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Impact of Demographic and Socio-Economic Factors on Households Out-of-Pocket Healthcare Expenditures: A Case of Trans-Nzoia County, Kenya

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Abstract

Purpose: Out-of-pocket (OOP) health expenses remain a significant obstacle to equitable healthcare access in Kenya, limiting progress toward Universal Health Coverage. In Trans-Nzoia County, Kenya, low insurance coverage, high poverty rates, and large household sizes exacerbate the risk of catastrophic health spending, forcing families into impoverishment. This study aimed to analyze the socio-economic and demographic factors determining household healthcare expenditures in Trans-Nzoia County, Kenya, and establish the various coping mechanisms households adopt to finance healthcare.

Design/methodology/approach: The study employed a non-experimental research design and utilized a stratified random sampling technique to collect data. Paper questionnaires were administered to 412 households across the five sub-counties of Trans Nzoia County. The methodology was based on the Engel Curve framework, with binary logistic regression used to identify determinants of catastrophic health expenditures, and multinomial logistic regression employed to analyze coping mechanisms.

Findings: Results showed that 25% of the households spend more than 40% of their income on non-food expenditure. Households with chronically ill members, larger family sizes, and elderly household heads had a significantly higher likelihood of experiencing catastrophic OOP expenditure. Regarding coping mechanisms, households with moderate income (Kshs. 20,000-60,000) were more likely to use alternative medicine, insured households were less likely to seek aid or borrow, whereas unemployed households and those with larger household sizes opted for asset liquidation.

Research limitations: The main limitation is that the study captured data at a single point in time restricting the ability to infer causality between socio-economic characteristics and healthcare expenditure patterns. Additionally, the study relied heavily on self-reported data, particularly concerning income, health expenditures, and coping strategies, which may affect the accuracy of the responses.

Practical implications: The findings will help stakeholders identify strategic policy targets to maximize the return on investments in healthcare. The national and county government of Kenya will also rely on this study to identify and address regional disparities in OOP payments, insurance coverage, and coping mechanisms, guiding targeted interventions and reforms to improve healthcare equity.

Originality/value: This study is original in its focus on the proportion of household income spent on healthcare and the coping mechanisms employed by households in Trans-Nzoia County. It addresses a gap in previous research, which primarily examined aggregate household spending and the prevalence of OOP payments, while also considering the demographic and socioeconomic factors influencing these expenditures.

Categories: Consumer Behavior, Labor Economics, Sustainable Economic Development
Keywords: out-of-pocket expenditure, catastrophic health spending, universal health coverage, household income, chronic illness, health insurance, impoverishing effects, borrowing, alternative medicine, household size
JEL Classifications: H51, H75, I00, I10, I11, I12, I13, I15, I18, I19

Introduction

Background of the study

The Kenya Demographic Health Survey report of 2018, published by the Kenya National Bureau of Statistics (KNBS), reveals that decisions regarding general welfare, including socio-economic and health status, are largely made within the household (KNBS, 2018). Household members often allocate their resources to promote good health and well-being among other priorities (Wagstaff, 2008). Health, encompassing both mental and physical well-being, is a key aspect of personal and societal wellness

(Hernández-Peña, 2019). It is recognized not only as an outcome but also as a vital resource, enabling individuals to pursue their goals and fully participate in society (Friedman, 2001). In some cases, households must trade off spending on non-medical goods to prioritize health, which can stretch their limited resources and lead to catastrophic expenditures (Rono, 2017). The opportunity cost associated with healthcare consumption underscores the critical role that healthcare has in safeguarding household health, which in turn positively impacts the overall well-being.

The World Health Organization (WHO) has constantly emphasized the need for household members to be protected against catastrophic health expenditures, which is usually a residual outcome of a household's inability to cater for its healthcare needs financially (WHO, 2025). In the design and implementation of global health policies, the socio-economic and demographic factors must be understood to facilitate the comparative examination of health expenditures among households (Munge, 2019). The trajectory necessitates a deeper understanding of the household's well-being and the proportions of income that they allocate for healthcare. Globally, there has been a growing acceptance that both demographic and socio-economic factors have had a direct impact on many households' health expenditures, subjecting close to 150 million people to a financial catastrophe and close to 100 million to poverty (Xu et al., 2003). Studies have shown that socio-economic factors like the level of education are directly related to rates of infectious diseases, physical disability, and morbidity rates among households (Rout, 2008). Conventionally, socio-economic factors are described as social and economic resources that determine the health of individuals, households, and populations.

Several studies have observed this connection by comparing the socio-economic factors in developed and developing countries and how they impact household health (Kollamparambil, 2021). Household's socio-economic positions are manifested in the form of education level, which increases the capacity of the households to earn better or even shape their spending habit; income and occupation of the household members which determines if a household can afford proper healthcare; the residence of the household which impacts on quality of healthcare considering variations in healthcare utilization among households in the rural and urban settings (Rono, 2017). The employment status and educational attainment of the household head and their spouses influence the expenditure patterns by indirectly impacting their income levels (Njagi et al., 2020). Consequently, medical expenses for an individual's health are expected to rise with age. The location of the household is important in evaluating the consumption expenditures, which are derived from differences in cultural backgrounds and climatic conditions.

According to Rout (Rout, 2008), households with a well-educated household head reported longer life expectancy, lower levels of morbidity, and lower chronic infectious rates. Just like the socio-economic factors, demographic factors also directly influence the patterns of healthcare expenditure. Demographic aspects in households are related to the head of the family as well as the family unit itself. The demographic parameters pertaining to the head of the home comprise their gender and age. The size of the home and the presence of disabled family members are among the demographic parameters that pertain to the family itself. Several studies evaluated the demographic factors among different households by comparing how they affect healthcare expenditures in both emerging and advanced economies (Munge, 2019). Njagi, Arsenijevic, and Groot established that factors such as the employment status of the head of the household, the level of income, poverty rate, income levels, and access to social amenities are vital in assessing the quality of life (Njagi et al., 2020). According to the study, deprivation of these key services reduces the well-being of households. Therefore, it is important to understand how the two factors have deeply impacted the proportions of household income that is allocated to healthcare.

In most countries, governments have faced challenges in designing healthcare systems that can protect households from being poor or financially unstable after paying for healthcare directly from their pockets. Studies have shown that catastrophic out-of-pocket (OOP) exists both in developed and developing worlds (Xu et al., 2003). Notably, wealthy households can also pay high OOP. However, this might not have negative implications for their livelihoods as compared to the low-income households. This is despite their low healthcare expenditure. Most low-income households have opted to seek other sources of income to meet their healthcare needs. This has been a coping mechanism to counter the increased proportion of income spent on health (Saksena et al., 2011). Some of the coping mechanisms have included seeking aid from relatives and friends, selling assets, using alternative medicine, borrowing loans, paying through private insurance, fundraising or "Harambee" contributions, and reimbursements from employers (Bonfrer and Gustafsson-Wright, 2017).

According to the World Bank and WHO report of 2017, despite the ever-growing healthcare investment of the 1.2 billion households globally, approximately half of them lack access to essential health services (World Bank, 2017). This global financial catastrophe has increased from 9.7% to 11.7% between 2000 and 2015. The main driver being increased proportions of income spent on healthcare (Chuma et al., 2019). Most people in Africa deplete their savings while paying for healthcare because the manner in which healthcare is set up system-wise favors OOPs (Chuma and Maina, 2012). The region, predominantly made up of developing countries, has OOP payments for healthcare accounting for between 60% and 80% of aggregate healthcare spending compared to government spending (Di Giorgio et al., 2022). According to the World Bank, Kenya's healthcare sector has experienced an increase in per capita OOP payments, which

have grown from 9.82% in 2000 to 20.87% in 2018 (World Bank, 2019). Monitoring this growing pattern of families depleting their savings while trying to pay for healthcare and studying the effect of such behavior enables the determination of catastrophic healthcare expenditures in Kenya.

According to the Kenya Health and Household Economic Survey (KHHEUS) 2013 report, several counties in Kenya reflect this pattern of growing OOP payments for healthcare (KNBS, 2013a). Similarly, the Ministry of Health (MOH) reported that 22 counties had exhibited higher catastrophic healthcare expenditures (CHE) than the national average, which currently stands at 6.2% (MOH, 2019) (KNBS, 2018). This study focused, in particular, on Trans Nzoia County as one of the counties that recorded high incidences of poverty and significant spending in healthcare compared to the country's average (KNBS, 2013b). As in many counties, the proportions of income households spend on healthcare could be catastrophic. The study investigated the link between the different household characteristics and spending patterns. Moreover, the study sought to determine the mechanisms that households adopt in financing healthcare expenditures.

From Figure *1*, the trend line shows that there has been a general positive increase in per capita OOP payments, which stood at approximately 9.82% in 2000 and rose to a high of 21.8% in 2013, but slightly declined to 18.42% in 2017 and then increased to 20.87% in 2018 (World Bank, 2019). According to Di Giorgio et al. (Di Giorgio et al., 2022), this increase has been affected by low per capita healthcare expenditure and percentage allocations from donor funding and health insurance. Donor funding withdrawal rendered the sector vulnerable. The Global Alliance for Vaccines and Immunization, which initially financed nearly 80% of Kenya's vaccines budget, withdrew its support in 2018 on the grounds of Kenya's Gross National Income (GNI) per capita. Kenya exceeded the minimum support threshold of Ksh. 158,000 GNI per capita (MOH, 2019). Moreover, aggregate donor funding declined from 32% in 2009/2010 to 22% in 2017/18. Private firms and health insurance coverage stood at 16.044% countrywide in 2019, which is way below the UHC target of 30% for the national insurance plan (MOH, 2019). Due to these inadequacies, households' OOP payments have led to CHE since they are consequently high, lowering their living standards.

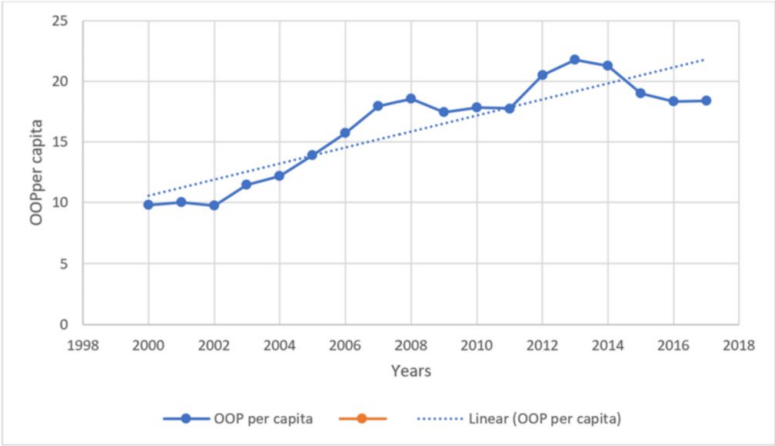

FIGURE 1: Kenya's Per Capita Out-Of-Pocket Expenditure in the Period (2000-2018)

Source: Author's Compilation

According to MOH (MOH, 2019), 36.1% of households in Kenya are living in poverty: households consuming less than US$1.90 per day. From Figure *2*, Trans-Nzoia is among the counties whose poverty rates are above the national average. This means that over 39% of its households must forego other consumption expenditures to cater for their healthcare expenses. Notably, CHE is not synonymous with high healthcare costs, as many might perceive, but it is a proportion of income that surpasses a certain percentage of a household's earnings (Kimani, 2014).

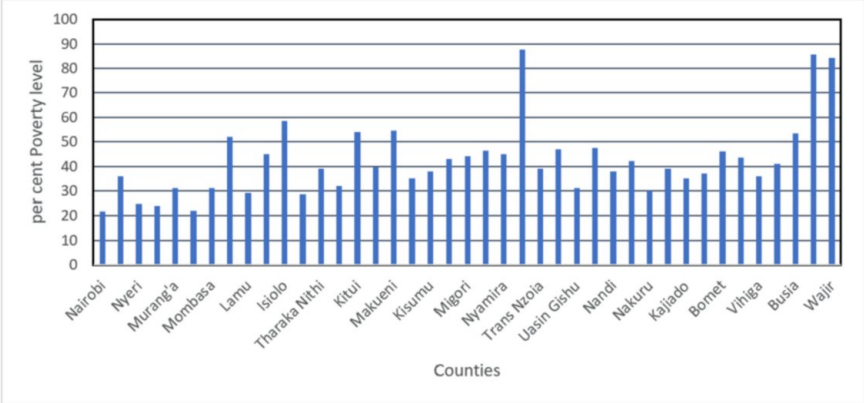

FIGURE 2: Poverty Rates in Kenyan Counties (in %)

Source: Author's Compilation

According to KNBS (KNBS, 2019a) and Country Health Accounts report of 2018, Trans-Nzoia county has had a slight increase in the per capita income from Ksh. 129 thousand to Ksh. 138 thousand since FYI 2017/18 to 2018/19. This has been attributed to a national increase in per capita income, which was due to an increase in government expenditure. However, its per capita income is way below the national average of Ksh. 204 thousand (KNBS, 2020). In Table *1*, the county's budget allocated to healthcare has also increased from 22.9% to 24.7% in the same period. This has also led to an increase in per-person individual allocation to healthcare from Ksh. 1700 to Ksh. 1800. However, this budget allocation is still far below the constitutional requirement of 30%. The county's per-person allocation on health is also below the country's average allocation of 2020 Kshs per person. The absence of insurance coverage is also of great concern, as only 10.9% of the households has insurance, which is way below the national average of 16.04% insurance coverage (MOH, 2019). In 2018, individuals who reported illness in the Trans Nzoia county were 33.9% compared to the national average of 12.1% (MOH, 2019).

Trans Nzoia County				**National average**			
Year	Per capita income (Kshs.)	% of the total county budget	Allocation per person (Kshs.)	Year	Per capita income (Kshs.)	% of the total county budget	Allocation per person (Kshs.)
2017/18	128,977	22.9	1700	2017/18	191,789	23.4	1910
2018/19	137,715	24.7	1800	2018/19	204,783	25.2	2020

TABLE 1: Comparison Between National to Trans-Nzoia County Averages (2017/18 to 2018/19)

Source: KNBS (KNBS, 2019a) and MOH (MOH, 2019)

Figure *3* shows that Trans-Nzoia County is among the other 22 counties whose proportion of household spending on healthcare is more than the country's mean of 6.2% based on the 40% measure of total non-food expenditure on health. According to MOH, it is approximately 12.7% when considering the 10% threshold of total household expenditure (MOH, 2019). Therefore, while developing healthcare systems, policymakers must ascertain whether certain characteristics of households influence the percentage of income that households devote to healthcare. They must also assess which family units are more susceptible to any given combination of these traits (Kirubi et al., 2021). To understand this, the study will examine the demographic and socio-economic factors that affect the proportions of household income allocated to healthcare.

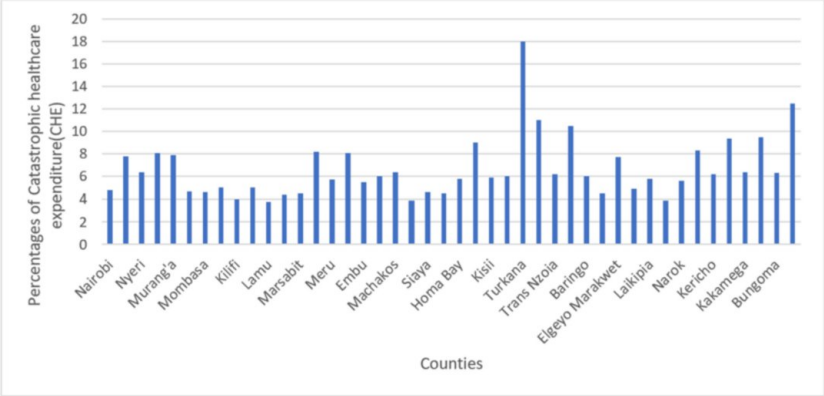

FIGURE 3: Catastrophic Healthcare Expenditures of Counties in Kenya

Source: Author's Compilation

Statement of the problem

Health is an imperative component of human capital due to its downright effects on the productivity and economic growth of a country (Muriithi and Mwabu, 2018). It is integral to both the individual and the nation's well-being since poor health can have a negative impact on households' productivity, which can consequently lead to an incapacitated human capital, aggravating poverty (Rono, 2017). In Kenya, the acquisition of a minimum of 20% OOP spending, as recommended by the WHO, of total spending on health for households has been vital for the government since it forms part of the ambitious "Kenya's Vision 2030" blueprint (MOH, 2019). The government has pursued this plan through the introduction of the nationwide healthcare schemes in all public facilities including the Social Health Insurance Fund, Health Sector Services Fund, and the Out-Put Based Aid (Di Giorgio et al., 2022). Despite the government's plan to ensure that all households acquire the required healthcare, Trans Nzoia County still lags behind in its healthcare budget allocation, forcing individual households to spend catastrophic OOP payments.

The county's budget allocation to the health sector is way below the average county allocation of 25.2% and far below the constitutional requirement of 30% (MOH, 2019). The limited insurance coverage is of great concern as it is the 18th lowest out of 47 counties, having only 10.9% of total households covered, which is way below the national average of 16.04% insurance coverage (MOH, 2019). At 33.9%, the county has the 2nd highest proportion of individuals who reported illness and never sought care. This is way above the national average of 12.1% of all Kenyans who reported illness and did not seek healthcare (MOH, 2017). The absence of sufficient insurance has had adverse effects on households, increasing the risk of impoverishment due to high costs of healthcare. The county has four to six people living in households, which is much more than the 3.9 national average (KNBS, 2019a). The county's citizens made Ksh. 137,715, less than the Ksh. 204,783 national average per capita income. With the high poverty rates, the county has only 26% of the population bearing secondary level education, with 32.10% of households headed by female (KNBS, 2019b).

This study on Trans-Nzoia County is motivated by previous studies conducted on CHE and the impoverishing effects of OOP payments (Chuma et al., 2019). These studies established the impact of aggregate household spending and impoverishing effects. Furthermore, studies on OOP payments and their effects on household well-being have often concentrated on the prevalence of OOP payments for health across various socioeconomic categories in Kenya's rural and urban areas (Munge, 2019) (Rono, 2017). More is yet to be done to establish the detrimental outcomes of the proportions of income that households spend on healthcare in specific Kenyan counties. Therefore, it has become desirable for the government to protect households at risk of catastrophic health payments (Chuma and Maina, 2012). This study intends to bridge this information vacuum regarding the ways in which households in Trans-Nzoia County pay for medical bills, as well as the impact of demographic and socioeconomic variables on the proportions of family income assigned to healthcare.

Objectives of the study

· To analyze the socio-economic and demographic factors that determine household healthcare expenditures in Trans-Nzoia County in Kenya.

· To investigate the mechanisms that households adopt in financing healthcare expenditures in Trans-Nzoia County in Kenya.

The study is guided by the following research questions.

RQ1: What are the socio-economic and demographic factors that determine a household's healthcare expenditures in Trans-Nzoia County in Kenya?

RQ2: What are the mechanisms that households adopt in financing healthcare expenditures in Trans-Nzoia County in Kenya?

Theoretical and empirical literature

Grossman's Theory on Household Healthcare Demand

According to Michael Grossman, the demand for health is a component in the direct utility function of an individual and therefore, its production and consumption are essential (Grossman, 1972). Like other goods in the market, households decide how to spend their income or wealth in buying healthcare goods with the objective of maximizing welfare. A key component of Grossman's theory, the dual property of health emphasizes the relationship between health and other facets of life and the need to promote health for both its inherent worth and its potential to advance societal and individual development.

In line with Grossman's model, households consume more healthcare bundles and less of other household goods. Therefore, households are not only assumed to be rational, but they will consistently prefer a bundle of healthcare goods compared to other goods in order to maximize their utility. This axiom is important in the decision-making of households and, therefore, a critical component in any household utility model. As per this framework, consumption of healthcare is an element in the demand for health. Therefore, health is not only demanded for its sake but also to enable its consumer to participate in market activities (i.e., labor market) (Grossman, 1972). On this account, health can be observed as a capital good. Its marginal efficiency for investment which translates to its rate of return must be greater than the cost of capital for it to be purchased or consumed.

Individuals who are household members allocate their resources to produce health. The household's health production function comprises several inputs such as genetic endowment, lifestyle, occupation, education, and environmental factors. This shows that household health depends on healthcare, which has a positive effect on health, and several factors combined with individuals' time to produce services that increase their utility (Grossman, 1972). However, the theory fails in the context that a rational consumer is "non-satiated," which implies that a household's needs are unlimited. Therefore, households are non-saturated in their preferences and allocation of resources. Besides that, the idea that the minimal expense and benefit of investing in medical care are equal cannot be practically applied because health is inherently influenced by a person's age, educational attainment, type of sickness, and other socioeconomic and demographic characteristics, all of which reduce the marginal advantages. Consequently, the goal of this study is to ascertain how socioeconomic and demographic characteristics affect OOP expenses. In this instance, household healthcare spending is represented by OOP expenses.

Wagstaff Theory of Household Health Expenditure

Adam Wagstaff defines OOP expenditures as catastrophic when they exceed a certain proportion of household income (Wagstaff, 2008). In Figure *4*, he illustrates the trade-off between non-medical expenditures (NM), such as housing, food, and clothing, plotted on the y-axis, and medical expenditures (M) on the x-axis. The theory suggests that, given a household income (100 dollars), an individual household will allocate Mo (20 dollars) toward healthcare and NMo (80 dollars) toward other essential household items. However, when the household's healthcare expenditure exceeds 40% of their income, it leaves less room for non-medical expenses, making healthcare expenditure unsustainable (Wagstaff, 2008). Therefore, as expenditure on healthcare (M) increases, non-medical expenditures (NM) decrease, highlighting the direct trade-off between spending on healthcare and essential items. On the other hand, the poverty line (PL) emphasizes the threshold beyond which health expenditures (M) become catastrophic, indicating that below this line, even minimal OOP payments could destabilize households' income.

Wagstaff's theory has limitations, particularly in its failure to account for other household-specific factors that influence health expenditure risk. Key factors such as health insurance coverage, household size, and the average age of the household are not considered, yet they can significantly alter the likelihood of incurring catastrophic health costs. Additionally, the theory does not address the broader policy environment-for example, the role of government health insurance or subsidies that may alleviate the financial burden of healthcare. Despite these limitations, Wagstaff's framework remains valuable in understanding the intersection of health expenditure and household welfare, particularly for lower-income households facing a disproportionate share of their income on health costs.

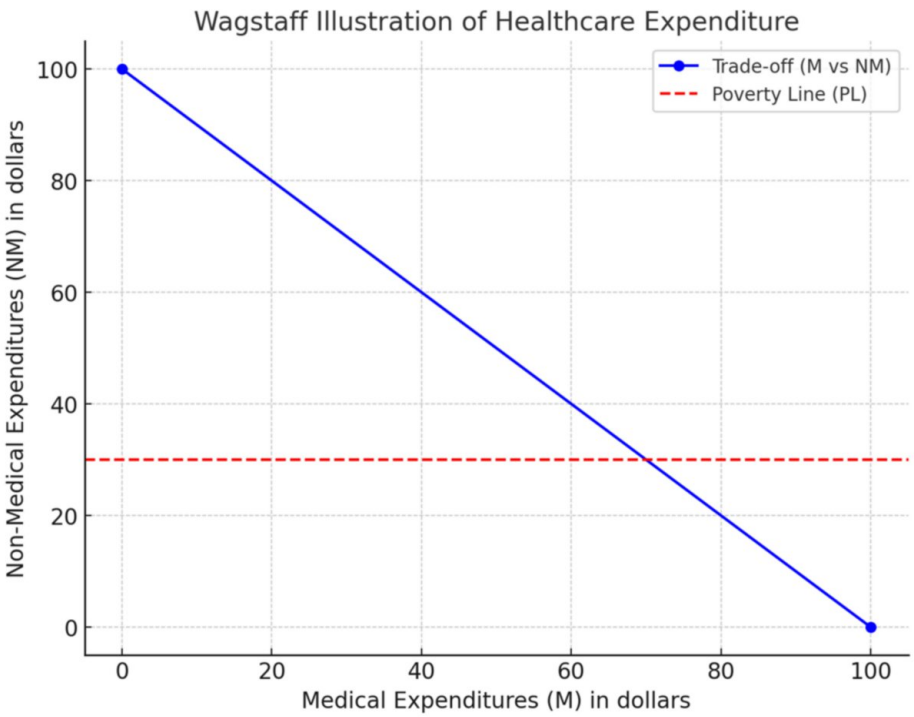

FIGURE 4: Wagstaff Illustration of Household Health Expenditure

Source: Author's Compilation

The Random Utility Theory

The Random Utility Theory by Block and Marschak (Block and Marschak, 1959) postulates that every individual is a utility maximizer and a rational decision-maker, and therefore individual choices are based on available alternatives. The theory assumes that an individual chooses from a set of mutually exclusive alternatives. Thus, an individual has a perceived utility and will always select the alternative with the greatest possible utility. On this account, the utility is influenced by individual characteristics and the choice specific attributes. This means that if an individual is faced with a choice between alternatives i and j, with associated utilities *Ui* and *Uj*, and if alternative "i" is selected, then the probability of choosing i over *j* is given by $P_i = \text{Prob}(U_i > U_j); \quad i \neq j$.

This suggests that the likelihood of selecting alternative i is greater than *j* because of its higher level of utility (Block and Marschak, 1959). This theory is not only applied to the choices that households make on whether to spend a high proportion of their income on healthcare, but it can also provide a theoretical framework when the given alternatives are more than two, such as analyzing the various coping strategies households employ to cover healthcare costs. In this study, households are faced with alternatives such as selling assets, borrowing money, using current income and savings, or seeking help to finance their OOP expenditures.

Empirical literature

Many studies have showed evidence of how OOP healthcare expenditures relate to poverty, the effectiveness of the government healthcare system, as well as how households adopt certain mechanisms to cope with these challenges. Diana Kimani studied the relationship between OOP health spending and household poverty (Kimani, 2014). The study assessed the prevalence of catastrophic costs of healthcare and destitution, as well as the impact of personal spending on the utilization of healthcare services. Using the logit model and the Two-Stage Residual Inclusion (2SRI) framework, the results from the estimated models revealed that approximately 12% of the individuals who sought healthcare services experienced catastrophic expenses (Kimani, 2014). In addition, about 4% of Kenyans were impoverished or had been made poorer by these catastrophic expenses.

Bonfrer and Gustafsson-Wright examined the coping strategies, health spending shocks, and the instances of medical care forgone among the cross-section of 1226 Kenyan farming households (Bonfrer and Gustafsson-Wright, 2017). The primary goal of the study was to evaluate the relative significance of health spending shocks and the factors associated with coping mechanisms and forgoing medical attention. A

probit model was employed and results showed that one out of five households had foregone necessary healthcare in their previous 12 months. The study concluded that the adoption of saving mechanisms or pre-payments would help protect the households from the financial constraints associated with health expenditures (Bonfrer and Gustafsson-Wright, 2017).

Gladys Rono investigated the effects of OOP on family well-being in Kenya in both rural and urban areas (Rono, 2017). The study compared the prevalence of OOP payments across various economic groups and to forecast the occurrence of catastrophic medical expenses using logit regression model. The study showed that a significant proportion of the poorest households, both rural and urban areas, faced unmanageable medical expenses (Rono, 2017). The study further concluded that the wealthy were also disproportionately affected by the OOP payments.

Basumatary and Srivastav examined the coping strategies employed by households in dealing with the OOP expenditures on healthcare in Assam, India (Basumatary and Srivastav, 2018). Their primary objective was to find out how households get the resources they need to cover their OOP expenses. A multinomial logit regression was employed in the study to assess factors that influence the coping strategies that households adopt. The findings revealed that savings and current income were the major coping mechanisms mostly used by non-poor households (Basumatary and Srivastav, 2018). However, most of the poor households mainly resorted to borrowing.

Salari et al. explored the disastrous and depressing effects of OOP healthcare costs in Kenya (Salari et al., 2019). The primary goal of the study was to evaluate the effectiveness of UHC and financial of the Kenyan healthcare system toward catastrophic spending. Mainly, the study investigated the frequency and severity of catastrophic and impoverishing health expenses nationwide. Using a multi-level logistic regression and the World Bank definition of catastrophic expenditure on healthcare (40% of non-food expenditure), the study examined if OOP payment overshoots the threshold (Salari et al., 2019). The findings demonstrated that the high probability of occurrence of OOP payments was associated with the incidence of chronic ailments, elderly individuals, and socio-economic conditions.

Benson Munge conducted a study on the factors influencing household healthcare spending in Kenya's rural areas (Munge, 2019). The study sought to determine the patterns of healthcare service consumption in Kenya's rural areas as well as to assess the trends in household OOP payments for health services. The study relied on the KHHEUS 2013 dataset (Munge, 2019). The effect of the various determinants on health expenses in Kenya's rural areas was estimated using the multiple regression model. The estimated results suggested that chronic illnesses, marital status, medical insurance and the gender of the respondents were directly related to the health expenditures (Munge, 2019). The wealth index and education levels had an indirect relationship with the health expenses.

Finally, Opondo and Oleche investigated OOP health costs among Kenyan senior citizens (Opondo and Oleche, 2020). The primary goal of the study was to assess the effects of various social and demographic factors on older adults' OOP health expenditures. Using a cross-sectional survey, the study also assessed the different wealth quintiles that categorized the elderly. The study found that high education level, possession of health insurance, having chronic ailments, age and being male had a positive correlation with the OOP health expenses (Opondo and Oleche, 2020). The concentration curves demonstrated that the richest quintile incurred the most OOP health expenditures.

Overview of Literature

Theoretical literature provides different views on OOP spending among households. According to Wagstaff (Wagstaff, 2008), health spending will mean households must forego consumption of other essential household goods and services. On the other hand, Grossman notes that healthcare is demanded among households for individual utility maximization. From the empirical literature, factors such as the incidence of chronic illnesses, marital status, and medical insurance were directly related to the health expenditures (Munge, 2019). More so, some of the coping mechanisms that households would adopt after facing catastrophic health expenses included the use of savings, loans, asking for gifts, and the sale of assets (Bonfrer and Gustafsson-Wright, 2017). Although, many studies on OOP payments were conducted in Kenya, these studies have focused on factors related to poverty, patterns of the consumption of health care services and the effectiveness of government healthcare system. Moreover, most empirical studies focused on the descriptive statistics that explained how households had incurred high OOP and the strategies they adopted. This study provides a comprehensive framework that helps analyze the relationship between the OOP healthcare expenditure and the various socio-economic characteristics of households in Kenya using the case of Trans Nzoia County. In particular, this study identifies the factors that likely influence the catastrophic OOP healthcare expenditures in the same county. This study further probes the strategies that households adopt to cope when faced with catastrophic healthcare expenditures.

Research Method

The study employed a non-experimental research design (Greene, 2012). The primary objective was to establish a clear relationship between the variables of interest. As per Mugenda and Mugenda (Mugenda and Mugenda, 2003), this design is particularly suitable for analyzing the raw primary data collected through questionnaires from households in Trans-Nzoia County.

Demand for healthcare

This study is based on the Engel Curve framework and the consumer demand theory, commonly used to characterize the relationship between household spending on goods and household income (Chai and Moneta, 2010). In general, a system of demand equations consisting of *n* commodities that is made up of all *n* demand equations may be expressed as;

$$Y_i = Y_j(P_1, P_2, \ldots, P_n, I, u_j), \quad j = 1, 2, 3, \ldots, n \quad (1)$$

where:

Y_i is the household demand for *jth* healthcare commodity.

P_j is the price for *jth* healthcare commodity.

I is the household income.

u_j is the stochastic term of the *jth* demand equation.

Estimation of equation (1) would require a specification of a particular functional form. For this purpose, a multiplicative form is often assumed such that

$$Y_j = A_j P_1^{n_{j1}} P_2^{n_{j2}} \ldots P_n^{n_{jn}} I^{n_{j1}} e^{u_j} \quad (2)$$

The linearization of equation (2) leads to the log transformation of the form

$$\ln Y_j = \alpha_j + \eta_{j1} \ln P_1 + \eta_{j2} \ln P_2 + \cdots + \eta_{jn} \ln P_n + \eta_j \ln I + \mu_j \quad (3)$$

Where intercept $\alpha_j = \ln A_j$ which is the constant for demand of healthcare goods.

$\eta_{j1}, \eta_{j2}, \ldots, \eta_{jn}$ are the price elasticities of demand with respect to the *nth* healthcare goods.

The foregoing discussion provides a theoretical framework to study the income elasticity of OOP healthcare expenditure as described by Onochie and Mobosi (Onochie and Mobosi, 2023). Additionally, household demand for healthcare commodities is also influenced by one's preferences. Intuitively, it can be argued that preferences are in turn determined by the various demographic and socio-economic characteristics that define the household. Therefore, the foundational model may be expressed as follows:

$$\ln \mathrm{OOPHE} = \psi(\ln \mathrm{INC}, \Omega) \quad (4)$$

where:

OOPHE is the per capita household healthcare expenditure.

INC is the household earnings.

Ω is the vector of all the demographic and socio-economic variables that characterize a household.

OOP healthcare expenditures and coping mechanisms

This study also analyzed the various mechanisms that households adopt in financing healthcare expenditures. The study assumes that the coping mechanism a household adopts is also influenced by demographic and socio-economic characteristics that define them. On this account, households are faced with alternatives such as selling assets, borrowing money, using savings, and seeking help to finance their OOP expenditures.

The random utility theory assumes that an individual chooses from a set of mutually exclusive alternatives. Accordingly, the alternative with greatest utility is guaranteed to provide the most satisfaction (Verbeek, 2017) (Cameron and Trivedi, 2005).

If a particular household decides to adopt a particular coping strategy *j*, it follows that:

$$P(y_i = j) = P\{U_{ij} = \max(U_{i1}, U_{i2}, \ldots, U_{iM})\} \quad (5)$$

where:

P is the probability that a household $i = 1, 2, \ldots, N$ adopts the *jth* coping mechanism

U_{ij} is the utility of the ith household for the jth coping mechanism, $j = 1, 2, \ldots, M$

Empirical model specifications and estimation

Model 1: Impact of Socio-economic and Demographic Factors on Out-of-Pocket Payments

The study employs a binary response model, which takes the form

$$Y_i^* = x_i'\beta + \epsilon_i \quad (6)$$

Equation (6) assumed that there is an unobserved latent variable which is linked to observed household characteristics such that, $y_i = 1 \quad \text{if} \quad Y_i^* > 0$, that is, OOP expenditure is greater than 40% of non-food expenditure and 0, otherwise, that is, $y_i = 0 \quad \text{if} \quad Y_i^* \leq 0.$

A vector of covariates for demographic and socioeconomic variables is represented by *xi,* which include household's income, the size of the household, age and gender of the household head, occupation, level of education, insurance coverage, and the presence of chronic illness. The estimated parameters are denoted by β, and ϵ_i represents the random error. The model in equation (6) is estimated using the maximum likelihood approach (Greene, 2012) (Cameron and Trivedi, 2005).

Model 2: Determinants of Household Coping Mechanisms

A multinomial logit model (MNL) is utilized to analyze the various coping mechanisms households adopt to finance OOP healthcare expenditures. According to Marno Verbeek, this choice model is reliable for discrete choice studies and the determination of probabilities for different categories (Verbeek, 2017).

Therefore, the probability of selecting a particular coping mechanism can be stated as follows (Verbeek, 2017):

$$P_{ij} = \Pr[y_i = j] = \frac{\exp(x_i\beta_j)}{1 + \sum_{l=2}^{M} \exp(x_i\beta_l)} \quad (7)$$

A normalization of parameters is needed as a consequence of the restriction that probabilities sum to one (Cameron and Trivedi, 2005).

where:

$P[y_i = j]$ is the probability of choosing either current income and savings, selling household assets, borrowing loans and seek aid from relations, and use of alternative medicine.

Whereas;

M is the number of coping mechanisms that households adopt in the choice set.

x_i is a vector of the socio-economic and demographic variables.

β is a vector of the estimated parameters, $j = 1, 2, \ldots, M$

The MNL is estimated using maximum likelihood approach. The current income and savings mechanism is used as the reference category.

Target population

The primary focus of this study were the households within Trans-Nzoia County. The five sub-counties-Kiminini, Kwanza, Endebess, Saboti, and Cherangany combined have 223.8 thousand households (KNBS, 2020).

Sampling and sample size

The study used stratified random sampling technique. The sample size was determined as guided by Yamane (Yamane, 1967), considering the total number of households (N) and a probability error of 5% at a 95% confidence level.

$$n = \frac{N}{1 + N(e)^2} = \frac{223,800}{1 + 223,800(0.05)^2} = 400 \quad (8)$$

Where;

n is the required sample size.

N is the total number of households.

e is the probability error.

The total number of sample households allocated per strata or sub-county is 80 households.

Both semi-structured and structured questionnaires were administered to households' heads. Questions were both closed and open-ended to enable respondents give additional information that might be useful to the study (see Appendix I).

Results And Discussion

Empirical findings

Summary Statistics: Socio-Economic and Demographic Factors

From Table 2, it is observed that majority of the households in Trans Nzoia County are male headed (72.1%), while female-headed households constitute 27.9%. Analysis of the age distribution revealed that most household heads fall within the 36-59 years age range, with 37.86% in the 36-45 years group and 26.46% in the 46-59 years group, together making up 64.3% of the total population. This was followed by older adults aged 60 years and above (20.6%) and young adults aged 18-30 years (15.1%). Notably, 45.9% of household heads had primary or no formal education, 43.9% had secondary or vocational training, and only 10.2% held a bachelor's degree or higher. Additionally, an examination of the employment status of the household head revealed that the majority (66.7%) are self-employed, 15.1% are formally employed, 10.9% are unemployed, and 7.3% are retired. Regarding insurance coverage, most households (84.9%) are uninsured, while only 15.1% have health insurance. Similarly, 41.5% of households rely on current income, 30.6% use alternative medicine, 17.7% sell household assets, and 10.2% borrow loans or seek aid. OOP healthcare expenditure analysis revealed that 75% of households spend below 40% of their income on medical expenses, while 25% are above this threshold.

Variable	Description	Frequency	Percentage (%)
Gender of Household Head	Male	297	72.10
	Female	115	27.90
Age of Household Head	18-35 years	62	15.05
	36-45 years	156	37.86
	46-59 years	109	26.46
	60+ years	85	20.63
Education Level of Household Head	None + Primary	189	45.87
	Secondary + Vocational	181	43.93
	Bachelors & Above	42	10.19
Employment Status of Household Head	Employed	62	15.05
	Self-employed	275	66.75
	Retired	30	7.28
	Unemployed	45	10.92
Insurance Status	No	350	84.95
	Yes	62	15.05
Coping Mechanisms			
Alternative Medicine		126	30.58
Borrowed Loan and Sought Aid		42	10.19
Current Income and Savings		171	41.50
Sold Assets		73	17.72
Out of Pocket Payments	Below 40%	309	75.00
	Above 40%	103	25.00
Household Income (Kshs.)	Below 20,000	248	60.19
	20,000-40,000	92	22.33
	40,001-60,000	32	7.77
	Above 60,000	40	9.71

TABLE 2: Summary of Household Characteristics

Source: Author's Compilation

Table 3 shows the correlation coefficients among the continuous variables used in the model estimation. A low positive correlation exists between the age of the household head and household size. No significant correlation between the age of the household head and income nor between the household size and household income. According to Onochie and Mobosi (Onochie and Mobosi, 2023), the lack of correlation between household size and income indicates that it is not necessarily true that households with many members register more income.

Correlation Analysis

		Age	Household size	Income
Age	Pearson Correlation	1		
	Sig. (2-tailed)			
Household Size	Pearson Correlation	0.3838	1	
	Sig. (2-tailed)	0.000		
Income	Pearson Correlation	0.0477	0.0255	1
	Sig. (2-tailed)	0.3340	0.6052	
** Correlation is significant at the 0.01 level (2-tailed).				

TABLE 3: Tests of Pearson Correlation

Source: Author's Compilation

Table *4* displays the relationship between OOP payments and some characteristics of the sample households. Age was significantly associated with OOP expenditure. Elderly household heads were disproportionately represented among households spending more than 40% of income on healthcare. The education level of the household head did not show a statistically significant relationship with OOP expenditure. Income level was also significantly associated with OOP expenditure. Notably, households earning below Ksh. 20,000 were more likely to experience catastrophic spending relative to higher-income households.

Insurance coverage within a household held a significant association with OOP expenditure. Households without health insurance were more likely to report catastrophic spending than their insured counterparts. Similarly, a significant relationship was found between the presence of chronic illness in a household and OOP healthcare expenditures. Households where no member had chronic illness were less likely to spend above 40% of their income on healthcare. This finding indicates a moderate association between chronic illness and increased OOP healthcare expenditure. Households with chronic illness bear a heavier financial burden, likely due to recurring medical costs, specialist visits, and long-term medication needs (Masengeli et al., 2017).

Employment status of the household head was significantly associated with OOP expenditure. Retired and unemployed respondents were more likely to fall into the high OOP payments category compared to employed and self-employed individuals. Whether a household head was employed or unemployed, the percentage of those spending below 40% of their income on healthcare remained more or less similar. Kollamparambil (Kollamparambil, 2021) suggests that while employment provides income stability, other factors-such as household income levels, insurance coverage, and the nature of employment (formal vs. informal sector)-might play a more critical role in determining healthcare affordability. Barasa et al. underscores the need for risk-pooling mechanisms in mitigating the financial burden of healthcare (Barasa et al., 2017).

Variable	Category	Below 40%	Above 40%	Total	χ^2 (do)	p-value	Cramér's V
Age	Young Adult	57	5	62	38.61 (2)	< .001>	0.262
	Middle-Aged	209	56	265			
	Senior Citizen	43	42	85			
Education	None + Primary	133	56	189	5.26 (2)	.072	0.096
	Secondary	140	41	181			
	Bachelor's	36	6	42			
Employment	Employed	54	8	62	11.12 (3)	.011	0.144
	Self-employed	207	68	275			
	Unemployed	31	14	45			
	Retired	17	13	30			
Income	Below 20,000	174	74	248	14.28 (2)	.001	0.158
	20,000–60,000	96	28	124			
	Above 60,000	39	1	40			
Chronic illness	Present	171	21	192	18.951 (1)	0.001	0.214
	Absent	158	62	220			
Insurance	No	250	100	350	15.82 (1)	< .001>	0.167
	Yes	59	3	62			

TABLE 4: Chi-Square Test of Independence on Correlation Between Healthcare Spending and Determinants of OOP

Source: Author's Compilation

Model Estimation and Analysis

Estimated Model 1: determinants of OOP payments

To analyze the likelihood of a household incurring high OOP healthcare expenditures, a binary logit model was estimated. The explanatory variables comprise of socio-economic and demographic characteristics of the household head as well as household-level health indicators. Gender of the household head was coded as male or female, with female serving as the reference category. Age was grouped into three categories: young adults (18-35 years), middle-aged (36-59 years), and elderly (60 years and above), with young adults as the base category.

Education level of the household head was aggregated into three categories: none/primary, secondary/vocational, and tertiary education, with tertiary serving as the reference. Concurrently, the employment status of the household heads was classified as self-employed, employed, unemployed, or retired, with self-employment as the base category. Household income was categorized into three groups: below Khs. 20,000, Ksh. 20,000-60,000, and above Ksh. 60,000, with the lowest category serving as the reference. Insurance coverage was also considered, coded as yes or no, with the uninsured group as the reference. In addition to these categorical socio-economic variables, two continuous household-level factors were included: household size and number of chronic illness cases reported within the household. The estimated marginal effects are presented in Table *5* while the actual regression results are represented in Appendix II.

Variable	Marginal Effects (dy/dx)	Standard Error	Z-value	p-Value
Gender (Ref: Female)				
Male	-0.0156	0.0412	-0.38	0.705
Age (Ref: Young Adults 18–35 years)				
Middle-aged (36–59 years)	0.0637	0.0612	1.04	0.299
Elderly (60+years)	0.2221	0.0831	2.67	0.008***
Education (Ref: Tertiary)				
None + Primary	-0.091	0.1005	-0.91	0.365
Secondary + Vocational	-0.0908	0.0977	-0.93	0.352
Employment (Ref: Self-employed)				
Employed	0.0829	0.0808	1.03	0.305
Unemployed	0.0693	0.0625	1.11	0.268
Retired	0.0696	0.0808	0.86	0.389
Income (Ref: Below Kshs. 20,000)				
Kshs. 20,000 – 60,000	-0.0527	0.0456	-1.16	0.248
Above Kshs. 60,000	-0.251	0.0427	-5.88	0.000***
Health Insurance (Ref: No)				
Yes	-0.2077	0.0441	-4.71	0.000***
Household size	0.0288	0.0063	4.58	0.000***
Chronic illness cases	0.0508	0.0165	3.08	0.002***

TABLE 5: Estimated Marginal Effects from Binary Logit Model

Source: Author's Compilation

Firstly, the results from the estimated model in Table *5* show that the age of the household head has a significant influence on OOP household expenditures. Specifically, when the household head is elderly, aged 60 years or above, the probability of experiencing catastrophic OOP health expenditure increases by 0.22. On the other hand, households with higher incomes show a reduced probability of incurring catastrophic health expenditures. Similarly, when a household's income exceeds Kshs. 60,000, the likelihood of catastrophic OOP health spending decreases by 0.25. This result agrees with Munge (Munge, 2019) study, which indicates that higher income levels provide a buffer against unexpected health expenses, enabling better financial resilience in the face of medical costs.

The results in this study also found that households with health insurance experienced a reduction in the probability of catastrophic OOP health expenditure by 0.21. This phenomenon highlights the importance of insurance in mitigating the financial burden of medical care, acting as a safeguard against high OOP costs (Barasa et al., 2017). Furthermore, larger household sizes have shown an increased risk of CHE. Precisely, for every additional member in a household, the probability of incurring catastrophic OOP health costs rises by 0.03 holding other factors constant. Pradhananga suggests that this may be due to the increased healthcare needs and expenses associated with a larger number of dependents, which puts more strain on household resources (Pradhananga, 2013).

Finally, the study also established that the presence of chronic illnesses within a household exacerbates the risk of catastrophic OOP health expenditures. For each additional case of chronic illness, the probability of incurring OOP expenditures above 40% increases by 0.05, holding other factors constant. Opondo and Oleche (Opondo and Oleche, 2020) reiterate that chronic conditions typically require ongoing medical treatment, which can lead to significant OOP expenses, especially in the absence of comprehensive insurance coverage. Overall, the probability of incurring catastrophic OOP health expenditures is likely influenced by several factors such as age, income, health insurance coverage, household size, and the number of chronic illnesses.

Estimated Model 2: coping mechanism and financing healthcare expenditures

The study examined household coping mechanisms for OOP healthcare payments using a multinomial logit model. The alternative coping mechanisms were categorized as follows: 1 = current income and savings used as base outcome, 2 = alternative medicine, 3 = borrowed loan and sought aid, and 4 = sold assets. The explanatory variables included are the demographic and socio-economic characteristics of the sample households. The estimated multinomial logistic regression results are presented in Appendix III.

The estimated results reveal distinct patterns in household responses based on income, education, age, and household size when compared to the base outcome, the use of current income and savings. Notably, compared to the base category, households with incomes ranging from Ksh. 20,000 to 60,000 are more likely to adopt alternative medicine, holding all other variables constant. Similarly, households that earned more than Ksh. 60,000 also show a higher likelihood of turning to alternative medicine, compared to those using current income and savings. Flores et al. (Flores et al., 2008) suggests that the adoption of alternative medicine as a coping mechanism may indicate that as disposable income increases, households seek alternative treatment options either due to perceived efficacy, lower costs, or a desire for a more holistic approach. In contrast, compared to the base outcome, households with a member suffering from chronic illness are less likely to adopt alternative medicine, suggesting that households with chronic illness tend to rely more on conventional medical care rather than alternative remedies. According to Oyando et al. (Oyando et al., 2023), chronic illnesses typically require ongoing medical supervision and treatment, which might make conventional medicine the preferred option for these households.

Middle-aged households, those between 36 and 59 years old, are less likely to adopt borrowing and seeking aid as a coping mechanism, compared to current income and savings as coping mechanism, holding all other variables constant. Sofi and Yasmin identify these household heads as more stable financially, having established careers or savings over time (Sofi and Yasmin, 2024). As a result, they might rely less on external aid or loans and prefer managing financial challenges using their own resources. On the other hand, household heads with no education or only primary education are more likely to adopt borrowing and seeking aid, compared to the base category. This reflects limited employment opportunities which reduces their capacity to generate income and increase reliance on external support (Saksena et al., 2011). Income also plays a significant role in the adoption of this coping mechanism with households earning between Kshs. 20,000 and 60,000 are more likely to borrow or seek aid, holding all other factors constant. Muriithi and Mwabu claim that households in this income bracket may experience financial pressure, leading them to turn to loans or aid to cover expenses (Muriithi and Mwabu, 2018).

Furthermore, compared to the base outcome, larger household sizes are associated with an increased likelihood of borrowing and seeking aid. Also, they are more likely to adopt selling assets as a coping strategy. Similarly, households headed by elderly, those aged 60 and above, are more likely to sell assets as a coping strategy, compared to the base outcome. Larger households and households with elderly members may sell assets to meet urgent financial needs, particularly when day-to-day living costs exceed their available income (Opondo and Oleche, 2020).

The estimated marginal effects from the multinomial logit model are presented in Table 6. The empirical findings reveal several significant insights into how different factors influence household coping mechanisms, with particular attention to income, education, health insurance, household size, and employment status. Notably, households with an income between Ksh. 20,000 and 60,000 are more likely to adopt alternative medicine, with the probability increasing by 0.13. Similarly, the probability of using borrowed loans and seeking aid also rises by 0.11 for this income bracket. However, this income range reduces the likelihood of relying on current income and savings by 0.15 and also lowers their probability of selling assets by 0.08. Salari et al. (Salari et al., 2019) also found that households in this income group are more likely to turn to alternative medicine and external aid but less likely to depend solely on their savings or sell assets to cope with financial pressures.

Coping mechanism	Variable	Marginal effects (dy/dx)	Standard error	Z-value	p-value
Alternative Medicine	Gender (Ref: Female)				
	Male	0.0328	0.0499	0.66	0.51
	Age (Ref: Young Adults 18–35 years)				
	Middle Aged (36–59years)	-0.0159	0.0662	-0.24	0.81
	Elderly (60 + years)	-0.1532	0.0875	-1.75	0.08***
	Education (Ref: Tertiary)				
	None + Primary	-0.0524	0.0916	-0.57	0.568

	Secondary + Vocational	-0.0115	0.0853	-0.13	0.893
	Employment (Ref: Self-employed)				
	Employed	-0.008	0.0739	-0.11	0.913
	Unemployed	-0.0708	0.0696	-1.02	0.309
	Retired	0.1073	0.12	0.89	0.371
	Income (Ref: Below Kshs. 20,000)				
	Kshs. 20,000-60,000	0.1299	0.0514	2.53	0.011***
	Above Kshs. 60000	0.2707	0.0909	2.98	0.003***
	Health Insurance (Ref: No)				
	Yes	0.0683	0.0716	0.95	0.34
	Household Size	-0.0021	0.0087	-0.25	0.806
	Chronic Illness	-0.0683	0.0251	-2.72	0.007***
Borrowed Loan & Aid	Gender (Ref: Female)				
	Male	-0.0215	0.0334	-0.64	0.52
	Age (Ref: Young Adults 18–35 years)				
	Middle Aged (36–59years)	-0.0748	0.0556	-1.34	0.179
	Elderly (60 + years)	-0.0006	0.075	-0.01	0.994
	Education (Ref: Tertiary)				
	None + Primary	0.1006	0.0361	2.79	0.005***
	Secondary + Vocational	0.0727	0.0325	2.24	0.025***
	Employment (Ref: Self-employed)				
	Employed	0.0676	0.0723	0.93	0.35
	Unemployed	-0.0577	0.0346	-1.67	0.096
	Retired	0.0318	0.0693	0.46	0.646
	Income (Ref: Below Kshs. 20,000)				
	Kshs. 20,000-60,000	0.1088	0.0389	2.8	0.005***
	Above Kshs. 60,000	-0.025	0.0492	-0.51	0.611
	Health Insurance (Ref: No)				
	Yes	-0.0732	0.0332	-2.2	0.028***
	Household Size	0.0081	0.0042	1.95	0.052***
	Chronic Illness	0.0101	0.0126	0.8	0.424
Current Income & Savings	Gender (Ref: Female)				
	Male	-0.0462	0.0544	-0.85	0.396
	Age (Ref: Young Adults 18–35 years)				
	Middle Aged (36–59years)	0.0683	0.0709	0.96	0.335
	Elderly (60 + years)	-0.0164	0.0961	-0.17	0.864
	Education (Ref: Tertiary)				
	None + Primary	-0.0911	0.1096	-0.83	0.406
	Secondary + Vocational	-0.1002	0.1031	-0.97	0.331
	Employment (Ref: Self-employed)				

	Employed	-0.0126	0.0886	-0.14	0.887
	Unemployed	-0.0547	0.0776	-0.7	0.481
	Retired	-0.184	0.1032	-1.78	0.075***
	Income (Ref: Below Kshs. 20,000)				
	Kshs. 20,000-60,000	-0.1504	0.0543	-2.77	0.006***
	Above Kshs. 60,000	-0.1127	0.0923	-1.22	0.222
	Health Insurance (Ref: No)				
	Yes	0.0172	0.0814	0.21	0.832
	Household Size	-0.016	0.0093	-1.72	0.085***
	Chronic Illness	0.0331	0.0246	1.34	0.179
Sold Assets	Gender (Ref: Female)				
	Male	0.0348	0.0381	0.91	0.362
	Age (Ref: Young Adults 18–35 years)				
	Middle Aged (36–59years)	0.0224	0.0514	0.44	0.664
	Elderly (60+ years)	0.1702	0.076	2.24	0.025***
	Education (Ref: Tertiary)				
	None + Primary	0.0428	0.0822	0.52	0.603
	Secondary + Vocational	0.039	0.0792	0.49	0.623
	Employment (Ref: Self-employed)				
	Employed	-0.047	0.0606	-0.78	0.438
	Unemployed	0.1832	0.0697	2.63	0.009***
	Retired	0.0449	0.0768	0.58	0.559
	Income (Ref: Below Kshs. 20,000)				
	Kshs. 20,000-60,000	-0.0883	0.0405	-2.18	0.029***
	Above Kshs. 60,000	-0.133	0.0591	-2.25	0.024***
	Health Insurance (Ref: No)				
	Yes	-0.0123	0.0649	-0.19	0.849
	Household Size	0.01	0.0055	1.82	0.069***
	Chronic Illness	0.0251	0.0163	1.54	0.123

TABLE 6: Estimated Marginal Effects from Multinomial Logistic Regression

Source: Author's Calculations

Households with an income above Kshs. 60,000 are more likely to use alternative medicine, with an increase in probability of 0.27. However, from Table *6* this income group is less likely to sell assets, with a decrease in probability of 0.13, when all other factors remain constant. This indicates that higher-income households may rely more on alternative medicine and less on liquidating assets to manage their finances (Basumatary and Srivastav, 2018). The presence of chronic illness within a household significantly impacts coping mechanisms. Specifically, households with a member suffering from chronic illness are less likely to adopt alternative medicine, with the probability decreasing by 0.07. According to Pradhananga, this suggests that households dealing with chronic illness may prefer conventional medical treatment over alternative approaches (Pradhananga, 2013).

The level of education of the household head also plays a crucial role in the adoption of coping mechanisms. Households whose heads received primary education (or none at all) are more likely to

borrow and seek aid, with a probability of increasing 0.10. Similarly, household heads with secondary or vocational education show an increased likelihood of borrowed loans and aid by 0.07. This suggests that lower educational attainment may drive households to seek external financial assistance more often (Nkurunziza et al., 2023). Noticeably, health insurance coverage within a household significantly impacts how households borrow and seek aid. Households with health insurance are less likely to adopt borrowing and seek aid as a coping mechanism, with the probability decreasing by 0.07. Oyando et al. (Oyando et al., 2023) and Masengeli et al. (Masengeli et al., 2017) highlight the protective effect of health insurance, which reduces the need for external financial support in times of financial strain. On the other hand, an increase in household size raises the probability to borrow and seek aid by 0.01. While this effect is weak, it suggests that larger households may experience higher financial needs, making external aid more likely. Household size also increases the probability of selling assets by 0.01, indicating a potential reliance on asset liquidation in larger families.

Regarding employment status, a retired household head depicts a lower probability of using current income and savings as a coping mechanism by 0.02. In contrast, an unemployed household head significantly raises the probability of selling assets as a coping strategy, with an increase of 0.18. According to Masokolo et al., unemployed heads of households may resort to selling assets more frequently due to limited income (Masokolo et al., 2024). The overall empirical findings underscore how socio-economic factors, including income, education, and employment status, play a pivotal role in shaping how households cope with financial difficulties.

Discussion

The study used a sample of 412 households in Trans-Nzoia County, Kenya, to identify the demographic and socio-economic factors that determine the likelihood of incurring catastrophic OOP healthcare expenditures and to analyze how households adopt certain mechanisms to cope with healthcare payments.

Under the demographic structure of households, the study established that the average household consisted of 6 members, and household heads had a mean age of 46 years. Male-headed households accounted for 72.1% of the sample, suggesting a gender imbalance in healthcare decision-making. The average monthly household income was Ksh. 27.3 thousand with 62.4% earning below Ksh. 20 thousand. Educational attainment was generally low, with 45.9% of household heads having primary-level education only, and just 10.1% having tertiary education. Most household heads were self-employed with the proportion of 66.7%, indicating limited income stability. A significant 68.7% of households lacked any form of health insurance.

The study found that 75% of households spent less than 40% of their non-food expenditure on health while 25% spent more than 40%. An examination of insurance uptake indicated that 15.05% of household heads were insured. The findings show that this is likely a compounding problem because most families would be forced to pay directly from their pockets if the ailments suffered required short-notice funds (Barasa et al., 2017). The study first surveyed households' preferred mechanisms to pay for healthcare costs. About 41.50% relied on current income and savings, 17.72% stated they would sell their household assets, 30.58% stated that they use alternative medicine, and only 10.19% stated that they would borrow loan and seek aid.

The estimated binary choice model indicated that households headed by elderly individuals (60 years and above) are more likely to incur catastrophic OOP spending, with the probability increasing by 0.22. Household earning above Ksh. 60 thousand reduces the probability of incurring catastrophic OOP expenditure by 0.25. Similarly, health insurance coverage substantially lowers vulnerability, reducing the probability of catastrophic spending by 0.21. This underscores the importance of risk-pooling mechanisms in mitigating the financial burden of healthcare (Barasa et al., 2017) (Masengeli et al., 2017). Larger households are significantly more vulnerable, with each additional member increasing the probability of catastrophic OOP spending by 0.03. Likewise, the presence of chronic illness intensifies financial strain, as each additional case raises the likelihood of catastrophic expenditure by 0.05.

The multinomial logit model was employed to analyze household coping strategies in response to health-related financial shocks. With respect to household adopting alternative medicine, households with moderate and higher incomes were significantly more likely to adopt this strategy compared to relying on current income and savings. For borrowing and seeking aid strategy, the results indicate a differentiated pattern. Middle-aged household heads (36-59 years) were less likely to adopt this mechanism, which may reflect greater financial stability or stronger access to savings during this stage of the life cycle. On the other hand, households with low education levels (no or only primary education) were marginally more likely to depend on borrowing and aid, highlighting the role of limited financial literacy and weaker access to formal safety nets (Nkurunziza et al., 2023). Furthermore, households with incomes between Ksh. 20-60 thousand and those with larger household sizes were significantly more likely to rely on borrowing and external assistance, underscoring how both economic pressures and dependency burdens push families toward external coping strategies.

On the selling assets strategy, elderly households (60+ years) were more likely to adopt this coping mechanism, reflecting age-related vulnerability and the absence of stable income sources after retirement. Unemployed households also demonstrated a strong likelihood of selling assets as a coping mechanism, which is consistent with the lack of regular earnings and limited credit access. Similarly, larger households were significantly more likely to adopt asset liquidation, possibly due to higher consumption needs and the greater strain placed on limited resources (Basumatary and Srivastav, 2018).

Conclusions

In conclusion, the two methods of analysis affirmed that among the demographic and socioeconomic factors: age, income, health insurance coverage, household size, and presence of chronic illness significantly determine the likelihood of incurring catastrophic OOP healthcare expenditures. Specifically, households with older heads (60+) and those with higher incomes are less likely to face catastrophic health costs, while larger households and those with chronic illnesses are more likely to incur higher OOP expenses. Health insurance coverage also plays a protective role, significantly reducing the probability of catastrophic health spending.

In terms of coping mechanisms, the study found evidence that income, education, household size, and employment status determine the likely strategies that the household adopts to pay for high costs of healthcare. Households with moderate and high earnings were more likely to adopt alternative medicine and borrow as a coping strategy. However, these income groups were less likely to rely on savings or liquidate assets. Households with chronic illnesses showed a preference for conventional medicine, while those with lower educational attainment were more likely to borrow or seek aid. Larger households and elderly-headed households were more likely to sell assets to cope with financial stress, and unemployed household heads were more inclined to liquidate assets due to limited income.

These findings demonstrate the complex relationship between household income, education, health status, and coping strategies. The study suggests that interventions to reduce financial vulnerability, such as improving health insurance coverage, increasing income levels, and enhancing access to education, could significantly mitigate the financial strain caused by healthcare costs. Policymakers should focus on creating protective systems for households, particularly those that are larger or headed by the elderly, to ensure they are better equipped to handle health-related financial challenges.

Recommendations

Empirical findings and the overall pattern of the household healthcare expenditures in Trans-Nzoia suggest that there is a need to expand health insurance coverage in the county. Based on the low percentage of uninsured individuals, awareness and information campaigns are needed to sensitize households on the importance of health coverage. Subsidizing premiums would encourage enrollment. The awareness campaign and enrollment target should be focused on informal sector workers. Targeted assistance for households earning less than Ksh. 20 thousand a month would help families with elderly and chronically ill members. To ensure continuous health insurance uptake, stakeholders must promote community health education. Health literacy programs enhance understanding of insurance benefits and encourage preventive healthcare practices. Given that most household heads stated that they are self-employed, there is a need to support livelihood and income-generating activities outside formal employment. Such an initiative would strengthen economic resilience and create a buffer to mitigate catastrophic healthcare spending. Building the capacity of healthcare facilities would reduce the need for high OOP spending because, in the long run, it would ensure low-cost accessibility to hospital services.

Limitations of the study

The study captured data at a single point in time. This restricts the ability to infer the dynamic causality between socio-economic characteristics and healthcare expenditure patterns. Second, the study relied heavily on self-reported data, particularly concerning income, health expenditures, and coping strategies. Such data are susceptible to recall bias and social desirability bias, which may affect the accuracy of the responses. The survey did not comprehensively capture informal or non-monetary coping mechanisms-such as community-based support-which could have provided a richer picture of household behavior in response to health shocks. Fourth, while the sample size (n = 412) was sufficient for statistical analysis, the study was geographically limited to Trans-Nzoia County, and the findings may not be generalizable to other counties with different socio-economic or cultural contexts. The study focused exclusively on quantitative methods, which, while statistically robust, may have overlooked the motivations, beliefs, and constraints that drive household health expenditure decisions. A mixed-methods approach might have enriched the analysis by adding depth and context to the statistical findings.

Suggestions for future study

In future research, longitudinal or panel data studies are needed to better understand how household healthcare spending and coping mechanisms evolve over time. Such designs would allow researchers to examine causality and track the long-term economic effects of catastrophic health expenditures.

Qualitative or mixed-methods approaches-such as in-depth interviews, focus group discussions, or ethnographic case studies-could provide deeper insights into the contextual factors and decision-making processes that underlie household responses to health shocks. Future studies should consider comparing multiple counties or conducting a national-level analysis to examine regional disparities in OOP payments, insurance coverage, and coping mechanisms. This would help in the generalization of findings and support evidence-based policy formulation at both the county and national levels.

A focused study on the effectiveness of the Social Health Authority, especially among informal sector workers and low-income households, could shed light on the gaps in insurance access and utilization. Such research would be crucial in informing reforms toward achieving Universal Health Coverage. Lastly, future research could explore the role of community-based health financing models and social capital networks in cushioning households from catastrophic expenditures, particularly in rural and underserved areas.

Appendices

Appendix I. Questionnaire

Dear Respondent,

I am conducting a study on the impact of socioeconomic and demographic factors on household out-of-pocket spending. Your household has been selected at random from all households in the county for participation in this study.

I kindly request that you take a few moments to complete this survey. Please be assured that all information provided will be kept confidential and will be used solely for academic purposes.

Thank you for your valuable contribution.

INSTRUCTIONS

Please answer appropriately questions below. Do not write your name in this questionnaire.

You may seek clarity for any question which is not clear.

SECTION A: HOUSEHOLD PROFILE.

1. (A1) What is the gender of the household head?

Male [ ] Female [ ]

2. (A2) What is the age of the household head? (*PLEASE TICK THE APPROPRIATE BOX*)

18-35 years [ ] 36-45 years [ ] 46-59 years [ ] 60 & above years [ ]

3. (A3) What is the highest level of education completed by the household head?

I. Primary [ ]

II. Secondary [ ]

III. Vocational [ ]

IV. Bachelor's Level [ ]

V. Master's Level [ ]

VI. Doctorate Level [ ]

VII. None [ ]

4. (A4) What is the occupation of the household head? .....

5. (A5) What is the employment status of the household head? (*select what applies*)

I. Employed [ ] II. Self-employed [ ] III. Unemployed [ ] IV. Retired [ ]

6. (A6) Including yourself, how many members of your household are in the following age brackets? (All members of the household sharing meals, including the respondent)

Age Group	*Male*	*Female*	*Total*
Below 18 years			
18-30 years			
31-45 years			
46-59 years			
60 years & above			

SECTION B: HOUSEHOLD HEALTH PROFILE

7. (B2) Has anyone in your home received a diagnosis for any of the following illnesses? (If there are no members in the state, enter "0").

Disease	*Household Members*
Heart diseases	
Diabetes and related issues	
Cancer/Tumor	
Mental and behavioral disorders	
Eye disease	
Respiratory diseases (e.g., asthma)	
Others (Specify)	

8. (B2) Does any member of your family require ongoing care as a result of old age, a disability, a mental health condition, an accident, or other issues?

(a) Yes [ ]

(b) No [ ]

9. (B3) Do members of your household always receive traditional care from a healer or shaman, or do they always receive modern medical care from a doctor, nurse, or midwife in the event of illness?

(a) Never [ ]

(b) Sometimes [ ]

(c) Yes, Always [ ]

(d) Nobody has been sick in the past 7 months [ ]

10. (B4) Is there any member of your household taking medicines regularly?

(a) Yes [ ]

(b) No [ ]

11. (B5) In the period between January and March 2024 how many times members of your family including you were admitted or seen by a doctor upon ill-health as follows. (If "none" move to the next question)

(a) Once [ ]

(b) Twice [ ]

(c) Thrice [ ]

(d) Four times or more [ ]

(e) None [ ]

12. (B6) Which financial sources did your household use to cover health-related expenses between January and May 2024? (*tick appropriate box*)

SOURCE OF FUNDS	*TICK OR INDICATE*
Current income	
Savings (Bank, Sacco or Mobile phones)	
Borrowing loans/other institutions	
Sold assets (e.g., land, vehicle, other property)	
Sought aid from relatives	
Others (Specify)	

13. (B7) How much did your household spend on healthcare between January and May 2024?

A. 0-10,000 Kshs. [ ]

B. 10,000-20,000 Kshs. [ ]

C. 20,000-50,000 Kshs. [ ]

D. 50,000 Kshs & Above [ ]

14. (B8) Approximately what percentage of your total income did you spend on healthcare between January and May 2024?

A. 0-20% [ ]

B. 20-40% [ ]

C. 40-60% [ ]

D. 60% & Above [ ]

SECTION C: HOUSEHOLD INSURANCE

15. (C1) Have you ever heard about household health insurance?

i. Yes [ ]

ii. No [ ]

16. (C2) Is any member of your household covered by a health insurance scheme?

i. Yes [ ]

ii. No [ ]

17. (C4) How many persons in your household are covered by health insurance .....?

18. (C5) What is your opinion about the health insurance scheme? (Please select one option that best represents your opinion):

i. Very Positive [ ]

ii. Somewhat Positive [ ]

iii. Neutral [ ]

iv. Somewhat Negative [ ]

v. Very Negative [ ]

SECTION D: FINANCIAL SOURCES FOR HEALTH-RELATED PAYMENTS

19. (D1) How many members of your household receive income? (Salary, Pension, Rent, Farm Income, or any other sources of income)

I. One [ ]

II. Two [ ]

III. Three [ ]

IV. Four [ ]

V. Five & Above [ ]

20. (D2) How many sources of income does your household have?

I. One [ ]

II. More than one [ ]

III. None [ ]

21. (D3) What was the approximate income of your household in May 2024, including salary, pension, farm income, alimony, and any other sources of income? (The interviewee should know that all information is private and confidential)

I. Below Ksh. 20,000 [ ]

II. Kshs. 20,000-40,000 [ ]

III. Kshs. 40,000-60,000 [ ]

IV. Kshs. 60,000 & Above [ ]

Appendix II. Estimated Binary Logit Model

Variable	Coefficient	Standard error	Z-value	p-value
Gender (Ref: Female)				
Male	-0.108	0.255	-0.38	0.703
Age (Ref: Young Adults 18–35)				
Middle-aged (36–59)	0.499	0.864	0.95	0.341
Elderly (60+)	1.444	2.510	2.44	0.015**
Education (Ref: Tertiary)				
None + Primary	-0.594	0.346	-0.95	0.343
Secondary + Vocational	-0.592	0.335	-0.98	0.329
Employment (Ref: Self-employed)				
Employed	0.556	0.899	1.08	0.281
Unemployed	0.471	0.648	1.16	0.245
Retired	0.473	0.831	0.91	0.361
Income (Ref: <20,000)				
20,000–60,000	-0.351	0.219	-1.13	0.258
Above 60,000	-2.955	0.060	-2.56	0.010**
Health Insurance (Ref: No)				
Yes	-2.013	0.093	-2.91	0.004**
Household size	0.202	0.059	4.21	0.000**
Chronic illness cases	0.356	0.172	2.95	0.003**
Constant	-2.530	0.064	-3.13	0.002

Notes: LR $\chi^2(13) = 100.78$, $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$, Pseudo $R^2 = 0.218$

TABLE 7: Appendix II

Source: Author's Calculations

Appendix III. Estimated Multinomial Logit Model

Coping mechanism	Variable	Coefficient	Standard error	Z-value	p-value
Alternative Medicine	Gender (Ref: Female)				
	Male	0.2239	0.2883	0.78	0.437
	Age (Ref: Young Adults 18–35 years)				
	Middle Aged (36–59years)	-0.2350	0.3548	-0.66	0.508
	Elderly (60 + years)	-0.6364	0.5633	-1.13	0.259
	Education (Ref: Tertiary)				
	None + Primary	0.0184	0.5008	0.04	0.971
	Secondary + Vocational	0.1903	0.4593	0.41	0.679
	Employment (Ref: Self-employed)				
	Employed	0.0110	0.4259	0.03	0.979
	Unemployed	-0.1985	0.4538	-0.44	0.662

	Retired	0.8882	0.6713	1.32	0.186
	Income (Ref: Below Kshs. 20,000)				
	Kshs. 20,000-60,000	0.8402	0.2845	2.95	0.003***
	Above Kshs. 60000	1.0914	0.4274	2.55	0.011***
	Health Insurance (Ref: No)				
	Yes	0.1873	0.3791	0.49	0.621
	Household Size	0.0298	0.0513	0.58	0.561
	Chronic Illness	-0.3383	0.1451	-2.33	0.020***
	Constant	-0.7107	0.6283	-1.13	0.258
Borrowed Loan & Aid	Gender (Ref: Female)				
	Male	-0.101	0.3973	-0.25	0.799
	Age (Ref: Young Adults 18–35 years)				
	Middle Aged (36–59years)	-0.9126	0.5492	-1.66	0.097***
	Elderly (60 + years)	0.0482	0.6869	0.07	0.944
	Education (Ref: Tertiary)				
	None + Primary	1.9789	1.1582	1.71	0.088***
	Secondary + Vocational	1.7223	1.1366	1.52	0.13
	Employment (Ref: Self-employed)				
	Employed	0.5932	0.6423	0.92	0.356
	Unemployed	-0.7096	0.8049	-0.88	0.378
	Retired	0.8806	0.7693	1.14	0.252
	Income (Ref: Below Kshs. 20,000)				
	Kshs. 20,000-60,000	1.3253	0.3917	3.38	0.001***
	Above Kshs. 60000	-0.2638	1.1125	-0.24	0.813
	Health Insurance (Ref: No)				
	Yes	-1.1846	0.8316	-1.42	0.154
	Household Size	0.1323	0.0577	2.29	0.022***
	Chronic Illness	0.0349	0.1645	0.21	0.832
	Constant	-3.8612	1.2806	-3.02	0.003
Sold Assets	Gender (Ref: Female)				
	Male	0.3285	0.3363	0.98	0.329
	Age (Ref: Young Adults 18–35 years)				
	Middle Aged (36–59years)	0.0036	0.5276	0.01	0.995
	Elderly (60 + years)	1.0165	0.6161	1.65	0.099***
	Education (Ref: Tertiary)				
	None + Primary	0.5611	0.8042	0.7	0.485
	Secondary + Vocational	0.5422	0.779	0.7	0.486
	Employment (Ref: Self-employed)				
	Employed	-0.3275	0.6675	-0.49	0.624
	Unemployed	1.0059	0.4105	2.45	0.014

	Retired	0.8224	0.641	1.28	0.2
	Income (Ref: Below Kshs. 20,000)				
	Kshs. 20,000-60,000	-0.1871	0.3867	-0.48	0.628
	Above Kshs. 60000	-0.8796	0.8341	-1.05	0.292
	Health Insurance (Ref: No)				
	Yes	-0.1657	0.5668	-0.29	0.77
	Household Size	0.1083	0.0507	2.14	0.033***
	Chronic Illness	0.1015	0.1388	0.73	0.465
	Constant	-2.7279	0.9719	-2.81	0.005

Model Fit: Number of observations = 412; Log likelihood = -463.95, LR $\chi^2(21) = 115.84$, $p < .001$; Pseudo $R^2 = 0.111$ Note: *p < .10. **p < .05. ***p < .01. Current Income and Savings = Reference Category/Base Outcome

TABLE 8: Appendix III

Source: Author's Compilation

Appendix IV. Definition and Measurement of Variables

Variable	Definition	Measurement
Out-of-pocket payments	Is the expenditure on medical care reported by a household in the last one month excluding payments covered by insurance.	Equals to 1 if a household spends more than 40% of non-food expenditure on healthcare and zero if otherwise.
Income	The total earnings from all income generating sources within the household.	Below 20,000 Kshs. (reference category), 20,000-40,000 Kshs. 40,000-60,000 Kshs. and above 60,000 Kshs.
Household size	Number of individuals who live together and pool their financial resources and are answerable to the household head.	Counting household members who include adults, children, disabled family and non-family members.
Age	Age in years of the household head.	Age is measured in years and categorized in groups based on age ranges. 18-35 years, 36-45 years, 46-59 years, and 60 & above years.
Gender	The biological sex of the household head.	Equal to 1 if the household head is male and zero otherwise.
Education level	Level of schooling of the household head.	Equal to 1 if the level of education of a household head is secondary level and above and zero if otherwise.
Employment status	Household head having fulltime paid work.	Equal to one if a household head is employed or self-employed, zero otherwise.
Presence of chronic illness	The number of household members suffering from chronic illnesses.	Counting household members who have been diagnosed with chronic illness.
Insurance	Is whether a household has healthcare insurance.	Equals to one if household members have any subscription and zero if otherwise.

TABLE 9: Appendix IV

Source: Author's Compilation

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of

the work.

Concept and design: Samson M. Wameya, Angelica E. Njuguna

Acquisition, analysis, or interpretation of data: Samson M. Wameya, Angelica E. Njuguna

Drafting of the manuscript: Samson M. Wameya

Critical review of the manuscript for important intellectual content: Samson M. Wameya, Angelica E. Njuguna

Supervision: Angelica E. Njuguna

Disclosures

Human subjects: Consent was obtained or waived by all participants in this study. National Commission for Science, Technology & Innovation (NACOSTI) issued approval NACOSTI/P/25/4179623. This is to certify that Mr. Samson Milimo of Kenyatta University has been licensed to conduct research, as per the provisions of the Science, Technology and Innovation Act, 2013 (Rev. 2014), in Trans-Nzoia on the topic: Impact of Demographic and Socio-Economic Factors on Household Out-of-Pocket Healthcare Expenditures: A Case of Trans-Nzoia County, Kenya, for the period ending 15 September 2026. License No.: NACOSTI/P/25/4179623. **Animal subjects:** All authors have confirmed that this study did not involve animal subjects or tissue. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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