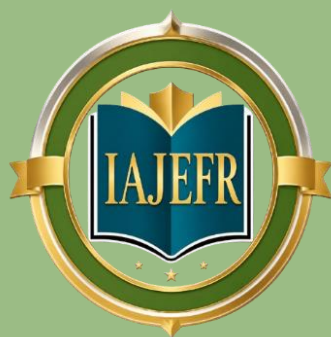




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**EFFECT OF PATIENT-RELATED FACTORS ON HOUSEHOLD
EXPENDITURES ON NON-COMMUNICABLE DISEASES IN NYERI
COUNTY BETWEEN 2015 AND 2025**

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Abstract:

Purpose of study: This study examined the effect of patient-related factors, namely treatment adherence, health-seeking behaviour, and perceived illness severity, on household expenditure on non-communicable diseases (NCDs) in Nyeri County, Kenya, between 2015 and 2025.

Methodology: Anchored on the Andersen Behavioral Model of Health Services Use, an explanatory correlational design with a cross-sectional survey was adopted. A sample of 398 households was drawn from 85,000 households

across five Level Four public hospitals using Yamane's formula and simple random sampling. Structured questionnaires and secondary hospital records provided data, analyzed using SPSS Version 28 through descriptive statistics, Pearson correlation, and multiple linear regression.

Findings: A response rate of 85.9% (n=342) was achieved. Descriptive findings revealed respondents strongly agreed patient-related factors increased household expenditure (aggregate mean=4.09), with non-adherence (M=4.21) and delayed treatment-seeking (M=4.18) rated highest. Households incurred average NCD expenditure of KES 61,590, with medication costs (KES 28,650) forming the largest component. Correlation analysis established a strong positive relationship between patient-related factors and household expenditure ($r=0.681$, $p<0.001$). Regression results confirmed patient-related factors significantly predicted household expenditure ($\beta=0.668$, $p<0.001$), explaining 44.6% of the variance ($R^2=0.446$). The null hypothesis was rejected, confirming that patient-related factors significantly influence household expenditure on NCDs in Nyeri County.

Conclusion: Patient behaviour, particularly non-adherence, delayed care-seeking, and irregular clinic attendance, is a critical determinant of the economic burden of NCDs on households. The study recommends strengthened patient education, adherence support systems, expanded insurance coverage for medication and diagnostics, and enhanced routine monitoring services to reduce household financial strain from NCD management.

Keywords: *Non-communicable diseases, patient-related factors, household expenditure, treatment adherence, health-seeking behaviour*

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1. INTRODUCTION

1.1 Background of the Study

Non-communicable diseases, including cardiovascular conditions, diabetes, cancers, and chronic respiratory illnesses, have become a leading cause of morbidity, mortality, and household financial strain across low- and middle-income countries. Unlike acute illnesses, NCDs require sustained, often lifelong, medical attention, which translates into recurring costs for medication, laboratory testing, consultation, and transport to health facilities. In Kenya, the burden of NCDs has grown steadily over the past decade, placing considerable pressure on both the public health system and the household budgets of affected families. Evidence from a nationally representative costing study found that Kenyan households spend a substantial share of their income accessing NCD screening, diagnosis, and treatment services, with affordability remaining a major concern for those without health insurance coverage.

Household spending on NCDs is shaped not only by the type and severity of illness but also by how patients themselves engage with available healthcare services. Patient-related factors such as adherence to prescribed treatment, promptness in seeking care, regularity of clinic attendance, and self-management practices directly influence whether a disease is controlled early or allowed to progress into a more complex and costly condition. A cross-sectional study of medication adherence among patients with hypertension and diabetes in western Kenya found that poor adherence was closely linked to cost-related barriers and weaker disease control, underscoring how patient behaviour and household financial capacity are closely intertwined (Gala et al., 2023). Similarly, an assessment of the treatment burden experienced by patients with chronic conditions in Kenya found that medical and healthcare expenses, alongside the burden of ongoing self-management, ranked among the most demanding aspects of living with an NCD (Koros et al., 2023).

Within Nyeri County, the growing prevalence of NCDs mirrors the national trend, with many households relying on a combination of public hospital services, private clinics, and out-of-pocket payments to manage chronic conditions. A costing analysis of type 2 diabetes care in Kenya established that the disease imposes a considerable economic burden on the public healthcare system, with medication and long-term management accounting for the largest share of costs (Karugu et al., 2024). Furthermore, an evaluation of the National Health Insurance Fund's role in protecting households against the costs of hypertension and diabetes found that, despite insurance coverage, many households continued to face substantial out-of-pocket expenditure, particularly where care-seeking behaviour and adherence to treatment schedules were inconsistent (Oyando et al., 2023).



Patient behaviour is also shaped by biological and psychological dimensions of illness. Research on genetic susceptibility to breast cancer among Kenyan women found that inherited biological factors interact with patient awareness and screening behaviour to influence how early a condition is detected and how costly its eventual treatment becomes (Association of CYP1B1 Gene Polymorphisms with Estrogen Receptor-Positive Breast Cancer, 2024). Likewise, a study on self-care practices among newly diagnosed type 2 diabetes patients in Kenyan hospitals found that patient empowerment and self-management behaviour strongly predicted adherence to medication and clinic attendance, both of which have direct cost implications for households (Ndirangu, Mbithi, Karuguti, & Onsongo, 2025). These findings collectively suggest that the financial burden of NCDs on households in Nyeri County cannot be fully understood without examining how patients themselves engage with treatment, monitoring, and preventive care. This study therefore sought to establish the effect of patient-related factors on household expenditure on NCDs in Nyeri County between 2015 and 2025.

1.2 Statement of the Problem

The financial burden of non-communicable diseases on Kenyan households remains substantial, with many families spending a considerable proportion of their income on consultation, medication, laboratory tests, and transport to access care. A systematic review of catastrophic health expenditure across sub-Saharan Africa found that chronic illness, together with limited health insurance coverage and long-term treatment needs, significantly increased the likelihood of households incurring expenditure that exceeded ten percent of their total income (Eze et al., 2022). Within Kenya specifically, access to NCD medicines at the household level has remained inconsistent even with the gradual rollout of universal health coverage, with many households continuing to purchase medicines from private outlets at their own cost (Kiragu et al., 2022).

While national-level and multi-county studies have documented the general scale of NCD-related expenditure, comparatively little empirical attention has been paid to how specific patient behaviours, rather than disease type or health system characteristics alone, shape the household costs incurred in a defined county context such as Nyeri. Existing Kenyan studies have tended to focus either on the treatment burden experienced by patients (Koros et al., 2023), the cost of specific diseases such as diabetes at a national scale (Karugu et al., 2024), or the protective role of insurance schemes (Oyando et al., 2023), without directly quantifying the extent to which patient-related factors, such as treatment adherence, health-seeking behaviour, and perceived illness severity, predict the level of household expenditure incurred. This leaves a clear empirical gap regarding whether, and to what extent, patient behaviour independently drives the financial burden of NCDs among households in Nyeri County. Without such context-specific evidence, healthcare providers, county health planners, and policymakers lack a sound empirical basis for designing targeted interventions, such as adherence support programmes or patient education initiatives, that



could meaningfully reduce the economic burden that NCDs place on affected households. This study addressed this gap by examining the effect of patient-related factors on household expenditure on NCDs in Nyeri County between 2015 and 2025.

1.3 Purpose of the Study

The purpose of the study was to determine the effect of patient-related factors on household expenditure on non-communicable diseases in Nyeri County between 2015 and 2025.

1.4 Research Hypothesis

H01: Patient-related factors do not significantly influence household expenditure on non-communicable diseases among households in Nyeri County.

2.0 LITERATURE REVIEW

2.1 Theoretical Review: The Andersen Behavioral Model

This study was anchored on the Andersen Behavioral Model of Health Services Use, which explains the use of health services and the resulting household healthcare expenditure through three interacting sets of determinants: predisposing, enabling, and need factors (Andersen, 1995; Andersen, 2008). Predisposing characteristics refer to demographic attributes of the individual or household, such as age, sex, education level, and household size, that shape the likelihood of seeking care. Enabling characteristics cover financial and structural resources, including household income, health insurance status, availability of services, and travel time to a health facility, that make it possible for a household to act on its need for care. Need factors relate to the actual and perceived health condition of the patient, including the presence of symptoms, the seriousness of the illness, and prior episodes of disease that necessitate treatment.

Within the context of NCDs, the model suggests that a patient's pattern of health-seeking behaviour, adherence to prescribed treatment, and perception of illness severity interact with household income and insurance status to determine both the frequency of service use and the resulting level of expenditure. A recent cross-sectional study of self-care practices for hypertension and type 2 diabetes among adults in rural Kenya found that socio-demographic and behavioural factors consistent with the Andersen framework significantly predicted the consistency of self-care practices among patients, which in turn has direct implications for the cost of managing these conditions over time (Schwarz et al., 2024). Similarly, the systematic review of catastrophic health expenditure in sub-Saharan Africa found that need-related factors, particularly chronic illness and hospitalisation, combined with enabling factors such as the absence of health insurance, were



among the strongest predictors of households incurring expenditure that exceeded their capacity to pay (Eze et al., 2022).

While the Andersen Model remains widely applied in health services research, it has notable limitations in fully capturing behavioural responses within low-resource settings, including informal coping mechanisms that households adopt when faced with unaffordable healthcare costs, and cultural factors that influence how illness is perceived and acted upon. Despite these limitations, the model provides a coherent theoretical basis for examining how patient-related factors, as a subset of the broader predisposing, enabling, and need framework, contribute to household expenditure on NCDs in Nyeri County.

2.2 Empirical Review: Patient-Related Factors and Household Expenditure on Non-Communicable Diseases

Gala et al. (2023) conducted a cross-sectional analysis of factors associated with medication adherence among patients with hypertension and diabetes in western Kenya. The study specifically examined cost-related and economic wealth factors alongside patient behaviour and found that poor medication adherence was closely associated with financial constraints at the household level, as patients frequently reported skipping doses or delaying refills due to the cost of medication. The study concluded that addressing the economic barriers patients face is essential to improving adherence and, by extension, controlling the long-term cost of disease management. However, the study focused primarily on adherence as an outcome rather than directly measuring the resulting household expenditure, a gap that the present study addressed by examining how patient adherence behaviour translates into actual spending on NCDs in Nyeri County.

Koros et al. (2023) examined the treatment burden experienced by people living with chronic conditions in Kenya using the Patient Experience with Treatment and Self-Management questionnaire. The study found that patients reported the heaviest burden in the domains of medical and healthcare expenses, ongoing health monitoring, and the exhaustion associated with self-management tasks such as diet control and physical activity. These findings demonstrated that the demands placed on patients by chronic disease management extend beyond clinical outcomes to include a considerable financial and psychological toll on households. The study, however, did not isolate the specific contribution of individual patient behaviours, such as adherence or health-seeking promptness, to the level of household expenditure, a distinction that the current study sought to establish.

Karugu et al. (2024) undertook a cost-of-illness study to estimate the economic burden of type 2 diabetes on Kenya's public healthcare system. The study found that medication, laboratory monitoring, and management of complications arising from poorly controlled diabetes accounted for the largest share of costs, with poor glycaemic control substantially increasing the overall cost



burden. This finding reinforced the understanding that patient-level factors influencing disease control, including adherence and the timeliness of care-seeking, have a direct bearing on the scale of expenditure incurred, whether by the health system or by the household. The study's national-level focus, however, meant that county-specific dynamics, such as those present in Nyeri, were not addressed, a gap the present study filled.

Oyando et al. (2023) evaluated the effectiveness of Kenya's National Health Insurance Fund in providing financial protection to households managing hypertension and diabetes. The study found that although insurance coverage reduced the proportion of costs borne directly by patients, considerable out-of-pocket expenditure persisted, particularly for services and medications not fully covered by the scheme. Patients with inconsistent clinic attendance and delayed treatment-seeking were found to incur higher cumulative costs over time, suggesting that even with financial protection mechanisms in place, patient behaviour remains an important determinant of the residual financial burden experienced by households. This study extended these findings by examining how such behavioural factors specifically shape household expenditure patterns among NCD patients in Nyeri County.

A study assessing the association between CYP1B1 gene polymorphisms and estrogen receptor-positive breast cancer risk among Kenyan women receiving care at a Nairobi hospital found that biological susceptibility interacts with patient awareness and screening behaviour to determine how early a cancer diagnosis is made (Association of CYP1B1 Gene Polymorphisms with Estrogen Receptor-Positive Breast Cancer, 2024). Patients who delayed seeking care despite biological risk factors were more likely to be diagnosed at an advanced stage, which is associated with substantially higher treatment costs. This finding illustrates that patient-related behavioural factors do not operate independently of underlying disease characteristics but rather interact with them to shape the eventual financial burden faced by households, a relationship this study examined directly in the context of Nyeri County.

Ndirangu, Mbithi, Karuguti, and Onsongo (2025) investigated self-care practices among adult patients newly diagnosed with type 2 diabetes in selected Level Five hospitals in Kenya. The study found that a considerable proportion of newly diagnosed patients demonstrated inconsistent self-care practices, including irregular monitoring of blood glucose and inconsistent adherence to dietary recommendations, which the authors linked to a heightened risk of disease-related complications over time. Since complications typically necessitate more intensive and costly treatment, the study's findings imply that early patient behaviour following diagnosis has long-term financial consequences for households. This study built on these findings by directly linking patient-related behavioural factors to the actual household expenditure incurred in managing NCDs within Nyeri County over the ten-year period between 2015 and 2025.



2.3 Conceptual Framework

The conceptual framework for this study proposes that patient-related factors, specifically treatment adherence, health-seeking behaviour, and perceived illness severity, serve as the independent variables influencing household expenditure on NCDs, the dependent variable. Treatment adherence captures the extent to which patients follow prescribed medication regimens and clinical recommendations. Health-seeking behaviour reflects the promptness and regularity with which patients access care, including clinic attendance and response to emerging symptoms. Perceived illness severity relates to how patients interpret the seriousness of their condition, which in turn shapes their engagement with treatment and monitoring. Household expenditure on NCDs is measured through consultation costs, medication costs, laboratory and diagnostic costs, transport costs, and other related out-of-pocket healthcare costs. The framework proposes that stronger, more consistent patient engagement across these behavioural dimensions is associated with lower long-term household expenditure, since early and consistent management reduces the likelihood of costly complications, while weaker engagement is associated with higher expenditure driven by delayed diagnosis, disease progression, and more frequent unplanned healthcare use.

3.0 RESEARCH METHODOLOGY

This study adopted the positivist research philosophy, which emphasizes objective measurement, hypothesis testing, and statistical analysis to establish the effect of patient-related factors on household expenditures for non-communicable diseases (NCDs) in Nyeri County between 2015 and 2025. An explanatory correlational research design with a cross-sectional survey approach was employed to examine the relationship between patient-related factors and household expenditure on NCDs without manipulating the study variables. The target population comprised 85,000 households with at least one member diagnosed with an NCD across the five Level Four public hospitals in Nyeri County. A sample of 398 households was determined using Yamane's (1967) formula and selected through simple random sampling, while all five Level Four hospitals were included using a census approach. Primary data were collected using structured questionnaires administered to household representatives, while secondary data were obtained from hospital records covering NCD trends, patient characteristics, and household healthcare expenditures between 2015 and 2025. Data collection followed ethical approval from relevant authorities, including the Catholic University of Eastern Africa (CUEA), NACOSTI, and the Nyeri County Government, with informed consent obtained from all participants. Patient-related factors were measured using treatment adherence, health-seeking behaviour, and perceived illness severity, while household expenditure was measured through consultation, medication, laboratory, transport, and out-of-pocket costs. Data were analyzed using SPSS Version 28. Descriptive statistics, including frequencies, percentages, means, and standard deviations, summarized the



data, while Pearson correlation and multiple linear regression were used to determine the relationship and effect of patient-related factors on household expenditure for NCDs.

4.0 RESEARCH FINDINGS AND DISCUSSION

Response Rate

The study targeted a sample of 398 households drawn from the five Level Four public hospitals in Nyeri County. The response rate is presented in Table 1.

Table 1: Response Rate

Category	Number
Targeted Sample	398
Questionnaires Returned	342
Questionnaires Not Returned	56
Response Rate (%)	85.9%

Source: Field Data (2026)

As presented in Table 1, out of 398 questionnaires which were distributed to Nyeri County households, a total of 342 questionnaires were properly filled and returned. Therefore, 56 questionnaires remained unaccounted for, giving a response rate of 85.9%. The high response rate implies that the target population of Nyeri County participated in this study and that the sampled households had sufficient willingness to share information concerning the cost of household non-communicable disease expenditure. The study therefore collected adequate and sufficient information required to conduct effective statistical analysis. The response rate of 85.9% was also seen to be sufficient enough to facilitate meaningful analysis and generalisation of research findings to the entire target population, which is considered sufficient in social research. In social research practice, a response rate of 70% or more is considered adequate and sufficient for conducting valid statistical analyses and for generalising the results of a study.

Descriptive Analysis

4.1 Patient-Related Factors and Household Expenditure

Table 2 displays the descriptive results on patient-related factors contributing to household expenditure on non-communicable diseases in Nyeri County. It presents the perceptions of respondents through the means and standard deviations for each item, as well as the aggregate score for the construct. Means and standard deviations describe the average level of agreement



among households and the extent of variation in their responses. The aggregate score gives an overall indication of how strongly patient-related factors contribute to household expenditure.

Table 2: Patient-Related Factors

Statement	Mean	Std. Dev
Non-adherence increases household costs	4.21	0.76
Irregular clinic visits increase long-term costs	4.10	0.79
Delayed treatment increases expenses	4.18	0.73
Poor lifestyle increases financial burden	4.05	0.80
Consistent monitoring reduces expenditure	3.92	0.82
Self-medication increases costs	4.07	0.77
Aggregate Score	4.09	0.78

Source: Field Data (2026)

The descriptive results of patient-related factors that affect household spending on NCDs are presented in Table 2. The overall mean score of 4.09 shows that respondents were largely in agreement that the financial burden of chronic disease management was shaped by patient behaviour. Responses were relatively consistent across households, with a standard deviation of 0.78 indicating a reasonable degree of agreement in how households perceived the link between patient behaviour and healthcare expenditure. These results suggest that how a disease is managed at the individual level has a significant bearing on household spending, in addition to the underlying severity of the condition itself. This finding is consistent with the Andersen Behavioral Model of Health Services Use, which holds that need-related and behavioural factors, alongside enabling resources, jointly determine both the pattern of healthcare use and the resulting cost to the household (Andersen, 2008).

Non-adherence to treatment recorded the highest mean score of 4.21, indicating that respondents strongly associated a lack of compliance with prescribed treatment with rising household expenses. Non-adherence is likely to allow a disease to progress further, resulting in more complications, more frequent clinic visits, and higher cumulative medical costs. This finding is consistent with Gala et al. (2023), who established that poor adherence among patients managing hypertension and diabetes in western Kenya was closely tied to increased use of healthcare services and higher treatment costs, particularly where cost-related barriers discouraged consistent medication use. Improving adherence support at the point of care therefore represents an important avenue for reducing avoidable household spending on NCDs.

Delayed treatment-seeking recorded a mean score of 4.18, suggesting that households strongly perceived a delay in seeking care as a driver of higher costs. When patients postpone seeking



medical attention, underlying conditions are often more advanced by the time treatment begins, requiring more intensive and costly interventions. This finding aligns with the broader evidence on catastrophic health expenditure in sub-Saharan Africa, which identified chronic illness and delayed care-seeking as key contributors to households incurring expenditure beyond their financial capacity (Eze et al., 2022). Encouraging early health-seeking behaviour therefore remains central to minimising the long-term financial burden of NCDs.

Irregular clinic attendance recorded a mean score of 4.10, reflecting respondents' awareness that missed appointments can allow disease progression to go undetected until it becomes costlier to manage. This result is consistent with the treatment burden findings of Koros et al. (2023), who found that ongoing monitoring and follow-up represented one of the most demanding aspects of chronic disease management reported by Kenyan patients, with direct implications for the frequency and cost of subsequent care. Strengthening follow-up systems and reminders for scheduled visits could help reduce unnecessary long-term expenditure linked to irregular attendance.

Self-medication recorded a mean score of 4.07, indicating that respondents recognised the risks associated with self-diagnosis and informal treatment of NCD symptoms without professional guidance. Self-medication can result in incorrect dosing, delayed proper diagnosis, and, ultimately, higher costs once complications necessitate formal medical intervention. This observation is broadly consistent with findings on self-care practices among newly diagnosed diabetes patients in Kenya, where inconsistent self-management practices were linked to a heightened risk of costly complications over time (Ndirangu et al., 2025). Strengthening patient education on the risks of self-medication is therefore an important consideration for reducing avoidable expenditure.

Consistent monitoring recorded the lowest mean score among the patient-related factors, at 3.92, though it remained above the midpoint of the scale. This suggests that while households generally recognised the value of routine monitoring in controlling disease progression and costs, not all households practised this consistently, potentially due to limited access to monitoring services or the cost of frequent diagnostic tests. This is consistent with the broader observation that inconsistent self-care practices remain common among Kenyan NCD patients, even where the benefits of regular monitoring are well understood (Ndirangu et al., 2025). Expanding access to affordable routine monitoring services within Nyeri County could therefore help households better control the long-term costs associated with NCD management.

Overall, the descriptive results indicate that patient-related factors, spanning adherence, promptness of care-seeking, consistency of clinic attendance, avoidance of self-medication, and routine monitoring, collectively shape the financial burden that households in Nyeri County bear in managing NCDs. These findings point to the importance of interventions that target patient



behaviour directly, alongside broader health system and financing reforms, in reducing the economic burden of chronic disease.

4.2 Household Expenditure on Non-Communicable Diseases

This section presents the results on the actual expenditure incurred by households in caring for NCDs in Nyeri County. Specifically, this section measured costs associated with consultations, medication, laboratory services, transport, and other out-of-pocket costs by asking respondents to state the approximate amount, in Kenya Shillings, incurred in caring for NCDs within a defined period. Table 3 summarises this expenditure using means, minimum, maximum, and standard deviation values.

Table 3: Household Expenditure on NCDs

Expenditure Component	Mean (KES)	Std. Dev (KES)	Min (KES)	Max (KES)
Consultation costs	8,450	4,320	1,000	25,000
Medication costs	28,650	15,740	3,000	80,000
Laboratory and diagnostic costs	12,380	6,520	1,500	35,000
Transport costs	6,240	3,180	500	18,000
Other related healthcare costs	5,870	2,950	500	15,000
Total household expenditure on NCDs	61,590	24,710	8,000	150,000

Source: Field Data (2026)

The actual household expenditure on the management of NCDs in Nyeri County is presented in Table 3. The results show that, on average, households incurred an expenditure of KES 61,590 on NCD-related healthcare services. The lowest expenditure recorded was KES 8,000, while the highest was KES 150,000, showing considerable variation in healthcare spending across households. The standard deviation of KES 24,710 indicates that the level of household spending varies according to factors such as disease severity, duration of illness, frequency of healthcare visits, treatment required, and insurance coverage. These results indicate that NCD management places a substantial financial demand on affected households.

The largest share of household expenditure was allocated to medication, averaging KES 28,650. This finding suggests that the cost of pharmaceuticals represents the most significant recurring financial need in NCD management, since chronic conditions such as diabetes, hypertension, and cardiovascular disease typically require sustained, long-term medication use. The wide standard



deviation of KES 15,740 reflects considerable variation between households, likely linked to differences in disease complexity, the specific medicines prescribed, dosage requirements, and access to subsidised medication. This finding is consistent with Karugu et al. (2024), who established that medication represents the single largest cost driver in the economic burden of type 2 diabetes within Kenya's public healthcare system. Without adequate insurance coverage, households are likely to experience continued financial strain from these recurring medication costs.

Laboratory and diagnostic expenses represented the second-largest expenditure category, averaging KES 12,380 per household. Regular monitoring of NCDs through laboratory testing is essential for tracking disease progression and treatment effectiveness, and the results indicate that these costs constitute a meaningful share of the overall financial burden, particularly where insurance schemes provide limited coverage for specialist diagnostic tests. This aligns with the findings of Oyando et al. (2023), who noted that out-of-pocket expenditure on diagnostic and monitoring services persisted among insured households managing hypertension and diabetes in Kenya. The standard deviation of KES 6,520 reflects the variation in testing needs across patients with differing disease profiles.

Consultation costs averaged KES 8,450 per household, covering routine check-ups, specialist visits, and ongoing medical reviews. Although lower than medication and diagnostic costs, consultation expenses represented a recurring financial commitment given the chronic nature of NCDs, which typically require regular clinical assessment. Variation in these costs likely reflects differences in how frequently households sought care and the type of health facility accessed.

Transport costs averaged KES 6,240 per household, highlighting the indirect financial burden associated with accessing NCD care. These costs were incurred while travelling to hospitals, specialised clinics, or referral centres, particularly where local facilities lacked the required NCD services. The standard deviation of KES 3,180 suggests that transport costs varied according to household location, distance to health facilities, and frequency of visits, underscoring the role of geographical accessibility in shaping the overall cost of NCD management within the county.

Other healthcare-related costs, averaging KES 5,870 per household, comprised additional expenses not captured under consultation, medication, diagnostics, or transport, such as supportive care items and other personal healthcare needs. Although this was the smallest expenditure category, it nonetheless added to the cumulative financial burden faced by households.

The findings further indicate that household spending on NCDs was not fully eliminated by health insurance coverage. Even among insured households, considerable out-of-pocket expenditure persisted, particularly for medication and diagnostic services not fully covered under existing schemes. This mirrors the findings of Oyando et al. (2023) regarding the limitations of Kenya's



National Health Insurance Fund in fully protecting households managing chronic conditions from residual out-of-pocket costs. Overall, the results demonstrate that spending on NCDs among households in Nyeri County remains substantial, with medication, diagnostic, and consultation costs forming the core drivers of expenditure, while transport and other related costs add a meaningful indirect burden. These findings underscore the importance of strengthening insurance mechanisms, expanding NCD-related benefits within health financing schemes, and improving affordable access to healthcare services for households managing chronic disease.

4.3 Inferential Statistics

Inferential statistics were used to draw conclusions and make predictions about the broader population of Nyeri County households based on the sample data, allowing for hypothesis testing and providing insight to inform healthcare planning, financing policy, and future research.

4.3.1 Correlation Analysis

The study employed correlation analysis to examine the direction and strength of the linear relationship between patient-related factors and household expenditure on NCDs. The Pearson correlation coefficient (r) was used to measure the strength of this association, given that the data satisfied the assumption of normality as confirmed through the Shapiro-Wilk test. Coefficients closer to positive one indicates a strong positive linear relationship, those closer to negative one indicate a strong negative relationship, while values close to zero indicate a weak or negligible relationship. Statistical significance was assessed using the p -value at the 0.05 level. Table 4 presents the results of the correlation analysis.

Table 4: Correlation Between Patient-Related Factors and Household Expenditure on NCDs

Variable	Correlation (r)	Sig. (p)
Treatment adherence	0.612	0.000
Health-seeking behaviour	0.588	0.000
Perceived illness severity	0.647	0.000
Aggregate patient-related factors	0.681	0.000

Source: Field Data (2026)

As shown in Table 4, all three dimensions of patient-related factors recorded a positive and statistically significant correlation with household expenditure on NCDs, with the aggregate construct yielding a correlation coefficient of 0.681 ($p < 0.05$). This indicates a strong positive linear relationship, implying that households whose members demonstrated poorer treatment adherence, weaker health-seeking behaviour, and higher perceived illness severity tended to report



higher NCD-related expenditure. Perceived illness severity recorded the strongest individual correlation at 0.647, suggesting that households who perceived their condition as more serious incurred correspondingly higher costs, consistent with the need-based component of the Andersen Behavioral Model (Andersen, 2008). These results support the theoretical expectation that patient behaviour is closely and significantly linked to the financial burden of chronic disease management in Nyeri County.

4.3.2 Regression Analysis

Multiple linear regression analysis was conducted to determine the effect of patient-related factors on household expenditure on non-communicable diseases (NCDs). The findings are presented in Tables 5, 6 and 7.

Table 5: Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of Estimate
1	0.668	0.446	0.444	0.548

Predictors: (Constant), Patient-related factors

The model summary in Table 5 indicates a strong positive relationship between patient-related factors and household expenditure on NCDs ($R = 0.668$). The coefficient of determination ($R^2 = 0.446$) shows that patient-related factors explain approximately 44.6% of the variation in household expenditure on NCDs, while 55.4% is explained by other factors outside the model. The adjusted R^2 value of 0.444 confirms that the model retains substantial explanatory power after adjusting for the predictor.

Table 6: Analysis of Variance (ANOVA)

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	76.184	1	76.184	253.624	0.000
Residual	102.124	340	0.300		
Total	178.308	341			

Dependent Variable: Household expenditure on NCDs

Predictors: (Constant), Patient-related factors

The ANOVA results in Table 6 indicate that the regression model is statistically significant ($F = 253.624$, $p < 0.001$). This demonstrates that patient-related factors significantly influence household expenditure on NCDs among households in Nyeri County. The model therefore provides sufficient evidence to reject the null hypothesis.

Table 7: Regression Coefficients



Model	Unstandardized B	Std. Error	Standardized Beta	t	Sig.
(Constant)	1.182	0.204		5.794	0.000
Patient-related factors	0.574	0.036	0.668	15.925	0.000

Dependent Variable: Household expenditure on NCDs

Dependent Variable: Household expenditure on NCDs

The regression coefficients in Table 7 indicate that patient-related factors have a positive and statistically significant effect on household expenditure on NCDs ($B = 0.574$, $\beta = 0.668$, $t = 15.925$, $p < 0.001$). This implies that a one-unit increase in adverse patient-related factors, including poor treatment adherence, delayed health-seeking behaviour, and greater perceived illness severity, results in a 0.574-unit increase in household expenditure on NCDs, holding other factors constant. The statistically significant p-value confirms that patient-related factors are an important predictor of household expenditure, leading to the rejection of the null hypothesis.

5.0 SUMMARY OF THE STUDY

This study examined the effect of patient-related factors on household expenditure on non-communicable diseases (NCDs) among households in Nyeri County between 2015 and 2025. Descriptive findings revealed that respondents strongly agreed that poor treatment adherence, delayed health-seeking behaviour, irregular clinic attendance, poor lifestyle practices, and self-medication contributed to increased household expenditure on NCDs, with an aggregate mean score of 4.09. The study further established that households incurred an average expenditure of KES 61,590 on NCD management, with medication costs accounting for the largest proportion of total healthcare expenditure. Correlation analysis revealed a strong positive and statistically significant relationship between patient-related factors and household expenditure on NCDs ($r = 0.668$, $p < 0.001$). Regression analysis further showed that patient-related factors significantly predicted household expenditure, explaining 44.6% of the variation in household spending ($R^2 = 0.446$, $F = 253.624$, $p < 0.001$). The findings demonstrate that patient-related factors are significant determinants of household expenditure on NCDs in Nyeri County and support the Andersen Behavioral Model of Health Services Use, which emphasizes that individual health behaviours influence healthcare utilization and associated healthcare costs.

6.0 CONCLUSION

The study concludes that patient-related factors are a significant and substantial driver of household expenditure on non-communicable diseases in Nyeri County. Households whose members demonstrated weaker treatment adherence, delayed care-seeking, irregular clinic attendance, and greater reliance on self-medication reported considerably higher healthcare



expenditure than those who engaged more consistently with recommended care. Medication costs emerged as the single largest component of household spending, reflecting the long-term nature of NCD treatment, while laboratory, consultation, and transport costs added further to the cumulative financial burden. The persistence of considerable out-of-pocket expenditure, even among insured households, points to gaps in the extent to which existing financing mechanisms shield households from the full cost of chronic disease management.

7.0 RECOMMENDATIONS

Based on the findings of this study, several recommendations are proposed. Health facilities in Nyeri County should strengthen patient education programmes that clearly communicate the long-term cost implications of poor treatment adherence, delayed care-seeking, and self-medication, empowering patients to make informed decisions about their disease management. County health authorities should invest in structured adherence support systems, including medication reminders, community health worker follow-up, and simplified refill processes, to reduce the financial consequences associated with treatment discontinuation. Efforts should also be made to strengthen routine monitoring services for NCD patients by expanding access to affordable diagnostic testing within local health facilities, thereby reducing the transport and opportunity costs associated with seeking such services elsewhere. Health financing stakeholders, including the National Health Insurance Fund and county health departments, should review existing benefit packages to expand coverage for medication and diagnostic costs, which this study identified as the largest components of household expenditure on NCDs. Finally, healthcare providers should prioritise early diagnosis and prompt treatment initiation through community-based screening programmes, given the strong relationship established in this study between delayed care-seeking and higher household expenditure.

8.0 AREAS FOR FURTHER RESEARCH

Future research should consider replicating this study in other Kenyan counties with differing health infrastructure and socio-economic profiles to establish whether the relationship between patient-related factors and household expenditure on NCDs observed in Nyeri County holds more broadly. Longitudinal studies tracking individual households over an extended period would provide deeper insight into how changes in patient behaviour over time translate into changes in cumulative healthcare expenditure. Further studies could also examine the interaction between patient-related factors and health system characteristics, such as facility distance and service availability, to establish which combination of factors most strongly predicts household financial burden. Finally, future research could explore the effectiveness of specific interventions, such as structured adherence support programmes, in reducing household expenditure on NCDs within resource-constrained county settings.



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