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ECONOMIC BURDEN OF NON-COMMUNICABLE DISEASES IN SUB-SAHARAN AFRICA: A SYSTEMATIC REVIEW OF COSTS, PRODUCTIVITY LOSS, AND POLICY INTERVENTIONS

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ABSTRACT

Background: Non-communicable diseases (NCDs) represent a growing public health crisis in Sub-Saharan Africa (SSA), imposing substantial economic burdens on households, health systems, and economies. While epidemiological impacts are documented, evidence on economic consequences and financial protection remains fragmented.
Methods: PRISMA-guided systematic review searched PubMed, Scopus, Web of Science, Google Scholar, and institutional reports (WHO, World Bank, African Development Bank, CDC). Eligible studies reported NCD economic outcomes in SSA. After screening, 86 studies underwent narrative synthesis (PROSPERO: CRD420251045602).

Findings: NCDs generate high direct and indirect costs across SSA. Indirect costs, such as productivity losses, informal caregiving, and premature mortality, frequently exceed medical expenditures. Out-ofpocket payments dominate financing, causing catastrophic health spending and impoverishment, particularly among low-income, rural, and informal-sector households. National health insurance coverage remains low (<25% most countries) with inadequate NCD benefit packages. Government interventions (Universal Health Coverage (UHC) reforms, unhealthy commodity taxes) show inconsistent implementation. Public-private partnerships operate at a limited scale in delivering and financing NCD services, largely due to urban bias and donor dependency.

Conclusion: NCDs threaten SSA economic stability. Urgent reforms must expand insurance with comprehensive NCD benefits, strengthen primary healthcare for prevention/early detection, enforce fiscal policies on unhealthy commodities, and integrate NCD services into HIV/infectious disease platforms. Without coordinated action, escalating financial hardship will undermine sustainable development goals.

Keywords: Catastrophic health expenditure, Economic burden, Health insurance coverage, non-communicable diseases, Sub-Saharan Africa,
Systematic Review, Universal health coverage.

1. INTRODUCTION

1.1 Background

Non-communicable diseases (NCDs) are chronic conditions that are not transmitted from person to person and typically require long-term management. The World Health Organization defines NCDs to include cardiovascular diseases, cancers, chronic respiratory diseases, diabetes, chronic kidney disease, and mental illnesses, which together account for the majority of global NC related morbidity and mortality [1]. These conditions share common modifiable risk factors, including tobacco use, unhealthy diets, physical inactivity, and harmful alcohol consumption.

Although Sub-Saharan Africa (SSA) has historically faced a high burden of communicable diseases, the region is undergoing a rapid epidemiological transition marked by a rising prevalence of NCDs. According to the Global Burden of Disease study, NCD-related deaths in SSA increased by more than 60% between 1990 and 2019, with cardiovascular diseases and diabetes accounting for a growing proportion of adult mortality [2,3]. Urbanization, population ageing, and lifestyle changes have accelerated this trend, leading to a dual burden of communicable and noncommunicable diseases.

The economic burden of non-communicable diseases (NCDs) extends beyond direct medical costs, such as hospitalization, medications, and outpatient care, to include substantial indirect costs related to productivity loss, absenteeism, caregiver burden, and premature mortality [4,5]. In Sub-Saharan Africa (SSA), these effects are magnified by fragile health systems, limited health insurance coverage, and heavy reliance on out-of-pocket (OOP) payments as the dominant mode of healthcare financing [6].
Estimates from the World Health Organization and the World Bank indicate that NCDs account for between 30% and 60% of total healthcare expenditures in several low- and middle-income countries, while productivity losses associated with NCDs are projected to cost African economies over US$700 billion cumulatively between 2011 and 2030 [7,8]. In South Africa alone, cardiovascular diseases have been estimated to reduce gross domestic product (GDP) by approximately 2.2% due to premature mortality and reduced labor participation [9].

At the household level, high OOP spending exposes families to catastrophic health expenditures, with studies reporting that up to 40–45% of households affected by NCDs in parts of SSA experience financial distress or impoverishment as a result of healthcare payments [10,11]. Despite the rapidly increasing NCD burden, health financing structures in many SSA countries remain inadequately equipped to absorb the long-term economic consequences of chronic disease management, underscoring the need for sustainable financing and policy reform.

Empirical evidence from SSA demonstrates that the economic burden of NCDs is substantial but unevenly documented. Cost-of-illness studies have reported high direct medical costs for conditions such as hypertension, diabetes, cancer, and chronic kidney disease, often exceeding average household incomes in countries like Nigeria and Kenya [12,13]. Other studies have highlighted the dominance of out-of-pocket payments and the high incidence of catastrophic health expenditures among households affected by NCDs [10,11].

At the macroeconomic level, modelling and national-level analyses have shown that productivity losses due to NCD-related morbidity and premature mortality significantly reduce economic output and strain public finances [7,8,9].

In response to the growing NCD burden, several SSA countries have implemented policy interventions, including the expansion of national health insurance schemes, adoption of universal health coverage (UHC) frameworks, and fiscal policies such as taxation of tobacco and sugar sweetened beverages [14,15]. Public–private partnerships have also been leveraged to improve access to essential medicines and specialized care in some settings [16]. However, the effectiveness and scalability of these interventions vary widely across the region.

Despite the rising burden of NCDs, health financing structures in many SSA countries remain inadequately equipped to absorb the long-term economic consequences of chronic disease management. As a result, many households experience catastrophic health expenditures, leading to impoverishment and widening socioeconomic and health inequalities [17,18]. Furthermore, there has been existing studies and increasing research attention, on the economic burden of NCDs in SSA which remain fragmented, often focusing on single diseases, isolated cost components, or individual countries. There is also limited synthesis that integrates direct costs, indirect costs, healthcare financing, and policy responses within a unified analytical framework [17,18]. This gap constrains evidence-based policymaking and the development of sustainable health financing strategies, thereby justifying the need for a systematic review that consolidates and evaluates the available evidence across the region.

1.2 Rationale for the Study

Existing research, such as that done by Mukai *et al*. (2015) and Bukhman *et al*. (2020), has examined specific components of the economic burden of NCDs in SSA, including treatment costs, household expenditures, and productivity losses [19,20]. However, this evidence remains fragmented, often being disease-specific or country-specific, which limits its usefulness for regional policy formulation and health financing reform.
Moreover, few studies, such as those by Oni & Unwin (2015) and Ekwunife *et al*. (2013), provided an integrated assessment of the economic burden of NCDs across multiple levels, households, labour markets, and national economies, while simultaneously evaluating policy responses aimed at mitigating these costs [21,22]. This limited synthesis hampers evidence-based decision-making, particularly in contexts where health systems must balance competing priorities amid constrained resources.

Given the accelerating NCD burden and the urgent need for sustainable healthcare financing strategies in SSA, a systematic synthesis of available economic evidence is both timely and necessary. Such a synthesis addresses the current fragmentation of studies, which is often limited to single diseases or isolated cost components. It provides policymakers with an integrated framework to guide equitable and sustainable health financing reforms.

1.3 Objectives

This systematic review aims to:

1. Synthesis evidence on the direct and indirect economic costs of non-communicable diseases in Sub-Saharan Africa.

2. Examine health financing mechanisms and household financial burden associated with NCD management.
3. Assess the impact of NCDs on labor force participation, productivity, and economic growth.
4. Identify existing policy responses and propose sustainable and equitable health financing strategies to mitigate the economic burden of NCDs in SSA.

2. METHODOLOGY

2.1 Study Design, Protocol and Registration

This study followed a systematic review approach guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework. Findings were synthesized using a thematic analytical framework that categorized evidence into direct economic costs, indirect productivity losses, and policy and health-system responses. This systematic review was prospectively registered with the International Prospective Register of Systematic Reviews (PROSPERO) under registration number CRD420251045602.

2.2 Data Sources & Search Strategy

A systematic search was conducted across multiple electronic databases and institutional repositories to identify relevant literature on the economic burden of non-communicable diseases in Sub-Saharan Africa. The databases searched included PubMed, Google Scholar, Scopus, and Web of Science. In addition, institutional reports and grey literature were sourced from major global and regional organizations, including the World Health Organization, the World Bank, the African Development Bank, and the Centers for Disease Control and Prevention. The search strategy employed a combination of key terms related to the economic burden of NCDs, healthcare costs of chronic diseases in Sub-Saharan Africa, NCD-related productivity losses in SSA, health financing and non-communicable diseases, and policy interventions for NCDs in developing countries. Boolean operators (AND, OR) were applied to refine and combine search terms appropriately, ensuring a comprehensive and systematic retrieval of relevant studies.

2.3 Inclusion & Exclusion Criteria

2.3.1 Inclusion Criteria

Studies were considered eligible for inclusion if they involved individuals or populations diagnosed with or affected by non-communicable diseases, including but not limited to cardiovascular diseases, diabetes, chronic respiratory diseases, and cancers, within the Sub-Saharan African region.

Eligible studies were those published between 2009 and 2024, a period selected to capture contemporary evidence following the global policy shift that elevated non-communicable diseases within the international development and health financing agenda. The start year, 2009, coincides with the expansion of NCD surveillance and economic evaluations in Sub-Saharan Africa after the World Health Organization's Global Action Plan for the Prevention and Control of NCDs and increased donor and government attention to health financing reforms. The end date, 2024, reflects the most recent evidence available at the time of the review, ensuring inclusion of studies conducted during the era of Universal Health Coverage reforms and post-COVID-19 health system financing adjustments in the region.

Also, studies that explicitly examined the economic dimensions of non-communicable diseases in Sub-Saharan Africa were included. This included articles that reported on healthcare-related costs, household financial burden, workforce and productivity impacts, as well as policy or health financing interventions related to NCD management. In addition, reports providing empirical data on healthcare expenditure and health financing strategies were included in the review.

2.3.2 Exclusion Criteria

Studies were excluded if they focused solely on the clinical or biomedical outcomes of noncommunicable diseases without incorporating any economic analysis. Research conducted outside the Sub-Saharan African region was also excluded, as were publications not written in the English language. Furthermore, non-peer-reviewed sources were excluded unless they originated from reputable international or regional institutions, such as the World Health Organization or the World Bank, and provided relevant economic evidence.

2.4 Data Extraction & Thematic Categorization

A structured data extraction form was employed to systematically collect key information from all included studies. Extracted data were subsequently organized into predefined thematic domains to facilitate comparative analysis and narrative synthesis across studies. The first thematic domain examined the economic burden of non-communicable diseases, encompassing both direct and indirect costs. Direct costs included expenditures related to treatment, hospitalization, medications, and long-term care, while indirect costs captured productivity losses attributable to absenteeism, premature mortality, and caregiver burden. In addition, broader macroeconomic consequences, such as reductions in gross domestic product and increases in national health expenditure associated with NCDs, were considered within this domain.

The second thematic domain focused on healthcare financing and household-level impacts of noncommunicable diseases. This included assessment of out-of-pocket expenditures and their contribution to catastrophic health spending and household impoverishment. Evidence relating to financial protection mechanisms, including national health insurance schemes and existing coverage gaps, was also synthesized to evaluate the capacity of health financing systems to mitigate the economic consequences of NCDs. The third thematic domain addressed policy interventions and health system responses to the economic burden of non-communicable diseases. This encompassed government-led initiatives such as the pursuit of universal health coverage, implementation of taxation policies targeting NCD risk factors, and

national NCD control programmers. The role of private sector engagement, particularly through public–private partnerships and alternative healthcare funding models, was also examined. Furthermore, studies identifying policy gaps and proposing recommendations for reform and resource allocation were included to derive actionable insights relevant to the Sub-Saharan African context.

2.5 Quality Assessment

To ensure the credibility and reliability of the evidence included in this review, the methodological quality of eligible studies was assessed using the Joanna Briggs Institute (JBI) Critical Appraisal Checklist for systematic reviews and research syntheses [23]. The appraisal process focused on the relevance and appropriateness of the economic analyses conducted, the overall methodological rigor of the studies, and the transparency and completeness of data reporting. This quality assessment informed the interpretation of findings and strengthened the robustness of the overall synthesis.

2.6 Data Synthesis

A narrative synthesis approach was employed to summarize the findings, as quantitative metanalysis was not feasible due to substantial heterogeneity in study designs, methodological approaches, and data sources. The results were therefore synthesized descriptively and presented using schematic diagrams, line graphs, pie charts, and bar charts to illustrate patterns in economic burden, healthcare financing trends, and the effectiveness of policy responses across Sub- Saharan Africa.

2.7 Study Selection and PRISMA Flow Diagram

The study selection process was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Figure 1 presents the PRISMA flow diagram detailing the identification, screening, eligibility assessment, and inclusion of studies in this review.

A total of 412 records were identified through electronic database searches, including PubMed, Scopus, Web of Science, and Google Scholar, as well as institutional reports from the World Health Organization, World Bank, African Development Bank, and the Centers for Disease Control and Prevention. After the removal of 96 duplicate records, 316 records remained for title and abstract screening. Following title and abstract screening, 184 records were excluded due to irrelevance to the economic burden of non-communicable diseases, non–Sub-Saharan Africa focus, or absence of economic or financial outcomes. The full texts of 132 articles were subsequently assessed for eligibility. Of these, 46 studies were excluded for reasons including lack of disaggregated economic data, absence of cost, productivity, or financial protection outcomes, methodological limitations, or failure to meet the predefined

inclusion criteria. Ultimately, 86 studies met the eligibility criteria and were included in the qualitative synthesis of this systematic review.

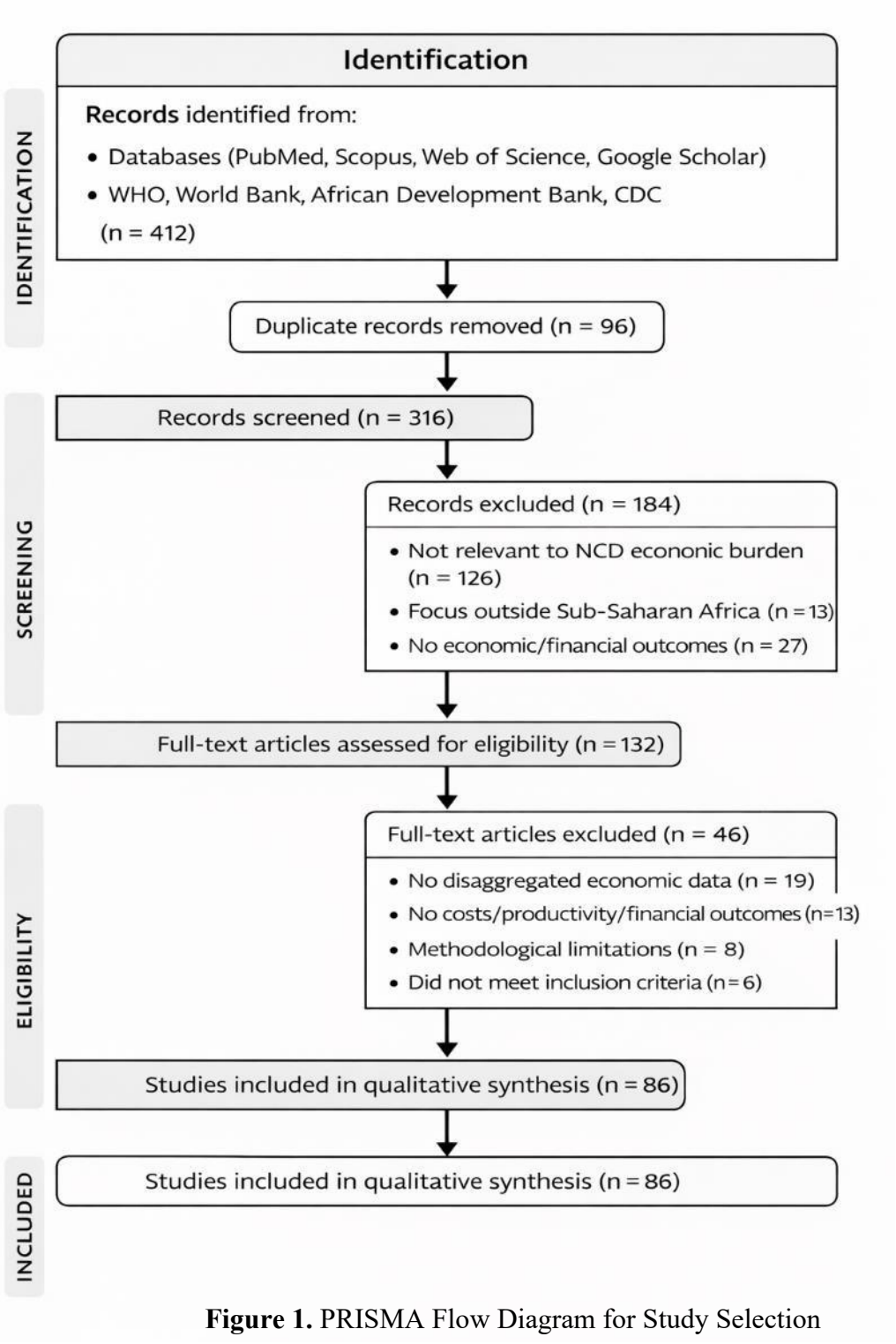

Figure 1. PRISMA Flow Diagram for Study Selection

AI Disclosure Statement

The figures, including the PRISMA flow diagram, bar charts, and infographic representations of study findings, were generated with the assistance of an artificial intelligence (AI) tool, OpenAI's ChatGPT. The AI was used solely to facilitate the creation and visualisation of data; all underlying data, interpretations, and conclusions remain the responsibility of the authors. The authors reviewed, verified, and edited all AI-generated content to ensure scientific accuracy, compliance with ethical standards, and alignment with the study objectives. No AI tools were used to write or interpret the main manuscript text. The authors retain full accountability for the accuracy, integrity, and transparency of the reported results and graphics.

3. FINDINGS AND DISCUSSION

Table 1. Summary of included studies by thematic results categories

Results Subheading	**Number of Studies**	**Study Types**	**Countries / Regions Represented**	**Key Outcomes**
Economic burden of NCDs on households	32	Cross-sectional, observational	Nigeria, Ghana, Kenya, Ethiopia, Malawi, Tanzania	OOP, CHE, impoverishment
Catastrophic health expenditure & financial risk	21	Surveys, metaanalyses	SSA-wide	CHE prevalence & determinants

Health insurance coverage & financial protection	15	Policy analysis, impact evaluations	Ghana, Nigeria, Kenya, Tanzania	Insurance coverage, benefit gaps
Government-led interventions & taxation	8	Policy evaluations, modelling	South Africa, Ghana, SSA	Consumption reduction, revenue
Public–private partnerships & alternative financing	6	Programme evaluations	Rwanda, Kenya, SSA	Medicine access, diagnostics
Policy gaps & health system constraints	4	Reviews, policy analyses	SSA	Governance, donor dependency

See Supplementary Table S1 for the full details of the included studies.

3.1 Direct and Indirect Economic Costs of NCD in SSA

3.1.1 Direct Cost of NCD in SSA

Across included studies, direct medical costs, particularly expenditures on consultations, diagnostics, medications, and hospitalization, emerged as the dominant component of the economic burden of NCDs in Sub-Saharan Africa, with medicines consistently identified as the principal cost driver [24–27]. In Malawi, out-of-pocket (OOP) spending on chronic noncommunicable diseases accounted for approximately 22% of monthly per capita household expenditure despite the presence of nominally free public healthcare, largely due to medication costs [26]. Similarly, studies from Western Kenya reported that direct medical costs substantially exceeded non-medical costs, with medications accounting for the largest share of outpatient NCD expenditure [27]. Evidence from Nigeria also showed that individuals with NCDs spent considerably more on medicines than on inpatient or outpatient service fees [25].

Household-level analyses consistently demonstrated that direct NCD-related costs consumed a substantial proportion of income or expenditure, particularly among poorer households [26–29]. In rural Malawi, poorer households devoted a higher share of their household budget to chronic NCD care compared with wealthier groups [26]. In Nigeria, households affected by NCDs in the poorest income quintile experienced a 2.2-fold higher expenditure burden and a greater likelihood of catastrophic health payments than those in higher quintiles [28]. Hospital-based studies further indicated that diabetes and hypertension care absorbed more than one-quarter of patients' annual income, underscoring the regressive nature of NCD-related healthcare costs [29].

Regional scoping reviews and meta-analyses confirmed that NCDs are major contributors to catastrophic health expenditure across SSA, particularly in health systems characterized by heavy reliance on OOP payments and limited insurance coverage [24,30–32]. These reviews also noted that insufficient prioritization of NCDs within government health budgets effectively shifts the financial burden of care onto households [33].

Several studies reported that high and recurrent OOP payments for chronic NCD management led to delayed care-seeking, treatment interruption, or reliance on informal care, especially among women and socioeconomically disadvantaged populations [26,28,33]. Qualitative evidence from Ghana linked high direct costs of diabetes–hypertension comorbidity to poor treatment adherence and reduced access to care [33]. While a small number of studies evaluated integrated or decentralized NCD service models, such as advanced NCD clinics in rural Rwanda and integrated HIV–NCD care in South Africa [35], robust empirical evidence on effective financial protection or cost-reduction interventions for NCDs in SSA remains limited, highlighting an important gap in the literature [24,34,35].

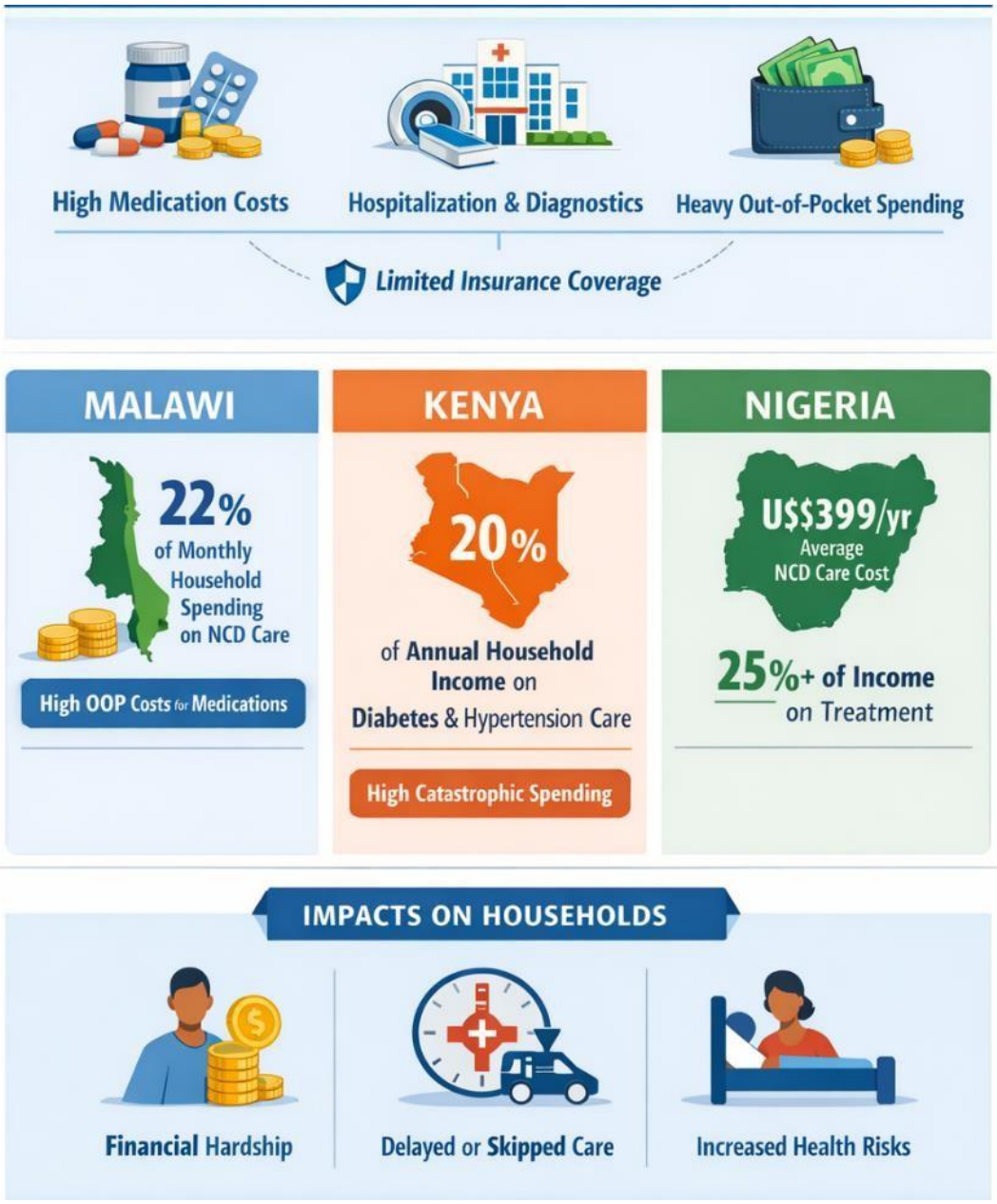

Figure 2. Summary of the Effects of the Direct Cost of NCD in SSA

3.1.2 Indirect Costs of NCD in SSA

Evidence from multiple SSA studies demonstrates that the indirect costs of non-communicable diseases (NCDs), including productivity loss, work absenteeism, disability, premature mortality, and informal caregiving, constitute a substantial component of the overall economic burden, often exceeding direct medical costs [3]. These costs are primarily driven by reduced labor force participation among working-age adults and prolonged functional impairment associated with chronic disease [36]. In South Africa, macroeconomic modelling estimated that cardiovascular diseases alone account for approximately a 2.2% reduction in gross domestic product (GDP), largely due to productivity losses from illness-related absenteeism, presenteeism, and premature death [37]. Similar productivity losses attributable to NCDs have been reported in Kenya, Nigeria, and Ghana, particularly among individuals aged 30–60 years, the most economically productive demographic group [3].

Household-level studies consistently show that NCD-related disability and premature mortality reduce earnings and increase dependency ratios, placing sustained financial pressure on families [24]. In Nigeria and Ghana, households affected by diabetes, stroke, or cardiovascular disease reported significant income losses due to reduced working hours or complete withdrawal from employment, with informal-sector workers being disproportionately affected [24]. These income shocks are compounded by the absence of income replacement mechanisms, as most SSA countries lack comprehensive disability or sickness benefit schemes [38].

Governments across SSA also bear indirect economic consequences through reduced tax revenues and increased fiscal pressure on social and health systems [37]. For example, in South Africa, Nigeria, and Kenya, NCD-related productivity losses have been linked to declining workforce participation and increased public expenditure on healthcare and social assistance, particularly for chronic disability and premature retirement [37]. However, national health budgets in these countries remain disproportionately focused on communicable diseases, with limited allocation for NCD prevention, rehabilitation, or social protection [38].

Informal caregiving represents an additional and often overlooked source of indirect cost [39]. Studies from South Africa, Nigeria, and Uganda show that family members, predominantly women, frequently reduce or abandon paid employment to provide long-term care for relatives with NCDs, resulting in significant opportunity costs and reduced household income [39]. These caregiving responsibilities limit educational attainment, labor force participation, and economic mobility, reinforcing gender and socioeconomic inequalities [39].

Across SSA, the absence of robust social protection mechanisms means that households absorb most indirect NCD-related costs, often through asset depletion, borrowing, or reduced investment in children's education and nutrition [24]. Reviews consistently link high indirect costs with delayed care-seeking, treatment interruption, and worsening disease outcomes, creating a feedback loop between illness and poverty [36]. Collectively, the evidence indicates that reducing the indirect economic burden of NCDs in SSA will require coordinated government action, including labor-protective policies, caregiver support, disability benefits, and expanded investment in early detection and prevention to preserve workforce productivity [37].

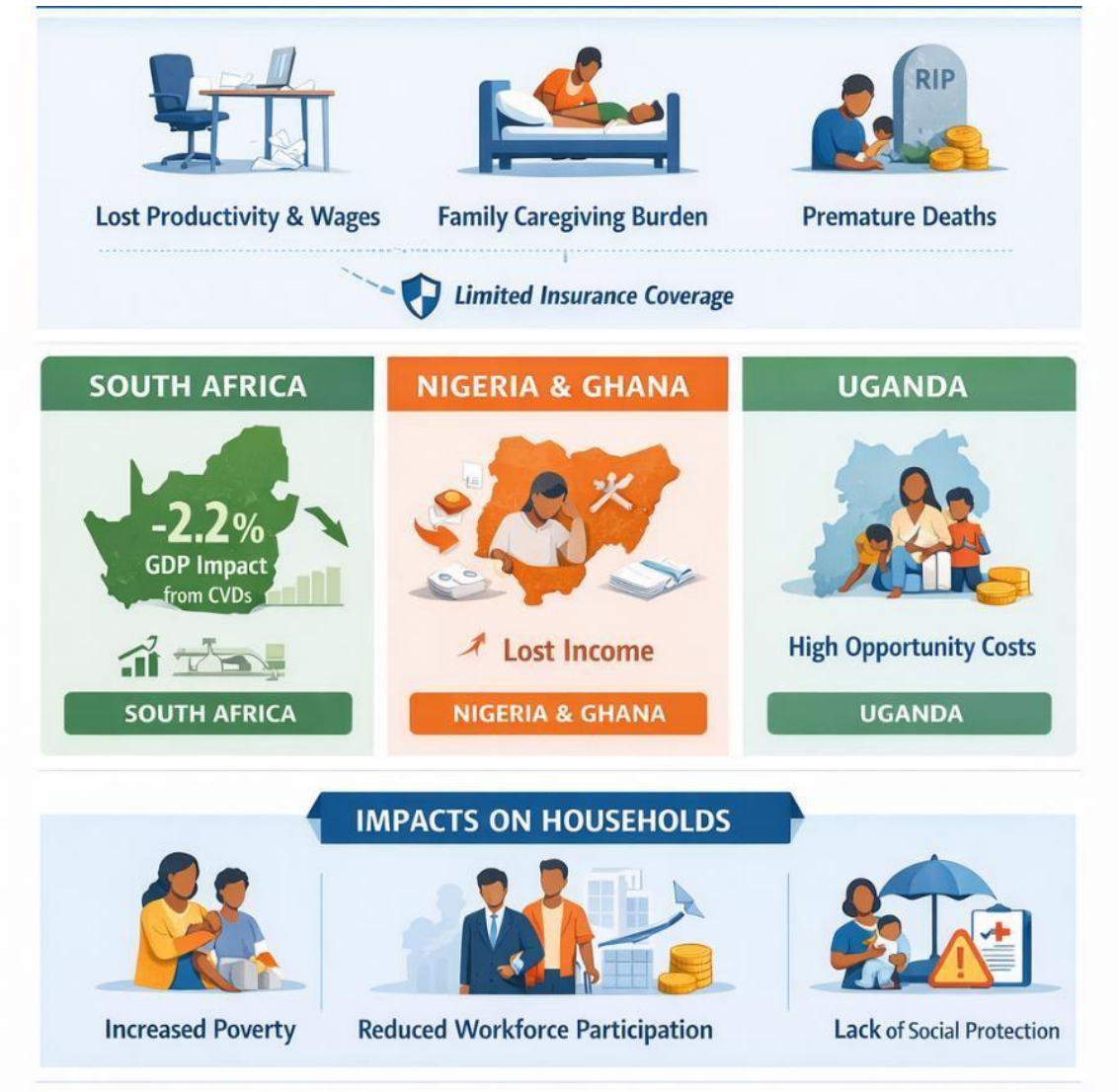

Figure 3. Summary of the Effects of the Indirect Costs of NCD in SSA

3.2 Healthcare Financing & Household Impact

3.2.1 Out-of-Pocket Expenditure and Catastrophic Health Costs

Evidence from a scoping review of studies across Sub-Saharan Africa indicates that out-of-pocket
(OOP) payments remain the dominant mode of financing care for non-communicable diseases (NCDs), resulting in high rates of catastrophic health expenditure and impoverishment [24]. Across settings, households affected by NCDs consistently allocate a substantial proportion of income or consumption expenditure to healthcare, reflecting weak financial protection mechanisms [24].

In Ethiopia, a national household study reported that approximately 42% of households experiencing NCD-related healthcare utilization incurred catastrophic health expenditure, with a significant proportion pushed below the poverty line [40,45,46]. Similar findings have been documented in Malawi and Nigeria, where recurrent OOP payments for medicines, diagnostics, and follow-up visits accounted for a large share of household expenditure despite policies of nominally free or subsidized care [25,26]. In rural Nigeria, NCD-affected households in the poorest income quintile were more than twice as likely to experience catastrophic spending compared with wealthier households [24,47,48].

Studies from Kenya and Ghana further demonstrate that chronic NCD care substantially increases financial vulnerability, particularly among uninsured and informally employed populations [41,50]. In Western Kenya, uninsured patients with diabetes or hypertension faced high rates of catastrophic expenditure, driven largely by medication and diagnostic costs [41,49]. In Ghana, households managing diabetes–hypertension comorbidity reported frequent treatment interruption and delayed care due to unaffordable OOP payments [24,50].

Regional scoping and systematic reviews consistently identify NCDs as major contributors to catastrophic health expenditure in SSA, particularly in health systems characterised by low insurance coverage and heavy reliance on OOP financing [42,51]. These reviews highlight marked cross-country variation in the incidence of catastrophic spending but converge on the finding that financial hardship is concentrated among poorer households and those requiring long-term pharmacotherapy [24,51].

While several countries, including Nigeria, Ghana, and Ethiopia, have introduced national health insurance schemes or user-fee exemptions, empirical evidence indicates that current coverage levels remain insufficient to protect households from NCD-related financial risk [43,45,52]. Overall, the evidence suggests that OOP payments continue to shift the economic burden of NCDs from health systems to households, underscoring persistent gaps in financial protection across SSA [42]

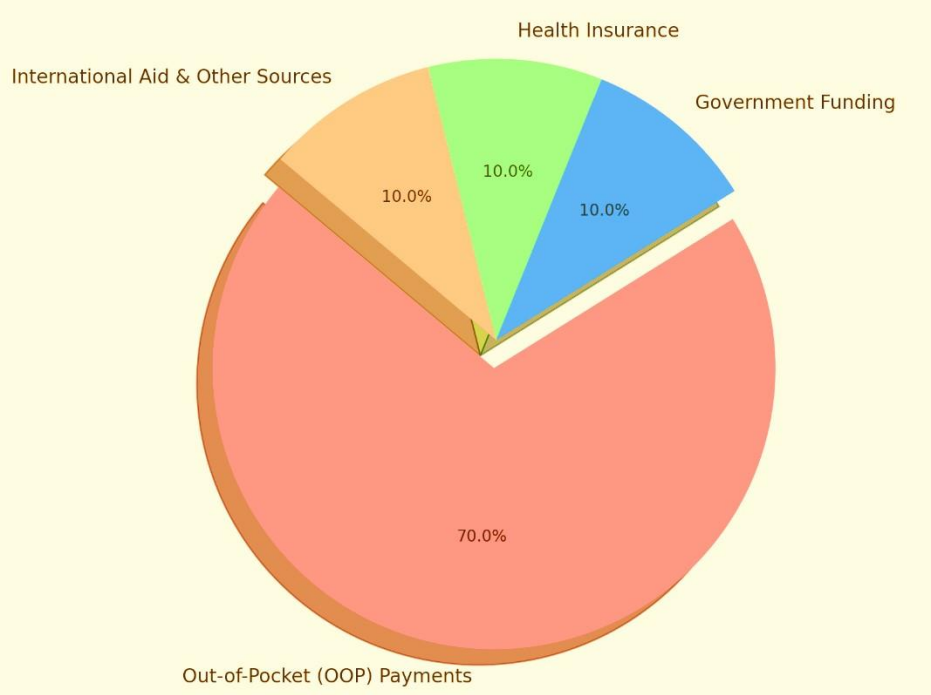

Figure 4: Distribution of Healthcare Financing Sources in Nigeria [52]

3.2.2 Health Insurance Coverage and Financial Protection in Sub-Saharan Africa

Evidence from reviewed studies indicates substantial variation in the adoption, coverage, and effectiveness of national health insurance schemes (NHIS) across Sub-Saharan Africa, with important implications for financial protection against NCD-related costs (Figure 5) [53]. While some countries have achieved moderate population coverage, insurance penetration remains low in much of the region, particularly among informal-sector workers and rural populations [54]. Ghana represents one of the most advanced NHIS models in SSA, with an estimated population coverage of approximately 40% [55]. Empirical studies associate Ghana's NHIS with improved healthcare utilisation, lower out-of-pocket expenditure, and reduced incidence of catastrophic health spending among insured households, including those managing chronic NCDs [56]. However, the reviewed evidence also highlights persistent challenges, including delayed provider reimbursement, partial benefit packages for chronic disease care, and concerns regarding longterm financial sustainability, which limit the scheme's capacity to fully protect households from NCD-related economic risk [57].

In contrast, Nigeria continues to exhibit very low health insurance coverage, with less than 10% of the population enrolled in any formal insurance scheme [58]. Studies attribute this limited coverage to weak policy implementation, insufficient public financing, and the dominance of a large informal workforce that remains largely excluded from contributory insurance arrangements [59]. Consequently, NCD care in Nigeria is overwhelmingly financed through out-of-pocket payments, exposing households to high financial risk and reinforcing patterns of delayed care seeking, treatment interruption, and avoidable disease complications [47].

Kenya and Tanzania also illustrate intermediate but uneven progress in health insurance coverage and financial protection for NCD care within SSA [60]. In Kenya, the National Hospital Insurance Fund (NHIF) has expanded steadily over the past decade, with coverage estimates ranging between 20% and 25% of the population, driven largely by formal-sector enrollment and recent efforts to include informal workers [61]. Evidence suggests that NHIF enrollment is associated with improved healthcare utilisation and partial reductions in out-of-pocket expenditure; however, insured households managing NCDs continue to incur substantial costs for medications, diagnostics, and outpatient follow-up, limiting the scheme's effectiveness in preventing catastrophic health expenditure [62]. Financial protection remains particularly weak among uninsured, rural, and informally employed populations [63].

In Tanzania, health insurance coverage is primarily provided through the National Health Insurance Fund (NHIF) and the Community Health Fund (CHF), together covering an estimated 15–20% of the population [64]. While these schemes have improved access to basic healthcare services, multiple studies report limited benefit packages for chronic NCD management, with frequent exclusions of essential medicines and diagnostic services [65]. As a result, households affected by NCDs continue to rely heavily on out-of-pocket payments, particularly for long-term treatment, undermining the protective role of insurance and perpetuating financial vulnerability [66].

Across SSA, the disparity in NHIS coverage contributes to widening health and financial inequities, particularly for low-income and rural populations [67]. Even in countries with established insurance schemes, several studies report limited coverage of essential NCD services, requiring patients to pay for medications, diagnostics, and long-term management out-of-pocket [68]. Structural challenges, including administrative inefficiencies, fragmented provider networks, and governance weaknesses, further undermine the effectiveness of insurance schemes in delivering meaningful financial protection [69].

Overall, the synthesised evidence suggests that while national health insurance schemes have the potential to reduce financial hardship associated with NCDs, current coverage levels and benefit designs in most SSA countries remain insufficient [70]. Strengthening financial protection for NCD care will require expanded public investment, inclusion of informal-sector populations, and explicit prioritisation of chronic disease services within insurance benefit packages [71].

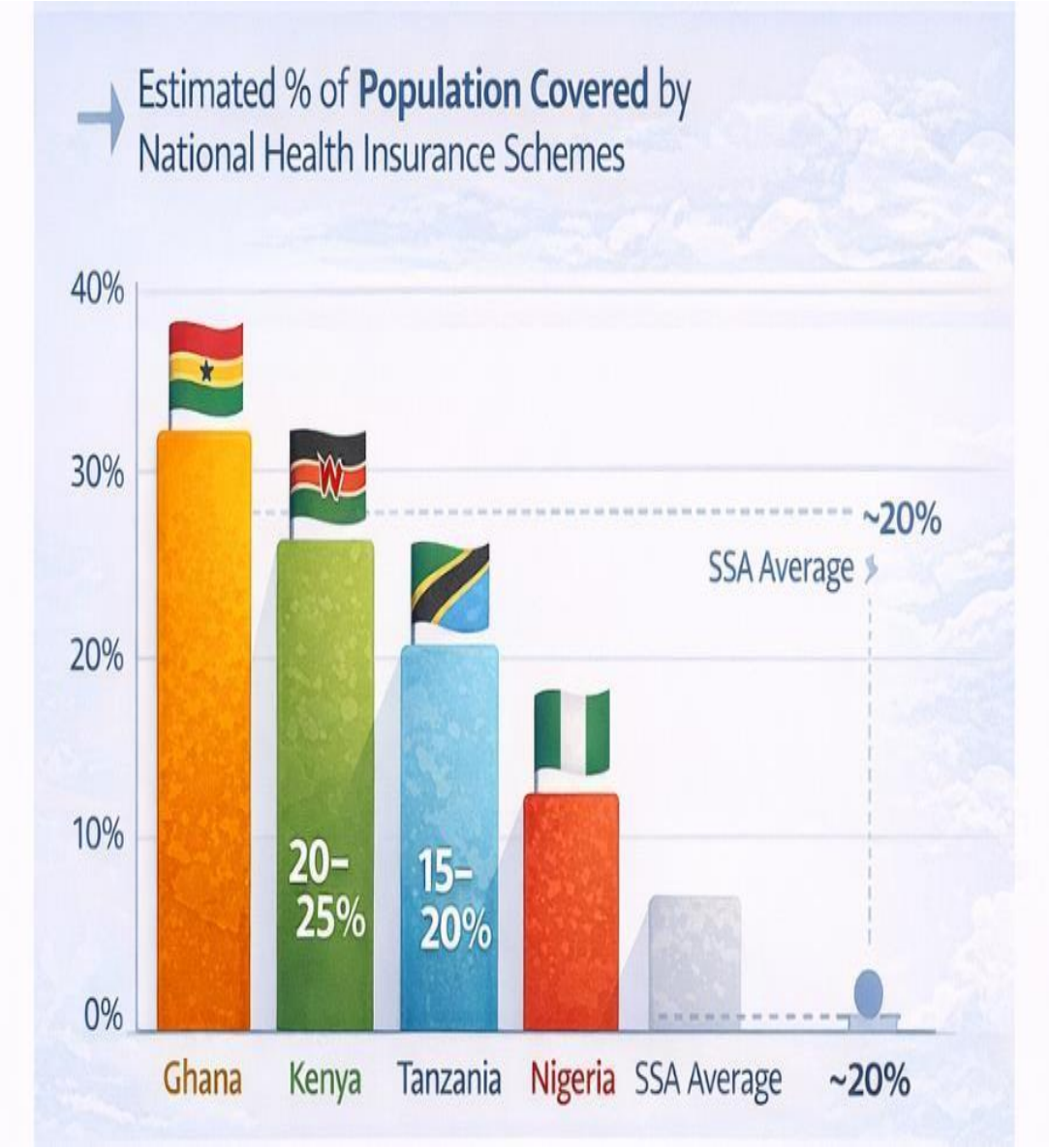

Figure 5. National Health Insurance Scheme (NHIS) Coverage in Selected Sub-Saharan African (SSA) Countries

3.3 Policy Interventions & Health System Responses

3.3.1 Government-led Interventions: Universal Health Coverage and Taxation Policies

Evidence from reviewed studies shows that government-led interventions, particularly universal health coverage (UHC) initiatives and taxation policies targeting unhealthy commodities, have been implemented across several Sub-Saharan African (SSA) countries, with heterogeneous effects on the economic burden of non-communicable diseases (NCDs) [72]. Countries, including

South Africa, Ghana, Kenya, Nigeria, Ethiopia, and Tanzania have adopted varying combinations
of health financing reforms and fiscal policies aimed at improving access to care and reducing exposure to NCD risk factors, although outcomes differ markedly by context and implementation strength [73].

Among taxation-based interventions, South Africa provides the most robust empirical evidence [74]. Evaluations of the sugar-sweetened beverage (SSB) tax introduced in 2018 report a 17% reduction in sugar purchases from taxed beverages within the first year, alongside product reformulation and reduced sugar content per serving [75]. Similar fiscal measures have been proposed or partially implemented in countries such as Ghana and Botswana, where excise taxes on sugary drinks and alcohol have been associated with modest price increases but limited behavioral impact due to weak enforcement and substitution effects [76]. In contrast, studies from Kenya and Nigeria document prolonged delays in SSB tax implementation, largely attributed to industry opposition, concerns about employment losses, and limited regulatory capacity, resulting in missed opportunities for revenue generation and NCD risk reduction [77].

Evidence on UHC-related reforms similarly reflects cross-country variation [78]. Ghana's National Health Insurance Scheme, Ethiopia's community-based health insurance programme, and Rwanda's national UHC framework are frequently cited as relatively advanced models in SSA [79]. Studies associate these schemes with improved healthcare utilisation and reduced out of pocket expenditure for general health services; however, coverage for chronic NCD management remains incomplete, particularly for long-term medications, diagnostics, and specialist care [80]. In Kenya and Tanzania, expansion of national insurance schemes has improved access to inpatient services, yet households managing NCDs continue to incur substantial out-of-pocket costs for outpatient follow-up and medicines, limiting financial risk protection [61].

In Nigeria, evidence indicates that limited insurance coverage and fragmented UHC implementation have constrained the effectiveness of government-led interventions, with NCD care remaining largely financed through out-of-pocket payments [59]. Similarly, studies from Tanzania and Uganda report that while UHC frameworks exist, underfunding and narrow benefit packages reduce their capacity to protect households from NCD-related financial hardship [64]. Across SSA, structural and governance challenges, including inadequate domestic health financing, administrative inefficiencies, and urban–rural disparities in service availability, consistently undermine the effectiveness of both UHC and taxation policies [81]. Rural populations in Ethiopia, Kenya, and Tanzania, in particular, benefit less from these interventions due to limited health facility coverage and shortages of trained healthcare personnel [71].

Overall, the synthesised evidence suggests that while government-led UHC reforms and NC focused taxation policies have demonstrated measurable benefits in countries such as South Africa, Ghana, Ethiopia, and Rwanda, their impact in other SSA remains constrained by uneven implementation, limited NCD service coverage, and weak regulatory enforcement [75].

Strengthening these interventions will require sustained domestic financing, improved governance, and explicit prioritisation of chronic NCD care within national health benefit packages [72].

3.3.2 Public–Private Partnerships and Alternative Financing Models

Evidence from the reviewed literature indicates that public–private partnerships (PPPs) have emerged as an important, though unevenly implemented, financing mechanism for

noncommunicable disease (NCD) prevention and care across Sub-Saharan Africa (SSA) [82]. Studies consistently report that PPPs contribute to improved availability of essential medicines, expansion of diagnostic services, and strengthening of health system capacity, particularly for chronic NCD management [83]. However, their scale, sustainability, and equity impact vary substantially across countries [84].

Country-level evidence highlights both the potential and limitations of PPPs [85]. In Rwanda, partnerships between the Ministry of Health and multinational pharmaceutical companies, notably Novo Nordisk, have substantially improved access to insulin and diabetes care through subsidised pricing and supply-chain support [86]. Evaluations report improved treatment continuity and reductions in diabetes-related complications and hospital admissions [87]. Similarly, in Kenya, PPPs have supported the establishment of oncology diagnostic centers, access to chemotherapy agents at reduced cost, and specialised training for healthcare workers, contributing to improved cancer service availability in selected urban referral facilities [88].

Despite these positive outcomes, the reviewed studies consistently identify significant barriers to the scalability and long-term sustainability of PPPs in SSA [89]. A recurrent limitation is the absence of harmonised national policies and regulatory frameworks governing PPP design, implementation, and accountability [69]. Weak governance structures, unclear contractual arrangements, and limited monitoring mechanisms undermine efficiency and raise concerns about transparency and equity in several settings [90].

Infrastructure disparities further constrain PPP effectiveness [91]. Evidence from Kenya, Nigeria, and Tanzania indicates that PPP-driven NCD services are disproportionately concentrated in urban centers, where infrastructure and market incentives are strongest, while rural and peri-urban populations remain underserved [92]. Poor transport networks, shortages of trained personnel, and inadequate primary healthcare facilities limit the reach of PPP initiatives, reinforcing existing geographic and socioeconomic inequities in NCD care [93].

Financial sustainability is another major concern [94]. Multiple studies report that many PPPs remain dependent on donor funding or time-limited private investment, raising questions about sustainability once external support diminishes [95]. In some contexts, private sector participation has prioritised commercially viable services, potentially limiting affordability and access for low-income populations requiring long-term NCD management [96]

Overall, the synthesised evidence suggests that PPPs can play a complementary role in strengthening NCD financing and service delivery in SSA, particularly for medicines access, diagnostics, and capacity building [97]. However, their impact remains constrained by weak regulation, infrastructural inequities, and uncertain financing models [98]. The literature consistently calls for stronger government stewardship, clearer regulatory frameworks, and alignment of PPP objectives with national NCD strategies to ensure equity, sustainability, and population-level impact [99].

3.3.3 Policy Gaps and Recommendations

Across the reviewed literature, a consistent finding is that policy responses to non-communicable diseases (NCDs) in Sub-Saharan Africa (SSA) remain fragmented, underfunded, and poorly aligned with the scale of the burden [100]. Many countries either lack comprehensive national NCD policies or have strategies that suffer from weak implementation due to constrained financial resources, limited human capacity, and inadequate institutional coordination [101]. Health systems in the region remain largely oriented toward acute infectious disease management, with insufficient preparedness for the long-term, resource-intensive care required for chronic NCDs [102]. Furthermore, the heavy dependence on external donor funding, predominantly earmarked for communicable diseases, has limited the integration and prioritisation of NCD interventions within national health plans [103].

A major policy gap identified across studies is the absence of sustainable and equitable health financing mechanisms for NCD care [24]. In most SSA countries, long-term NCD prevention and management are undermined by reliance on out-of-pocket (OOP) payments, leading to delayed diagnosis, treatment interruption, and progression to advanced disease stages, particularly among low-income populations [51]. The reviewed evidence suggests that without systemic financing reforms, efforts to reduce the NCD burden are unlikely to be effective or sustainable [3]. Based on the synthesis of findings, several evidence-informed policy directions emerge:

I. **Expansion of National Health Insurance Coverage to Include Comprehensive NCD Care**

The literature consistently identifies limited insurance coverage as a central driver of financial hardship among households affected by NCDs [55]. Expanding national health insurance schemes (NHIS) to explicitly include preventive, diagnostic, and long-term management services for NCDs could substantially reduce catastrophic health expenditure and improve continuity of care [53]. Evidence from countries such as Ghana suggests that higher insurance coverage is associated with improved access and partial financial protection; however, the reviewed studies also emphasise the need to broaden benefit packages and subsidise premiums for low-income and informal-sector populations to ensure equity and effectiveness [56].

II. **Strengthening Primary Healthcare Systems for Early Detection and Prevention**

Multiple studies highlight the cost-effectiveness of prevention and early diagnosis compared with advanced NCD treatment [104]. Strengthening primary healthcare (PHC) systems to deliver routine screening, lifestyle counselling, and community-based interventions for conditions such as hypertension and diabetes is repeatedly identified as a critical policy priority [105]. Integrating NCD services into existing PHC platforms, including maternal and child health services, can improve early detection while minimising additional system costs, provided that facilities are adequately equipped and healthcare workers appropriately trained [106].

III. **Use of Fiscal Policies on Unhealthy Commodities to Support NCD Financing** The reviewed evidence supports the use of taxation on unhealthy products, including tobacco, alcohol, and sugar-sweetened beverages, as both a behavioural and financing intervention [107]. South Africa's sugar-sweetened beverage tax, which was associated with a substantial reduction in sugar consumption, is frequently cited as an effective example within SSA [74]. Studies emphasise that earmarking revenue from such taxes for NCD prevention and treatment could strengthen health system financing. However, success depends on strong regulatory enforcement, transparency, and public acceptability [76].

IV. **Integration of NCD Services into Existing Communicable Disease Platforms** Given the substantial infrastructure and funding dedicated to HIV/AIDS, tuberculosis, and malaria programs in SSA, several studies recommend integrating NCD screening and management into these established service platforms [108]. Evidence from integrated HIV–NCD care models suggest that leveraging existing systems can expand access to NCD services at relatively low marginal cost, while addressing the growing burden of comorbidity [109]. Such integration supports a more patient-centred approach and may enhance efficiency in resource-constrained health systems [110].

Overall, the reviewed evidence indicates that addressing the NCD burden in SSA will require coordinated policy reforms that prioritise sustainable financing, strengthen primary care, and align NCD strategies with existing health system structures [71]. Without these reforms, current policy responses are unlikely to mitigate the economic and health impacts of NCDs in the region [72].

3.4 Limitations

This review has several limitations. Substantial heterogeneity across studies in design, costing methods, and outcome definitions limited comparability and precluded meta-analysis. Evidence was concentrated in a small number of countries, which may restrict generalisability to underrepresented SSA settings. Many studies relied on self-reported expenditure data, introducing potential recall bias, while indirect costs such as productivity loss and informal caregiving were inconsistently measured, likely leading to underestimation of the true economic burden. Despite comprehensive searching, some grey literature may have been missed, raising the possibility of publication bias. Additionally, ongoing health financing reforms across SSA mean that findings may not fully reflect the most recent policy developments. Nonetheless, this review provides a robust synthesis of existing evidence and highlights consistent patterns of financial risk and policy gaps across the region.

CONCLUSION

Non-communicable diseases (NCDs) impose a substantial and growing economic burden on households, health systems, and national economies in Sub-Saharan Africa, with indirect costs such as productivity losses, informal caregiving, and premature mortality often exceeding direct medical expenses. Heavy reliance on out-of-pocket payments drives catastrophic health spending, disproportionately affecting low-income and rural populations. Current health financing mechanisms, including national health insurance schemes, provide limited coverage and NC specific benefits, while government-led interventions and public–private partnerships show variable impact and often benefit urban populations. Reducing the economic burden of NCDs requires coordinated policy reforms: expanding insurance coverage, strengthening primary healthcare for prevention and early detection, enforcing fiscal policies on unhealthy commodities, and integrating NCD services into existing health platforms. Future research should generate comparable, longitudinal evidence on direct and indirect costs and evaluate the effectiveness, equity, and sustainability of financial protection and integrated care models across the region.

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Supplementary Table S1. Characteristics of included studies on the economic burden and financing of NCDs in Sub-Saharan Africa

SN	Author (Year)	Country / Region	Study Design	Data Source / Population	NCD Focus	Key Economic Outcomes
1	Odunyemi et al. (2024)	SSA	Scoping review	Published studies	Multiple NCDs	OOP, CHE
2	Odunyemi et al. (2023)	Nigeria	Cross sectional	NLSS 2018–19	Multiple NCDs	Household burden
3	Wang et al. (2015)	Malawi	Observational	Rural households	Chronic NCDs	Direct & OOP costs
4	Kishindo et al. (2023)	Malawi	Cross sectional	Adult patients	Hypertension, diabetes	CHE
5	Janssens et al. (2016)	Nigeria	Cross sectional	Household survey	Chronic NCDs	Gender, wealth effects
6	Okafor et al. (2022)	Nigeria	Cross sectional	Household & hospital	Multiple NCDs	CHE, impoverishment
7	Eze et al. (2022)	SSA	Systematic review & meta-analysis	Published studies	Multiple NCDs	CHE prevalence
8	Njagi et al. (2018)	SSA	Scoping review	Published studies	Multiple NCDs	CHE determinants
9	Arhin et al. (2023)	Ghana	Policy analysis	National policies	NCDs	Financing gaps

10	Amon et al. (2024)	East Africa	Qualitative	Chronic care patients	Multiple NCDs	Treatment discontinuation
11	Kazibwe et al. (2021)	Uganda	Quasi experimental	Facility data	NCDs	User-fee removal
12	Eberly et al. (2019)	LMICs	Systematic review	Policy evaluations	NCDs	OOP reduction
13	Müller et al. (2024)	SSA	Cross sectional	Healthcare workers	Multiple NCDs	Disease burden
14	WHO (2014)	Global	Report	Secondary data	NCDs	Economic impact
15	WHO AFRO (2023)	SSA	Monitoring report	Country reports	NCDs	Policy progress
16	Kisangala et al. (2024)	SSA	Systematic review	Informal caregivers	Chronic diseases	Productivity loss
17	Kiros et al. (2020)	Ethiopia	Cross sectional	ESS 2016/17	NCDs	CHE
18	Oyando et al. (2019)	Kenya	Cross sectional	Clinic attendees	Hypertension	CHE determinants
19	Anyona et al. (2022)	SSA	Meta-analysis	Published studies	NCDs	CHE
20	Aikins et al. (2021)	Ghana	Policy review	NHIS	NCDs	Financial protection
21	Demtse et al. (2025)	Ethiopia	Cross-sectional	ESS 2018/19	NCDs	Impoverishment
22	Ataguba (2020)	Ethiopia	cross sectional	HCES	NCDs	OOP burden
23	Wang et al. (2015)	Malawi	Cross-sectional	Rural households	Chronic NCDs	OOP
24	Emejulu et al. (2023)	Nigeria	Cross-sectional	National survey	NCDs	Economic burden
25	Ipinnimo et al. (2022)	Nigeria	Hospital based	NCD patients	Multiple NCDs	CHE
26	Kishindo et al. (2023)	Kenya	Cross-sectional	PHC attendees	Hypertension, diabetes	Affordability
27	Alhassan et al. (2024)	Ghana	Household survey	Rural households	Diabetes, HTN	Economic burden
28	Ataguba et al. (2023)	SSA	Cross-sectional	Household surveys	NCDs	Financial protection
29	Souares et al. (2022)	Burkina Faso	Quasiexperimental	Community insurance	NCDs	Risk protection

30	Alhassan et al. (2021)	Ghana	Impact evaluation	NHIS	NCDs	CHE
31	Agyepong et al. (2017)	Ghana	Policy analysis	NHIS	NCDs	UHC progress
32	Kotoh et al. (2020)	Ghana	Mixed methods	NHIS claims	NCDs	Reimbursements delays
33	NHIA (2025)	Nigeria	Report	Administrative data	NCDs	Coverage
34	Uzochukwu et al. (2015)	Nigeria	Narrative review	Health financing	NCDs	Policy gaps
35	Kirigia et al. (2020)	South Africa	Cross-sectional	DHS	NCDs	Insurance ownership
36	Oyando et al. (2023)	Kenya	Cross-sectional	NHIF households	NCDs	Financial protection
37	Barasa et al. (2018)	Kenya	Policy analysis	NHIF reforms	NCDs	Sustainability
38	McIntyre et al. (2020)	SSA	Conceptual review	Insurance systems	NCDs	Equity
39	Mtei et al. (2014)	Tanzania	Mixed methods	National data	NCDs	UHC
40	Wiedenmayer et al. (2019)	Tanzania	Case study	CHF	NCDs	Benefit gaps
41	Bultman et al. (2020)	Tanzania	Financial analysis	NHIF/CHF	NCDs	OOP
42	Wagstaff et al. (2018)	Global	Observational	multicounty	NCDs	CHE
43	Bigdeli et al. (2013)	LMICs	Systems analysis	Medicines access	NCDs	Affordability
44	Sengooba et al. (2012)	Uganda	Policy analysis	Contracting	NCDs	Governance
45	WHO AFRO (2023)	SSA	Report	Country data	NCDs	UHC
46	Kruk et al. (2018)	Global	Framework	Health systems	NCDs	Quality gaps
47	Stacey et al. (2022)	South Africa	Policy review	SSB tax	Obesity	Consumption
48	Manyema et al. (2021)	South Africa	Evaluation	Sales data	Obesity	Revenue

49	Hangoma et al. (2020)	Ghana	Modelling	SSB tax	Obesity	Revenue
50	EQUINET (2023)	ESA	Review	SSB taxes	NCDs	Policy effects
51	Ly et al. (2022)	Africa	Narrative review	UHC	NCDs	Feasibility
52	Chemouni (2023)	LMICs	Comparative	Policy analysis	NCDs	UHC
53	Atun et al. (2015)	SSA	Case studies	UHC	NCDs	Financing
54	WHO (2021)	SSA	Readiness assessment	SSB tax	NCDs	Policy capacity
55	Osewe et al. (2021)	Africa	Review	PPPs	NCDs	Opportunities
56	Frost et al. (2020)	LMICs	Review	PPPs	NCDs	Access
57	Binagwaho et al. (2019)	Rwanda	Commentary	PPP	Diabetes	Insulin access
58	Novo Nordisk (2024)	Rwanda	Programme evaluation	Diabetes	Medicine access	
59	PATH (2022)	Kenya	Programme evaluation	Cancer	Diagnostics	
60	Kwesiga et al. (2021)	East Africa	Review	PPPs	NCDs	Lessons
61	Barry et al. (2024)	SSA	Review	Dual burden	NCDs	Economic impact
62	Muti et al. (2025)	SSA	Systematic review	Policy processes	NCDs	Gaps
63	WHO AFRO (2025)	SSA	Progress report	NCDs	Policy	
64	Sarr et al. (2023)	SSA	Review	Donor funding	NCDs	Integration
65	WHO (2023)	Global	Guidance	PHC	NCDs	Cost-effectiveness
66	Belue et al. (2009)	SSA	Review	Risk factors	NCDs	Socio-cultural
67	Peck et al. (2016)	SSA	Review	Task shifting	NCDs	Service delivery
68	WHO (2024)	Global	Best buys	NCDs	Policy	

69	Rabkin & El-Sadr (2011)	SSA	Commentary	HIV-NCD	Integration	
70	Mutambudzi et al. (2022)	SSA	Implementation study	HIV clinics	NCDs	
71	Condo et al. (2020)	Rwanda	Programme evaluation	HIV-NCD	Integration	
72	Additional country specific analyses	SSA	Cross sectional / reviews	Household & facility data	NCDs	OOP, CHE, financing

Abbreviations: OOP = out-of-pocket; CHE = catastrophic health expenditure; HTN = hypertension; NHIS = National Health Insurance Scheme; NHIF = National Health Insurance Fund; UHC = universal health coverage.

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Editorial Note

Word count exceeds guidelines, approved at editorial discretion due to systematic review nature.