

**Développement financier et dépenses de santé pour la
préservation des vies des personnes vulnérables en Afrique
Subsaharienne**

**Financial development and healthcare expenditures for the
preservation of vulnerable lives in Sub-Saharan Africa**

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Abstract

The article analyses the impact of financial development on the life expectancy of vulnerable populations in Sub-Saharan Africa (SSA), focusing on women's longevity and child survival rates. Using data from 44 SSA countries covering the period 2002–2022, the study applies the Generalised Method of Moments (GMM), with financial development indices sourced from the International Monetary Fund (IMF) and healthcare, female life expectancy, and infant survival data obtained from the World Bank. The results indicate that financial development positively influences public health investment, thereby improving access to healthcare for vulnerable groups. It also stimulates private sector investment in the healthcare industry, highlighting its growing role in service delivery. Through increased health expenditures, financial development contributes to longer life expectancy and higher child survival rates. The findings stress the importance of policies that enhance the quality and efficiency of healthcare spending, while emphasising the value of private investment and targeted external assistance in improving women's and children's health outcomes. Furthermore, financial development, through its depth, institutional, and market dimensions, amplifies the effects of public health investment, strengthening governance, transparency, and resource allocation in SSA's healthcare systems, and calling for a holistic approach to address persistent health challenges.

Keywords financial development, healthcare expenditures, vulnerable lives, healthcare systems

JEL Classification H51-I15-I18-O16

Résumé

Cet article étudie l'impact du développement financier sur l'espérance de vie des populations vulnérables en Afrique subsaharienne, en se concentrant sur la longévité des femmes et le taux de survie des enfants. À partir de données de 44 pays sur la période 2002-2022, l'analyse repose sur la Méthode des Moments Généralisés (GMM), mobilisant les indices de développement financier du FMI et les données de la Banque mondiale relatives aux dépenses de santé, à l'espérance de vie féminine et à la survie infantile. Les résultats montrent que le développement financier favorise l'investissement public en santé et améliore l'accès aux soins des groupes vulnérables. Il stimule également l'investissement privé dans le secteur de la santé, confirmant son rôle croissant dans la prestation de services. En renforçant les dépenses sanitaires, le développement financier contribue à accroître la longévité des femmes et la survie des enfants. L'étude met en évidence la nécessité de politiques améliorant la qualité et l'efficacité des dépenses de santé, tout en valorisant l'investissement privé et l'aide extérieure ciblée. Enfin, le développement financier, à travers ses dimensions de profondeur, d'institution et de marché, amplifie les effets de l'investissement public, renforçant gouvernance, transparence et allocation des ressources dans les systèmes de santé africains.

Mots-clés : développement financier, dépenses de santé, populations vulnérables, systèmes de santé.

JEL Classification H51-I15-I18-O16

1. Introduction

The COVID-19 pandemic has exposed major weaknesses in global health systems, particularly in Sub-Saharan Africa (SSA), where healthcare infrastructures remain fragile (UNESCO, 2020). Despite policy responses, rising healthcare costs have intensified fiscal pressures (Kochar et al., 2022). Health is a key driver of economic development, supporting human capital formation and productivity (Becker, 1964; Schultz, 1961; Lucas, 1988), while also improving labour market participation (Burdett & Smith, 2002) and well-being (Ross & Bird, 1994).

Financial development plays a central role in this dynamic by improving resource allocation and facilitating investment (Levine, 2005). Theoretical contributions highlight its importance for financial intermediation and human capital accumulation (Schumpeter, 1911; Levine, 1997; Becker, 1964; Schultz, 1961). It also promotes financial inclusion and reduces inequalities in access to healthcare (Demirgüç-Kunt & Levine, 2009). Women and children, who face greater health vulnerabilities, particularly benefit from improved access to financial and health services, generating long-term intergenerational effects (Rana et al., 2021; Uddin et al., 2024).

Empirical studies confirm the positive relationship between financial development, economic growth, and healthcare efficiency (Beck et al., 2000; Petrovic et al., 2021). However, in SSA, financial constraints, low savings, and market imperfections continue to limit access to credit and investment in healthcare (Banerjee & Newman, 1993; Galor & Zeira, 1993; Sen, 1999). As a result, the region still records poor health outcomes, including high maternal and child mortality. In 2020, SSA accounted for 70% of global maternal deaths (WHO, 2023), while domestic savings averaged only 19% of GDP compared to 39% in Asia (IMF, 2023).

In this context, the central research question of this study is: **Does financial development foster life preservation among vulnerable populations in Sub-Saharan Africa, particularly through increased health expenditures?**

This study contributes to the literature by examining financial development through its multidimensional aspects (depth, access, and efficiency), an approach rarely adopted in previous research. Using the Generalized Method of Moments (GMM) on a panel of 44 SSA countries over the period 2002–2022, the findings show that financial development

stimulates both public and private health investment, improves the efficiency of health expenditures, and enhances women's life expectancy and infant survival.

2. Literature Review

This section reviews the theoretical and empirical literature on the relationship between financial development, healthcare expenditure, health outcomes, and social vulnerability in Sub-Saharan Africa (SSA). It is structured around five seminal contributions that have shaped the field, notably Joseph Schumpeter, Robert G. King, Gary Becker, Thorsten Beck, and David E. Bloom.

2.1. Financial Development and the Mobilisation of Healthcare Financing

The relationship between financial development and healthcare expenditure is rooted in foundational economic theories. The early contribution of Schumpeter (1911) emphasizes the role of financial systems in fostering innovation and investment through efficient capital allocation. This perspective is extended by King & Levine (1993), who argue that financial development enhances savings mobilization, reduces transaction costs, and improves resource allocation, thereby supporting investment in productive sectors such as healthcare infrastructure.

From the human capital perspective developed by Becker (1964) and Schultz (1961), investments in health are fundamental to productivity and long-term economic growth. Financial development reduces liquidity constraints and facilitates access to credit, enabling households and governments to invest more in healthcare services (Galor & Zeira, 1993). Moreover, financial inclusion reduces inequalities in healthcare access by providing financial tools such as insurance and credit (Demirgüç-Kunt & Levine, 2009; Sen, 1999).

Empirically, Beck, et al. (2000) demonstrate that financial sector development improves resource allocation and economic performance, indirectly supporting healthcare systems. Tidjani & Ngok (2020) suggest that modern management practices, backed by financial flexibility, improve service agility. Similarly, Vanderbilt & Dewinter (2019) highlight the necessity of robust financial frameworks to sustain public-private partnerships.

Additional studies confirm that financial markets provide long-term capital for health infrastructure and promote efficiency in healthcare delivery (Petrovic, et al., 2021; Sharda, et al., 2021). Furthermore, health investment contributes to economic growth through human capital accumulation (Mankiw, et al., 1992; Romer, 1990). Abani, et al. (2021) demonstrate

that financial development supports sustainable development by financing environmental initiatives that mitigate health risks. Recent discussions have expanded on this by examining how digital financial transformation serves as a catalyst for social infrastructure. Specifically, El Amrani & Mazoud (2023) demonstrate that in the Moroccan context, the modernization of financial systems is a prerequisite for the sustainability of health sector funding. This is further supported by Chakir, et al. (2021) who argue that financial depth reduces the public deficit's pressure on social expenditures, allowing for more consistent healthcare budgeting.

Despite these advances, empirical evidence remains limited for Sub-Saharan Africa, where financial systems are underdeveloped and healthcare financing gaps persist.

H1: Financial development increases healthcare expenditure in Sub-Saharan African countries.

2.2. Financial Development and Health Outcomes: Implications for Life Expectancy

Financial development also affects health outcomes by improving access to and quality of healthcare services. The finance-led growth hypothesis suggests that efficient financial systems enhance the mobilisation and allocation of resources toward essential sectors such as health (Levine, 1997). This process strengthens governments' ability to finance public health programmes and expand healthcare coverage. This resource allocation mechanism is further explored, where researchers emphasize that financial maturity is a prerequisite for the sustainability of social safety nets in developing economies (Sarr & Ba, 2023).

The health–growth nexus is further supported by Bloom & Canning (2000), who show that improved health outcomes contribute to economic growth through higher productivity and increased life expectancy. Similarly, Grossman (1972) conceptualises health as a form of capital that directly influences individual and societal well-being. This perspective is complemented by contributions, which argue that health capital must be managed with the same strategic rigor as financial capital to ensure long-term organizational and national performance (Koffi, et al., 2021).

Recent empirical studies confirm these theoretical predictions. Vysochyna, et al. (2023) find that countries with more developed financial systems were better able to absorb health shocks during the COVID-19 pandemic through increased healthcare spending. Yacour, et al. (2024) highlight the long-term relationship between economic growth, environmental quality, and healthcare expenditure. Furthermore, another research provide evidence that

financial depth reduces the catastrophic health expenditures faced by households, thereby stabilizing family units (Mensah & Sow, 2022). In a similar vein, Dubois & Hendricks, (2020) discussed how institutional quality within the financial sector directly correlates with the efficiency of hospital management systems. Other contributions show that financial development improves quality of life by strengthening institutional frameworks and expanding healthcare access (Uddin, et al., 2024). However, limited empirical research has examined the direct effect of financial development on life expectancy and survival indicators in SSA, particularly through healthcare expenditure channels. This perspective is complemented by other contributions, which argue that health capital must be managed with strategic rigor. In this regard, Berrada (2022) highlights that financial stability at the macro-level is directly translated into better health performance indicators in North and Sub-Saharan Africa. Furthermore, work published by Ouattara & El Ghini (2023) provides empirical evidence that financial openness promotes the transfer of medical technologies, which is a key driver for increasing life expectancy in developing nations.

H2: Financial development improves health outcomes by increasing life expectancy and survival rates in Sub-Saharan African countries.

2.3. Financial Development, Healthcare Spending and the Protection of Socially Vulnerable Populations

Beyond aggregate health outcomes, financial development plays a crucial role in protecting vulnerable populations, particularly women and children. According to the healthcare access inequality framework, these groups face significant barriers due to financial constraints and institutional weaknesses (Godt, et al., 2017). Financial development can alleviate these constraints by expanding access to credit, strengthening insurance systems, and improving public health financing. This perspective is reinforced by research which suggests that innovative financing models are essential to bypass traditional bureaucratic hurdles that limit medical access for rural women (Koussay & Traoré, 2023).

Empirical evidence supports this argument. Angelus, et al., (2024) show that environmental quality influences healthcare spending in SSA, suggesting that stronger financial systems can support health-related investments. Nonvignon, et al., (2024) emphasise the importance of public health financing in combating diseases and improving infrastructure. Similarly, Rana, et al., (2021) demonstrate that financial intermediation enhances governments' capacity to fund public health programmes targeting vulnerable populations. Another studies

further indicate that micro-insurance products, facilitated by financial depth, significantly reduce infant mortality by ensuring timely prenatal care (N'Guessan, et al., 2022). Financial development can alleviate these constraints by expanding access to credit and insurance. Research by Zekri & Alami (2022) shows that microfinance and inclusive financial policies are vital tools for reducing the vulnerability of rural households facing health shocks. This is consistent with the findings of Tahiri, et al. (2023), who emphasize that the synergy between public health spending and financial inclusion significantly improves maternal health outcomes by ensuring the continuity of care during and after pregnancy.

These findings indicate that financial development not only increases healthcare spending but also enhances its effectiveness in improving outcomes for vulnerable groups. However, the moderating role of financial development in strengthening the impact of healthcare expenditure on the survival of these populations remains underexplored in SSA.

H3: Financial development strengthens the effect of healthcare expenditure on the survival of vulnerable populations, particularly by increasing infant survival rates and women's life expectancy in Sub-Saharan Africa.

3. Methodology and Estimation Technique

3.1. Model Specification

The empirical model used to assess the impact of financial development and healthcare expenditure on the life expectancy of vulnerable populations in Sub-Saharan Africa (SSA) is inspired by the work of Manuela Nica et al. (2023), who analyse life expectancy dynamics in emerging economies. The baseline dynamic panel model is specified as follows:

$$health_outcome_{i,t} = \alpha + \beta_1 health_outcome_{i,t-1} + \beta_2 finance_{i,t} + \beta_3 X_{i,t} + \varepsilon_{it} \quad (1)$$

Where $health_outcome_{i,t}$ represents health indicators such as life expectancy or survival rates, $finance_{i,t}$ captures financial development, and $X_{i,t}$ is a vector of control variables.

The inclusion of the lagged dependent variable captures persistence effects in health outcomes, consistent with dynamic panel data theory.

3.2. Empirical Strategy: System GMM

To address endogeneity, omitted variable bias, and unobserved heterogeneity, this study employs the System Generalized Method of Moments (System GMM) developed by Richard Blundell and Stephen Bond (1998). This approach offers several advantages:

- ✓ It controls for country-specific fixed effects (μ_i) and time effects (γ_t)
- ✓ It addresses simultaneity and reverse causality
- ✓ It improves efficiency compared to the difference GMM estimator

To ensure robustness, the two-step estimator is implemented with corrected standard errors following Frank Windmeijer (2005). In addition, to avoid instrument proliferation and overfitting, the study follows the strategy proposed by David Roodman (2009), restricting the number of instruments and lag structure.

Post-estimation diagnostics include:

- ✓ The Hansen (1982) test for instrument validity
- ✓ The Arellano-Bond (1991) AR(2) test for serial correlation

3.3. Extended Models

To better capture the transmission channels, the following models are estimated:

Healthcare expenditure model:

$$\begin{aligned}
 \text{healt_expend}_{it} = & \\
 & \alpha + \beta_1 \text{healt_expend}_{it-1} + \beta_2 \text{finance}_{it} + \beta_3 \text{trade}_{it} + \beta_4 \text{remittances}_{it} \\
 & + \\
 & \beta_5 \text{fdi}_{it} + \beta_6 \text{gdp_growth}_{it} + \beta_7 \text{netodareceived}_{it} + \beta_8 \text{ressource_rents}_{it} + \mu + \gamma_t + \\
 & \varepsilon_{it} \quad (2)
 \end{aligned}$$

μ_i : Country-specific fixed effect, capturing unobserved and time-invariant characteristics.

γ_t : Time effects capturing global shocks that affect all countries similarly in a given year t .

ε_{it} : Error term representing other unobserved factors influencing $\text{Vulnerable_lives}_{it}$.

Sub-Saharan Africa faces significant vulnerabilities, making it essential to assess the role financial development can play in the relationship between healthcare expenditure and the life expectancy of vulnerable populations.

Vulnerable population's model:

$$\begin{aligned}
 \text{Vulnerable_lives}_{it} = & \\
 & \alpha + \beta_1 \text{vulnerable_lives}_{it-1} + \beta_2 \text{finance}_{it} + \beta_3 \text{trade}_{it} \\
 & + \beta_4 \text{remittances}_{it} +
 \end{aligned}$$

$$\beta_5 fdi_{it} + \beta_6 gdp_growth_{it} + \beta_7 netodareceived_{it} + \beta_8 health_expend_{it} + \beta_9 finance_{it} * health_expend_{it} + \mu + \gamma_t + \varepsilon_{it} \quad (3)$$

The interaction term (β_9) captures the moderating effect of financial development on healthcare expenditure.

Specific outcome models:

We can derive models 4 and 5 respectively for infant survival and mother's live expectancy.

$$\begin{aligned} \text{Infant survival}_{rate_{it}} = & \\ & \alpha + \beta_1 vulnerable_lives_{it-1} + \beta_2 finance_{it} + \beta_3 trade_{it} \\ & + \beta_4 remittances_{it} + \\ & \beta_5 fdi_{it} + \beta_6 gdp_growth_{it} + \beta_7 netodareceived_{it} + \beta_8 health_expend_{it} \\ & + \beta_9 finance_{it} * health_expend_{it} + \mu + \gamma_t + \varepsilon_{it} \quad (4) \end{aligned}$$

$$\begin{aligned} \text{Mother}_{live_expectancy} = & \\ & \alpha + \beta_1 vulnerable_lives_{it-1} + \beta_2 finance_{it} + \beta_3 trade_{it} \\ & + \beta_4 remittances_{it} + \\ & \beta_5 fdi_{it} + \beta_6 gdp_growth_{it} + \beta_7 netodareceived_{it} + \beta_8 health_expend_{it} \\ & + \beta_9 finance_{it} * health_expend_{it} + \mu + \gamma_t + \varepsilon_{it} \quad (5) \end{aligned}$$

The model examines the determinants of life expectancy among vulnerable populations by incorporating economic, financial, and healthcare variables. The inclusion of the lagged dependent variable captures persistence effects, indicating that past health outcomes influence current ones (Richard Blundell & Stephen Bond, 1998).

Financial development is expected to improve healthcare access and infrastructure ($\beta_2 > 0$), while healthcare expenditure directly enhances life expectancy ($\beta_8 > 0$). The interaction between financial development and healthcare spending further amplifies these effects ($\beta_9 > 0$).

Among control variables, remittances and economic growth positively influence health outcomes, whereas trade openness and foreign direct investment may have ambiguous effects. Official development assistance also contributes positively to healthcare improvement. Country and time fixed effects control for unobserved heterogeneity.

The model is estimated using the System GMM approach (Richard Blundell & Stephen Bond, 1998), with corrected standard errors following Frank Windmeijer (2005). To avoid instrument proliferation, the study follows David Roodman (2009) by limiting the number of instruments and lag structure.

3.4. Interpretation of Variables

The model incorporates key determinants of health outcomes:

- Financial development ($\beta_2 > 0$) improves access to healthcare and infrastructure
- Trade openness ($\beta_3 > 0$) has ambiguous effects
- Remittances ($\beta_4 > 0$) support household health investment
- FDI ($\beta_5 > 0$) has mixed effects
- Economic growth and aid $\beta_6, \beta_7 > 0$ enhance living standards
- Healthcare expenditure ($\beta_8 > 0$) directly improves health outcomes
- The interaction term ($\beta_9 > 0$) amplifies these effects

3.5. Data and Variables

This study examines the impact of financial development on the life expectancy of vulnerable populations (particularly women and children) in Sub-Saharan Africa, using a panel of 44 countries over the period 2002–2022. Data are sourced from the World Bank (2023) and the IMF Financial Development Index database.

Dependent Variables

The dependent variables capture both healthcare expenditure and health outcomes. Healthcare spending includes public, private, and external expenditures, reflecting government commitment and financial resources allocated to health systems. Health outcomes are measured by infant survival rates and women's life expectancy, widely used indicators in the literature (Ouedraogo, 2021; Kaulihowa & Adjasi, 2019; Asongu & Tchamyou, 2019).

Independent Variables

Financial development is measured using nine indices from the IMF database, covering depth, access, and efficiency of financial institutions and markets (Svirydzhenka, 2016). This



approach is consistent with the framework of Levine (2005), which emphasizes the role of financial systems in mobilising savings and improving resource allocation.

Control Variables

The model includes control variables commonly used in the literature on health determinants, such as GDP growth, remittances, official development assistance, and natural resource rents (Lyons, 2019; Petrovic et al., 2021; Koudjom et al., 2022). Trade openness and foreign direct investment are also included to ensure robustness, as their effects on health outcomes may be positive but context-dependent (Gylfason, 2001; Blanchard & Olney, 2017).



Table N°1: Descriptive Statistics and Data Sources

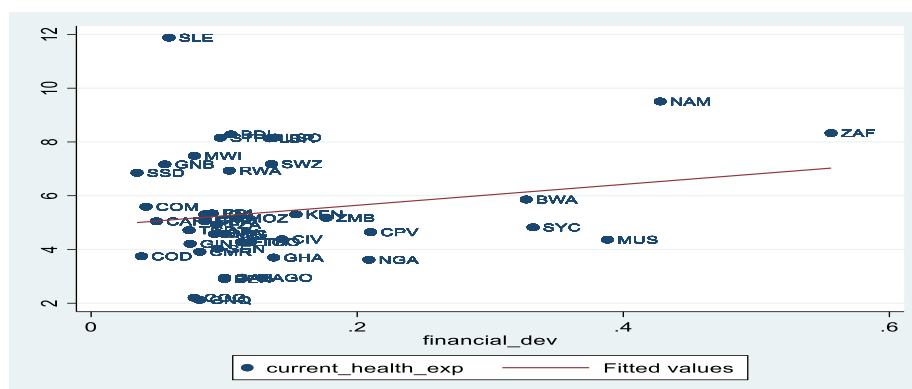
VARIABLES	N	mean	Sd	Min	max	Source	Measurement
financial_dev	911	0.137	0.111	0	0.643	IMF (2023)	Financial development index
financial_inst	918	0.215	0.139	0	0.731	IMF (2023)	Financial institution index
financial_market	916	0.0533	0.0974	0	0.535	IMF (2023)	Financial market index
financial_inst_depth	914	0.113	0.170	0	0.878	IMF (2023)	Financial institution depth index
financial_inst_accessibility	915	0.102	0.150	0	0.899	IMF (2023)	Financial institution accessibility index
financial_inst_efficiency	917	0.475	0.149	0	0.793	IMF (2023)	Financial institution efficiency index
financial_market_depth	917	0.0638	0.119	0	0.789	IMF (2023)	Financial market depth index
financial_market_accessibility	914	0.0603	0.157	0	0.915	IMF (2023)	Financial market accessibility index
financial_market_efficiency	914	0.0313	0.118	0	0.992	IMF (2023)	Financial market efficiency index
pub_health_operational_exp	913	5.367	2.335	1.264	20.41	World Bank (2023)	Public health operational expenditure
pub_invest_health-exp	918	1.651	1.178	0.0620	6.047	World Bank (2023)	Public investment in health expenditure
private_health_invest_exp	913	95.36	119.2	3.010	777.3	World Bank (2023)	Private health investment expenditure
Health_external_aid_exp	913	29.54	34.16	0	234.4	World Bank (2023)	Health external aid expenditure
Trade	913	70.34	35.53	20.72	225.0	World Bank (2023)	Trade openness index
Remittances	919	3.403	5.969	0	53.83	World Bank (2023)	Remittances as a percentage of GDP
Fdi	917	4.635	8.466	-10.72	103.3	World Bank (2023)	Foreign direct investment (as % of GDP)
gdp_growth	918	4.132	5.561	-46.08	63.38	World Bank (2023)	GDP growth rate
Netodareceived	910	70.46	76.80	-11.97	691.9	World Bank (2023)	Net official development assistance received
Ressource_rents	918	11,66	11,47	0,0012	62,72	World Bank (2023)	Resource rents as a percentage of GDP
Infant Survival Rate	918	0.87	0.05	0.75	0.95	World Bank (2023)	Infant survival rate (%)
Life Expectancy of Women	916	65.2	5.3	58	75	World Bank (2023)	Life expectancy for women
Number of individuals	44	44	44	44	44		Number of countries/individuals in the dataset

Source: authors

The correlation analysis indicates a positive association between financial development and health outcomes in Sub-Saharan Africa. This relationship is stronger for private health expenditures (Figure 2) than for public health investment (Figure 1), suggesting that financial development operates primarily through private-sector channels. In contrast, public health expenditure shows a more heterogeneous pattern, reflecting institutional and budgetary constraints.

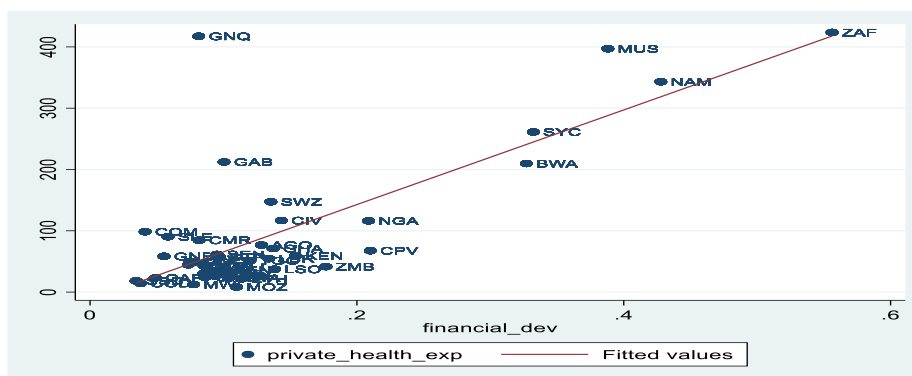
Moreover, improvements in infant survival rates (Figure 4) appear more gradual compared to gains in women’s life expectancy (Figure 3), likely due to the cumulative and long-term effects of maternal and child health interventions. Overall, these findings suggest that financial development enhances health outcomes by facilitating resource mobilisation and improving access to healthcare financing.

Figure N°1: Relationship between financial development and public investment expenditures



Source: authors

Figure N°2: Relationship between financial development and private health expenditure



Source: authors

Fig.3. Financial Development and Women's life Expectancy

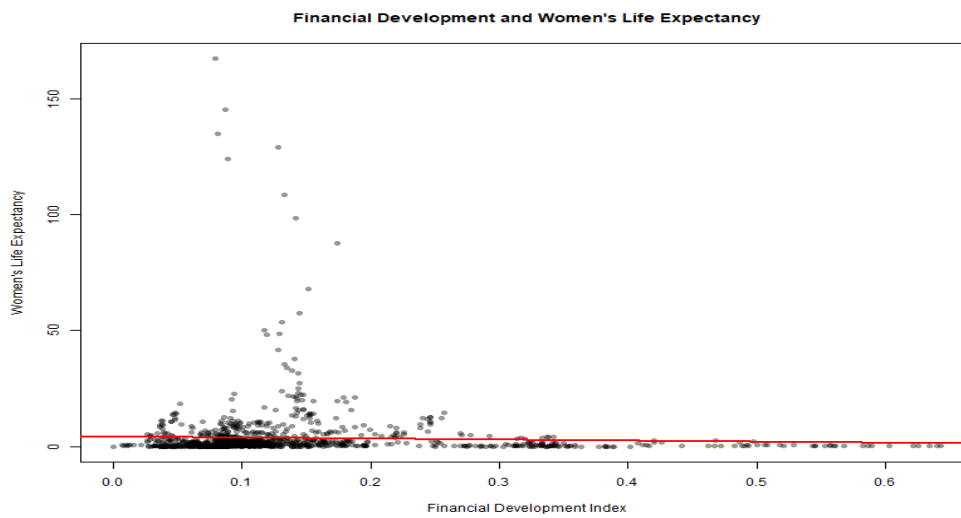
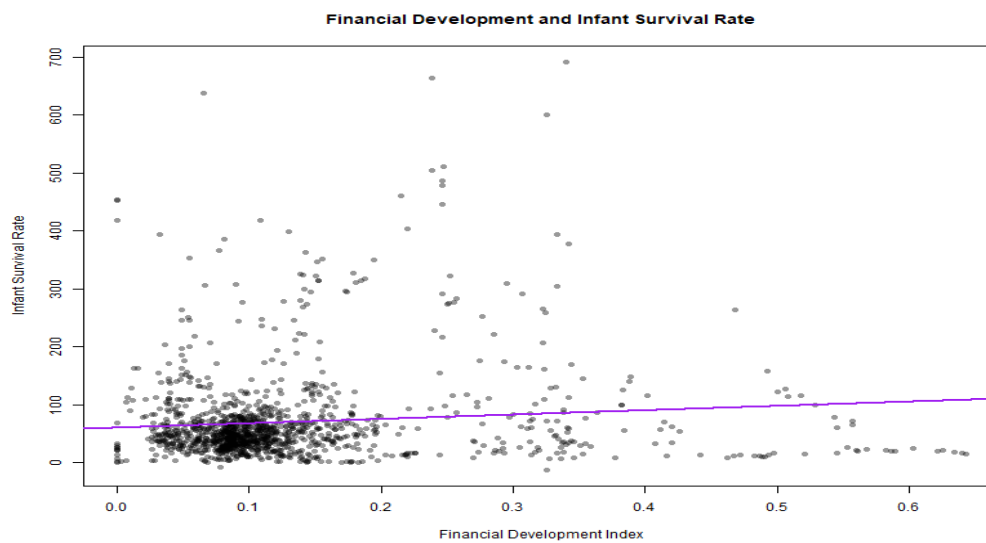


Fig.4. Financial Development and Infant Survival Rate



4. Results and discussion

This section presents the basic results and robustness results.

4.1. Basic Results

Table 2 presents the basic results of the effect of financial development on the healthcare system.

Table N°2: Basic results of the effect of financial development on the healthcare expenditures

	pub_invest_health-exp			pub_health_operational exp			private_health_invest_exp			Health_external_aid_exp		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
L.pub_invest_health-exp	0.368*** (0.0797)	0.366*** (0.0777)	0.341*** (0.0833)									
financial_dev	7.397*** (1.751)			0.704*** (0.001)			69.25* (36.03)			1.481 (7.237)		
gdp_growth	-0.00885	-0.00697	-0.0123	-	-	-	-0.128	-0.181	-0.0721	0.262*	0.264*	0.261*
ressource_rents				0.0273*** (0.00523)	0.0274*** (0.00536)	0.0274*** (0.00514)	(0.316)	(0.306)	(0.316)	(0.135)	(0.137)	(0.134)
Netodareceived	0.0444*** (0.0133)	0.041*** (0.0124)	0.056*** (0.0153)	-0.0129* (0.00711)	-0.0134* (0.00748)	-0.0135* (0.00750)	0.0356 (0.149)	0.244 (0.208)	-0.0695 (0.126)	- (0.0596)	- (0.0568)	- (0.0634)
Remittances	0.544*** (0.00150)	0.471*** (0.00131)	0.175*** (0.00183)	0.106*** (0.000819)	0.0956*** (0.000832)	0.117*** (0.000822)	0.0250* (0.0145)	0.0497** (0.0243)	0.763*** (0.0141)	0.190*** (0.0123)	0.181*** (0.0127)	0.180*** (0.0115)
financial_inst	0.477*** (0.0223)	0.198*** (0.0190)	0.431*** (0.0293)	0.137*** (0.0127)	0.124*** (0.0124)	0.149*** (0.0132)	0.618*** (0.113)	0.169*** (0.009)	1.05*** (0.0825)	0.210* (0.124)	0.255** (0.119)	0.468*** (0.131)
financial_market		6.719*** (1.406)	5.772** (2.682)		0.375*** (0.052)	0.821*** (0.078)			43.21* (22.89)		3.949 (6.305)	-3.874 (9.435)
L.pub_health_operational exp				0.714*** (0.0806)	0.718*** (0.0766)	0.706*** (0.0855)						
L.private_health_invest_exp							0.950*** (0.0532)	0.908*** (0.0687)	0.981*** (0.0384)			
L.Health_external_aid_exp										0.784*** (0.0572)	0.781*** (0.0571)	0.785*** (0.0561)
Constant	3.743*** (0.625)	3.362*** (0.607)	4.712*** (0.666)	1.617*** (0.363)	1.631*** (0.364)	1.709*** (0.414)	-0.282 (2.137)	-12.65** (5.091)	3.660 (3.724)	7.161*** (1.579)	6.518*** (1.868)	7.857*** (1.474)
Observations	916	914	915	917	917	914	914	913	918	913	913	913
Number of individuals	44	44	44	44	44	44	44	44	44	44	44	44
AR (1)	0,003	0,0054	0,006	0,0045	0,0023	0,0094	0,0067	0,0086	0,0093	0,0027	0,0063	0,0012
AR (2)	0,764	0,856	0,375	0,574	0,845	0,984	0,934	0,473	0,573	0,347	0,645	0,657
Hansen J-test	0,587	0,475	0,787	0,967	0,869	0,794	0,967	0,656	0,746	0,453	0,857	0,486

Source: authors. In parentheses, the standard deviations of the coefficients, *** p<0.01, ** p<0.05, * p<0.1

The correlation analysis reveals a positive association between financial development and health outcomes in Sub-Saharan Africa, highlighting the role of financial systems in improving population well-being. Notably, this relationship is stronger for private health expenditures (Figure 2) than for public health investment (Figure 1), suggesting that financial development primarily operates through private-sector channels. This result reflects the capacity of developed financial systems to ease liquidity constraints, expand access to credit, and support household and private investment in healthcare services.

In contrast, public health expenditure exhibits a more heterogeneous pattern, which may be attributed to institutional inefficiencies, fiscal rigidities, and governance challenges that limit the effective transmission of financial resources into public healthcare provision. This asymmetry underscores the relatively weaker responsiveness of public investment to financial development in the region.

Furthermore, improvements in infant survival rates (Figure 4) appear more gradual than gains in women's life expectancy (Figure 3). This difference can be explained by the fact that reductions in infant mortality depend on sustained investments in maternal and child healthcare, nutrition, and preventive services, which generate effects over a longer time horizon. Conversely, women's life expectancy may respond more rapidly to improvements in healthcare access and quality.

Overall, these findings suggest that financial development enhances health outcomes not only by mobilising resources but also by improving their allocation efficiency, particularly through private healthcare financing channels, while structural constraints continue to limit the effectiveness of public health spending.

4.2. Robustness Tests

Table N°3: Results of the Effect of Financial Development on the Healthcare expenditures with All Control Variables

VARIABLES	pub_invest_health-exp			pub_health_operational exp			private_health_invest_exp			Health_external_aid_exp		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
L.pub_invest_health-exp	0.423*** (0.0728)	0.427*** (0.0716)	0.393*** (0.0764)									
financial_dev	6.879*** (1.979)			0.709*** (0.076)			63.30* (33.34)			-3.023 (11.13)		
gdp_growth	-0.00262	-0.00180	-0.00356	-0.0272***	-	-0.0272***	-0.0933	-0.0547	-0.0747	0.255*	0.253*	0.257*
ressource_rents					0.0273*** (0.0192)							
Netodareceived	-0.0395*** (0.0144)	-0.0327** (0.0134)	-0.056*** (0.0155)	-0.0106* (0.00574)	-0.0105* (0.00601)	-0.0118** (0.00564)	-0.0823 (0.157)	-0.0973 (0.164)	-0.177 (0.151)	-0.238** (0.0955)	-0.227** (0.0955)	-0.244*** (0.0916)
Remittances	0.0537*** (0.00178)	0.044*** (0.00153)	0.0154*** (0.00230)	0.0296*** (0.00624)	0.273*** (0.0700)	0.0379*** (0.00577)	0.0419*** (0.00305)	0.0482*** (0.00323)	0.0269*** (0.00319)	0.0108*** (0.00100)	0.0112*** (0.00114)	0.0866*** (0.00821)
Trade	0.118*** (0.0357)	0.810*** (0.0314)	0.375*** (0.0423)	0.151*** (0.0201)	0.137*** (0.0198)	0.155*** (0.0203)	0.263*** (0.0261)	0.318*** (0.0257)	0.246*** (0.0258)	0.397*** (0.0252)	0.597*** (0.0243)	0.211*** (0.0259)
Fdi	0.0810*** (0.00578)	0.0310*** (0.00596)	0.0719*** (0.00562)	0.0881*** (0.00210)	0.0101*** (0.00228)	0.0447*** (0.00198)	0.136*** (0.0470)	0.119*** (0.0433)	0.166*** (0.0539)	0.623*** (0.0379)	0.581*** (0.0396)	0.0631* (0.0350)
financial_inst	0.0995*** (0.0244)	0.710*** (0.0246)	0.157*** (0.0245)	0.749*** (0.0738)	0.0738*** (0.00728)	0.0764*** (0.00763)	0.121*** (0.0583)	0.104*** (0.0591)	0.153*** (0.0577)	0.257*** (0.0234)	0.247*** (0.0235)	0.257*** (0.0233)
financial_market		6.640*** (1.571)			0.561*** (0.046)			44.56 (27.18)			-0.296 (9.611)	
L.pub_health_operational exp			4.994* (2.880)			0.658*** (0.097)			53.04** (24.22)			-6.459 (12.55)
L.private_health_invest_exp				0.792*** (0.0492)	0.794*** (0.0477)	0.783*** (0.0512)						
L.Health_external_aid_exp							0.937*** (0.0543)	0.947*** (0.0546)	0.950*** (0.0450)			
Constant	3.322*** (0.593)	3.057*** (0.568)	3.957*** (0.630)	1.211*** (0.223)	1.189*** (0.213)	1.295*** (0.252)	-4.296* (2.556)	-4.449* (2.621)	-1.646 (2.816)	0.782*** (0.0655)	0.780*** (0.0665)	0.780*** (0.0641)
Observations	915	917	917	914	914	913	918	913	913	913	919	917
Number of countries	44	44	44	44	44	44	44	44	44	44	44	44
AR (1)	0,005	0,0074	0,008	0,0055	0,0063	0,0064	0,0087	0,0096	0,0098	0,0087	0,0083	0,0072
AR (2)	0,674	0,566	0,575	0,574	0,455	0,574	0,945	0,467	0,579	0,354	0,667	0,687
Hansen J-test	0,877	0,785	0,957	0,673	0,679	0,564	0,565	0,589	0,786	0,478	0,987	0,4867

Source: authors,



In parentheses, the standard deviations of the coefficients; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

To assess the robustness of the baseline results, additional control variables—namely foreign direct investment (FDI) and trade openness—are incorporated into the model. The corresponding estimates, reported in Table 3, confirm the stability of the findings. Specifically, columns (1) to (3) show that the coefficients associated with different measures of financial development remain positive and statistically significant, indicating that financial development—through both financial institutions and markets—contributes to increasing the share of healthcare expenditure within government spending.

Similarly, columns (7) to (9) reveal a significant rise in private healthcare expenditure associated with financial development. This suggests that financial development stimulates healthcare financing through both public and private channels, reinforcing the robustness of the initial results.

Regarding the additional control variables, the findings indicate that trade openness exerts a positive effect on private healthcare spending, consistent with the evidence provided by Kokkinos et al. (2022). This effect can be explained by the expansion of private-sector activities, including those of non-governmental organisations, in response to increased economic integration and cross-border population movements. As highlighted by Corriero et al. (2022), such dynamics are often accompanied by greater involvement of private actors in the provision of humanitarian and health-related services.

Table N° 4: Effects of Financial Development on Infant Survival Rate

	Infant Survival Rate								
	Indices of financial_dev			Indices of financial_inst			Indices of financial_market		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
L. Infant survival rate	0.446*** (0.0738)	0.434*** (0.0758)	0.713*** (0.0741)	0.709*** (0.0404)	0.685*** (0.0621)	0.910*** (0.0408)	0.714*** (0.0384)	0.725*** (0.0800)	0.708*** (0.0399)
financial_dev	4.838*** (0.343)	10.58 (28.41)	2.314** (1.113)						
pub_invest_health-exp	0.034*** (0.0131)	0.036*** (0.0139)	0.00682 (0.0111)	0.196** (0.0824)	0.1117*** (0.0141)	0.00252 (0.0523)	0.199** (0.0840)	0.00537 (0.0102)	0.206*** (0.0789)
Finance* pub_invest_health-exp	6.839*** (2.700)	0.942 (3.481)	1.314** (0.713)	9.58 (18.41)	5.274** (2.716)	24.60** (12.26)	1.832 (7.95)	0.263 (1.434)	13.27 (14.14)
financial_inst				-2.832 (17.75)	6.275*** (1.718)	39.60** (17.26)			
financial_market							0.922 (3.281)	0.183 (1.684)	23.17 (24.13)
Constant	3.294*** (0.613)	3.784*** (0.583)	1.841*** (0.367)	7.085** (3.112)	2.710*** (0.611)	-1.361 (2.482)	8.263** (3.505)	1.575*** (0.377)	7.341*** (1.739)
Observations	913	913	913	918	913	918	918	919	916
Number of countries	44	44	44	44	44	44	44	44	44
AR (1)	0,004	0,007	0,0095	0,0057	0,0093	0,0066	0,0093	0,0084	0,0015
AR (2)	0,394	0,395	0,549	0,497	0,575	0,495	0,649	0,744	0,497
Hansen J-test	0,537	0,738	0,497	0,403	0,849	0,649	0,397	0,394	0,439
With control variables	Yes	Yes	Yes	Yes	Yes	Yes	yes	yes	yes

Source : authors

In parentheses, the standard deviations of the coefficients

*** p<0.01, ** p<0.05, * p<0.1

Table N°5: Effects of Financial Development on Women's Life Expectancy

	Women's Life Expectancy								
	Indices of financial_dev			Indices of financial_inst			Indices of financial_market		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
L. Life expect of women	0.639*** (0.0378)	0.848*** (0.0406)	0.927*** (0.0666)	0.889*** (0.0213)	0.843*** (0.0374)	0.916*** (0.0711)	0.904*** (0.0250)	0.831*** (0.0396)	0.876*** (0.0192)
financial_dev	42.23** (16.70)	0.625 (0.814)	58.22*** (13.55)						
pub_invest_health-exp	0.0731*** (0.0138)	0.0155*** (0.00565)	0.116 (0.467)	0.595*** (0.171)	0.0196** (0.00807)	0.205 (0.496)	0.505*** (0.172)	0.019*** (0.00504)	0.557*** (0.138)
Finance* pub_invest_health-exp	0.199*** (0.037)	0.615 (0.714)	18.22** (8.55)	12.76** (6.70)	0.0405 (1.110)	49.74** (24.35)	18.38*** (6.41)	0.223 (0.633)	25.90*** (9.23)
financial_inst				28.28** (13.51)	0.0605 (1.010)	89.74** (45.35)			
financial_market							0.190*** (0.0147)	0.333 (0.733)	45.90*** (16.33)
Constant	4.276*** (0.608)	0.930*** (0.202)	18.35 (12.69)	22.74*** (7.152)	1.161*** (0.403)	-1.400 (13.71)	20.04** (8.243)	1.188*** (0.184)	18.46*** (4.702)
Observations	914	915	914	918	917	914	913	917	913
Number of countries	44	44	44	44	44	44	44	44	44
AR (1)	0,008	0,0039	0,0077	0,0087	0,0063	0,0057	0,0049	0,0084	0,0072
AR (2)	0,355	0,535	0,947	0,397	0,835	0,483	0,395	0,354	0,639
Hansen J-test	0,487	0,967	0,484	0,406	0,499	0,659	0,848	0,749	0,587
Control variables	Yes	Yes	yes	yes	Yes	yes	Yes	Yes	yes

Source: authors

In parentheses, the standard deviations of the coefficients

*** p<0.01, ** p<0.05, * p<0.1

The numbers (1) to (9) above Tables 4 and 5 represent the dimensions of depth, accessibility, and efficiency for each financial development indicator.

In Tables 4 and 5, the analysis shifts to the determinants of child survival in Sub-Saharan Africa. The results highlight that the institutional pillar of finance is a primary determinant in reducing child mortality, largely by incentivizing private-sector participation in health service delivery. This corroborates earlier research by Ross & Bird (1994) and Park et al. (2020), which identifies robust financial systems as critical for directing resources toward pediatric care. Furthermore, Hossain et al. (2023) and Nica et al. (2023) emphasize that well-structured financial markets provide the foundational support for health infrastructure, thereby protecting the most at-risk demographics.

A key finding involves the synergy between financial depth and public health expenditures. When financial frameworks are strong, they significantly **amplify the efficacy** of state-funded health programs. This systemic strengthening is echoed by Rana et al. (2021), while Hsiao & Yip (2024) and Nonvignon et al. (2024) point to cooperative financing and the eradication of neglected diseases as vital components of this progress. Collectively, these insights indicate that financial development—particularly through its institutional and depth dimensions—serves as a structural backbone for optimizing health spending and safeguarding child survival in the face of environmental and social risks (Angelus et al., 2024; Yacour et al., 2024; Godt et al., 2017).

5. Conclusion

This study investigates the impact of financial development on the life expectancy of vulnerable populations in Sub-Saharan Africa, with a particular focus on women's life expectancy and infant survival rates. Using a panel of 44 countries over 2002–2022 and employing the System Generalised Method of Moments (GMM), the results indicate that financial development significantly enhances healthcare expenditures and improves health outcomes for vulnerable groups. Specifically, the institutional, market, and depth dimensions of financial development stimulate both public and private investment in healthcare, thereby improving access to essential services and contributing to higher women's life expectancy and increased infant survival rates.

The findings carry important policy implications. First, governments should prioritise the expansion and efficiency of public healthcare spending, particularly in maternal and child



health programmes, including prenatal care, assisted deliveries, and postnatal services. Second, strengthening financial inclusion (through digital financial services, microfinance, and improved banking access) can enhance vulnerable households' ability to utilise healthcare services. Third, policies promoting private investment in healthcare infrastructure, via targeted fiscal incentives and public–private partnerships, can complement public efforts. Finally, improving financial governance and deepening financial markets can facilitate long-term financing for healthcare infrastructure and ensure efficient allocation of resources across the health sector.

This study also highlights a limitation: it does not determine the threshold of healthcare expenditure necessary for financial development to sustain its positive effect on vulnerable populations' life expectancy. Future research could address this gap by estimating these thresholds and conducting comparative analyses across developing regions, thereby refining policy recommendations and strengthening the evidence base for health-finance linkages in emerging economies.

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