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Does unemployment influence out-of-pocket health expenditures in sub-Saharan Africa countries? Evidence from the defactored instrumental variables method

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Abstract. *This article analyses the effect of unemployment on out-of-pocket health expenditures in 35 sub-Saharan Africa countries. The defactored instrumental variables method was used over the period 2010-2022. The results of this research show that the unemployment rate leads to an increase in out-of-pocket health expenditures in this area. The policy suggestions that emerge from this research for African governments concern the promotion of employment through easier access to credit and skills development programmes that consider women. Governments could also put in place measures to protect against the financial risk associated with direct payments by making universal health insurance operational.*

Keywords: Out-of-pocket health expenditure, unemployment, defactored instrumental variables method, sub-Saharan Africa.

JEL Classification: C23, E24, H51, I18.

1. Introduction

Low-income countries, particularly those in Africa, continue to face the major challenge of financing their healthcare systems. Today, the health financing deficit on the continent is estimated at 66 billion dollars a year (Ngepah and Ndzignat Mouteyica, 2024). This underfinancing of healthcare leads to heavy reliance on out-of-pocket health expenditures, which generally results in catastrophic healthcare expenditures of up to 40% or more of total healthcare expenditures in some countries (Piabuo and Tieguhong, 2017: pp. 1-13).

Out-of-pocket payments refer to out-of-pocket health expenditures made by individuals for healthcare services at the time they are provided, without considering reimbursements made by insurance or other financial protection (Wagstaff and Doorslaer, 2003: pp. 921–933). In sub-Saharan Africa, the use of these payments is even more marked. In 2022, out-of-pocket health expenditures represented 32.03% of current healthcare expenditures, more than half the world average of 17.23% (World Bank, 2024). Furthermore, again, according to World Bank data, compared with other regions of the world, out-of-pocket payments for healthcare in Sub-Saharan Africa remain particularly high. For example, direct payments for healthcare in 2022 in the Middle East and North Africa, Latin America and the Caribbean, East Asia and the Pacific and the OECD were 25.97%, 29.93%, 25.45% and 13.07%, respectively.

However, high out-of-pocket health expenditures lead to major social problems. On the one hand, it can increase the risk of household impoverishment, and on the other hand, it could act as a brake on access to healthcare services. Indeed, the increase in direct payments for healthcare has an effect on reducing a household's income and limits its ability to consume the same or better goods and services (Frimpong et al., 2022: pp. 1129–1137). Frimpong et al. (2021: pp. 492-505) and Koch and Setshegetso (2020) stress that SSA is vulnerable to poverty due to high direct health payments. Second, out-of-pocket health expenditures are considered the most regressive form of health system financing, imposing a high financial burden on family budgets, which can lead to catastrophic spending and poverty (Silva et al., 2024: pp. 439-463). In addition, Sirag and Mohamed Nor (2021: pp. 536) reported that when out-of-pocket health expenditures in a country exceed 29% of total healthcare expenditures, there is a high probability of an increase in the level of poverty in the country. In addition, a cross-national analysis suggested that when out-of-pocket health expenditures are less than 15% of total health expenditures, few households are likely to face catastrophic expenditures (WHO, 2021). Finally, World Health Organization (2008) reported that it is difficult to achieve universal health coverage when out-of-pocket payments exceed 20% of total health expenditures.

One of the reasons why households resort to out-of-pocket health expenditures is the virtual absence of a strategy and mechanism for self-financing the healthcare system itself on the African continent, which is already affected by an even higher unemployment rate. The International Labour Organisation (ILO) defines the term "unemployed" as a person of working age who is available for work and seeking paid employment at a given time (World Bank, 2024). Economic theories establish a link between a high unemployment rate and a high level of direct payments. Indeed, the economic deprivation model of Janlert and Hammarström (2009) indicates that unemployed individuals have less money and that this

lack of money can have a negative effect on health and consequently lead to an increase in household expenditure. Additionally, the stress model (Selye, 1956: 426. p) notes that the cessation or loss of employment produces a stress mechanism, which can have consequences for health and consequently increase direct payments. On the other hand, according to the social support model (Cohen & Wills, 1985: pp. 310-357), the social network acts as a shield to protect individuals in stressful situations such as unemployment.

Empirically, several works have focused on out-of-pocket health expenditures (Attia-Konan et al., 2019 ; Boundioa and Diallo, 2025: pp. 228-249 ; Frimpong et al., 2022: pp. 1129–1137 ; Grigorakis et al., 2018: pp. 1290–1312 ; Łyszczarz and Abdi, 2021 ; Ngepah and Ndzignat Mouteyica, 2024 : pp. 1-17; Rice et al., 2018, etc.). However, with the exception of those by Boundioa and Diallo (2025: pp. 228-249), Grigorakis et al. (2018: pp. 1290–1312) and Łyszczarz and Abdi (2021), the other works have not considered the issue of unemployment. Furthermore, these studies have not focused on sub-Saharan Africa or its specific characteristics. In this context, our main research question is as follows: does the unemployment rate affect out-of-pocket health expenditures in Sub-Saharan Africa? To address this research question, the aim of this study is to analyse the effect of the unemployment rate on out-of-pocket health expenditures in Sub-Saharan Africa.

This research contributes to the literature on two (02) ways. First, it fills the gap in the literature by analysing the relationship between the unemployment rate and out-of-pocket health expenditure. Indeed, to our knowledge, no studies have addressed this relationship, especially in developing countries such as those in sub-Saharan Africa. However, the majority of young people in sub-Saharan Africa are highly dependent on employment, and being unemployed can create stress and pressure, which can have a negative effect on their health (Byaro et al., 2023) and consequently increase out-of-pocket payments. The choice of sub-Saharan Africa is further motivated by the fact that, unlike developed countries where unemployment benefits are available (Karpman and Acs, 2020) and health support is developed, SSA is characterised by a lack of such measures. Second, Jacques et al. (2024: pp. 1-25) indicate that approximately 37% of SSA countries have an unemployment rate of over 15%. Furthermore, the unemployment rates of countries in sub-Saharan Africa have increased from 5.98% in 2010 to approximately 6.20% in 2022 (World Bank, 2024), which is a tolerable threshold of 3% in an economy according to neoclassics. Second, this research uses a new approach, the defactored instrumental variables method recently developed by Norkutė et al. (2021: pp. 416–446). This method has the advantage of overcoming econometric problems such as interindividual dependence, endogeneity, heterogeneity of slopes and nonstationarity of variables. The measurement of the unemployment rate in Sub-Saharan African countries is strongly influenced by the informal nature of the labour market and by errors in the collection and statistical processing of the data, which generates an endogeneity bias and renders the conditional estimators invalid.

The rest of this article is structured as follows: the second section addresses the theoretical and empirical analysis of the effect of unemployment on direct health payments. The next section addresses the methodology, including the specification of the model, the data and the estimation method. The fourth section addresses the empirical results and their discussion, and finally, the last section concludes and formulates economic policy implications.

2. Effects of unemployment on out-of-pocket health expenditures: A theoretical and empirical review

2.1. Theoretical evidence

From a theoretical point of view, the effect of unemployment on direct health payments could be based on the economic deprivation model and the stress model. The first theory highlights the links between individual economic situations and health needs. The unemployed have less money, and this lack of money has a direct or indirect negative impact on health (Janlert and Hammarström, 2009: p. 235). This lack of resources, which leads to a decrease in consumption (food or nonfood), results in a potential deterioration in health (Pieters and Rawlings, 2020: pp. 207-237). These authors add that unemployment reduces the income available for spending on market goods such as healthcare (including private health insurance). When individuals are unemployed or lose their jobs, they are unable to subscribe to or pay into a health insurance system. The low take-up or abandonment of health insurance, on the one hand, and the deterioration of health through bad consumer habits, on the other hand, result in an increase in out-of-pocket payments.

In addition to the income channel, the stress model popularised by Selye (1956) indicates a positive correlation between social stimuli, particularly job loss, and illness. Janlert & Hammarström (2009) noted that job loss, as well as environmental and genetic factors, produces the stress mechanism that leads to illness. It is therefore obvious that the stressful situation during unemployment can lead to the abusive consumption of certain drugs, such as alcohol, cigarettes and others, which can damage health. To compensate for this deterioration in health, households turn to health services. However, the cost of these services is borne by the patients themselves, especially in African countries where health insurance (especially universal health insurance) is less well developed.

Finally, building on the stress model, Cohen & Wills (1985: pp. 310-357) developed the so-called social support model. The authors argued that the existence of a family network has a positive effect on stress and therefore on an individual's health. By distinguishing two social support mechanisms (direct effects and buffer effects), the authors consider that in the presence of a family network, stress, particularly that linked to unemployment, has no effect on an individual's health. For the buffer effect, they show that the social network acts as a shield to protect the individual in stressful situations such as unemployment. In the case of Africa, these models seem more justified in terms of existing social ties. In this case, responsibility for individual health issues falls to households, which contributes to a significant increase in their health expenditure.

2.2. Empirical evidence

Although no studies have directly analysed the effect of unemployment on out-of-pocket health expenditures, some studies on the determinants of direct health payments have taken unemployment into account (Grigorakis et al., 2018: pp. 1290–1312; Łyszczarz & Abdi, 2021). Indeed, Grigorakis et al. (2018: pp. 1290–1312) analysed the macroeconomic and financial determinants of household direct payments in 26 countries of the European Union and the Organisation for Economic Co-operation and Development (OECD). Using fixed and random effects methods and the generalised method of moments (GMM), they reported

that, in addition to public spending on health and public insurance, the unemployment rate is a significant determinant. According to their results, an increase in the unemployment rate translates into an increase in direct healthcare payments.

Łyszczarz and Abdi (2021: p. 1750) studied the factors associated with direct health payments in 16 Polish regions from 1999-2019. Using a two-stage fixed effects model with standard Driscoll-Kraay errors, they show that unemployment is one of the explanatory factors for direct health payments in these regions. However, contrary to the study by Grigorakis et al. (2018: pp. 1290–1312), unemployment has a negative effect on direct healthcare payments. This contradiction in results is explained by the fact that in EU and OECD countries, private health insurance is developed, and when people lose their jobs, they automatically lose their insurance coverage and must now pay out of pocket for health needs. In Poland, on the other hand, the public insurance system is well developed, whereas the private system is relatively underdeveloped. The unemployed benefit from public insurance without any restrictions.

Finally, Boundioa and Diallo (2025: pp. 228-249) analysed the cross effect of financial development and public spending on health in reducing out-of-pocket health expenditures in the West African Economic and Monetary Union and included unemployment as a control variable. They find that the unemployment rate has a positive effect on direct health payments in this area. They explain this result by the fact that since health insurance (both public and private) is underdeveloped in this area, unemployed individuals and those working in the informal sector are obliged to pay directly for access to health services.

The analysis revealed that no study has analysed the effect of unemployment on direct health payments in sub-Saharan Africa. Second, our research also differs from existing works in terms of the estimation method applied. Indeed, this research uses the defactored instrumental variables method recently developed by Norkutė et al. (2021: pp. 416–446), contrary to the widespread use of the generalised method of moments (GMM) and other methods. This method has the advantage of overcoming econometric problems such as interindividual dependence, endogeneity, heterogeneity of slopes, Nickell bias and nonstationarity of variables.

3. Methodology and data

3.1. Econometric models

The theoretical model used in this study is based on health demand theory (Grossman, 1972: pp. 6-41). According to this theory, the individual's main objective is to maximise his utility by combining healthcare and other goods and services, subject to his budgetary constraints.

The individual's problem can therefore be formalised as follows:

$$\begin{cases} Max\ U = U(H, X) \\ sc \\ P_h H + P_x X \leq I \end{cases} \quad (1)$$

where H represents health; X represents other goods and services; P_h represents the unit price of health care; P_x represents the unit price of other goods and services; and I represents income.

The Lagrangian of the problem of maximising individual utility (and therefore minimising expenditure) is written as follows:

$$L(H, X, \lambda) = U(H, X) + \lambda\,(-P_h H - P_x X + I) \quad (2)$$

(λ: the Lagrange multiplier)

After applying the first-order conditions to the Lagrange function (equation 2), we show that the optimal demand for healthcare is given by:

$$H^* = f(I, P_h, P_x) \quad (3)$$

On the basis of equation 3, for a given price of healthcare and drawing on the work of

Frimpong et al. (2022: pp. 1129–1137.) and following the models of economic deprivation, stress and social support, direct household healthcare payments (OOPHE) can take the following functional form:

$$OOPHE = f(Y, I, Z) \quad (4)$$

where Y is the unemployment rate and Z is a set of control variables likely to influence direct healthcare payments.

From equation (4), we use a dynamic panel model where OOPE represents direct health payments $OOPHE$, UNEM, unemployment rate Y, GDPG income I. Drawing from the literature and following Grigorakis et al. (2018: pp. 1290–1312), Frimpong et al. (2022: pp. 1129–1137.), the set of control variables for Z includes public health expenditure (DGGHE), external health expenditure (EHE), voluntary health insurance (VHI) and institutional quality (IQI). The dynamic panel specification takes the following form:

$$OOPE_{it} = \beta_0 + \beta_1\, OOPE_{it-1} + \beta_2 UNEM_{it} + \beta_3 GDPG_{it} + \beta_4 DGGHE_{it} +$$
$$+\beta_3 EHE_{it} + \beta_6 VHI_{it} + \beta_5 IQI_{it} + \varepsilon_{it} \quad (5)$$

ε represents the error term.

3.2. Estimation method

The analysis of panel data requires the application of certain preliminary econometric tests to choose an appropriate estimation method. In general, preliminary tests begin with an analysis of cross-sectional dependence to verify whether there is individual dependence between the different countries in the sample. The stationarity test, which is a preliminary test, is not carried out in this research, as univariate unit root tests are known to lack power for small or medium-sized samples (Palm et al., 2004). When the number of periods is small (less than 10 or 15), unit root tests suffer from severe distortions (Dialga & Ouoba, 2022). In this research, we favour tests of cross-sectional dependence on the model (Frees, 1995:pp. 393–414; Friedman, 1937: pp. 675-701; Pesaran, 2015: pp.1089-1117) over those on the variables. Indeed, tests on the variables are generally used to select the appropriate

stationarity and cointegration tests. After this test, we also carry out the Pesaran and Yamagata (2008: pp.50-93) homogeneity test, the Wooldridge (2002: pp. 245–254) serial correlation test, the Baum (2024) heteroskedasticity test and the Hausman (1978: pp. 1251-1271) specification test.

The empirical model (equation (5)) in this study requires the use of dynamic panel data methods because the lagged variable of the dependent variable is one of the explanatory variables. Thus, the application of traditional methods (ordinary least squares, for example) leads to biased results. Indeed, introducing the lagged value of the dependent variable into the model creates a bias linked to its correlation with the error term (Nickell, 1981: pp. 1417-1426). In contrast, the generalised method of moments (GMM) developed by Arellano and Bond (1991: pp. 277–297) Arellano and Bover (1995: pp. 29-51) and Blundell and Bond (1998: pp. 115–143) overcomes this problem by eliminating individual effects and using the lagged values of both dependent and independent variables as instruments. Dynamic panel GMM provides robust results (Roodman, 2006).

On the other hand, this method could lead to biased results in the presence of interindividual dependence or unobserved common factors and nonstationarity of the variables (Sharma et al., 2021). Furthermore, Hansen (1982: pp. 1029–1054) argues that GMMs are based solely on stationary processes. To overcome the above problems, this paper uses the defactored instrumental variables approach developed by Norkutė et al. (2021: pp. 416–446). Indeed, Kripfganz & Sarafidis (2021: pp. 659-686) show that this method is robust even in the presence of interindividual dependence, endogeneity, slope heterogeneity and nonstationarity. Furthermore, Norkutė et al. (2021: pp. 416–446) propose two types of estimators, namely, the two-stage defactored instrumental variable estimator (2SIV) for homogeneous panel models and the mean group defactored instrumental variable estimator (MGIV) for heterogeneous panel models. The estimator is based on the staggered lag autoregressive model. The equation is as follows:

$$Y_{it} = \rho Y_{it-1} + \phi' Z_{it} + \xi_{it} \qquad \text{with } \xi_{it} = \lambda'_{Y_i} + f_{Y_t} + \varepsilon_{it} \tag{6}$$

whereZ_{it} is a vector of explanatory variables andξ_{it} is an idiosyncratic error term. $\lambda'_{Y_i} f_{Y_t}$ andε_{it} represent the unobserved factors, the factor scores and an idiosyncratic error term, respectively.

In the presence of homogeneous slope coefficients, the two-stage instrumental variable estimator (2SIV) is obtained in the first stage by using instruments based on defactored covariates. In the second stage, the entire model is defactored using the factors extracted from the residuals in the first stage. The overidentifying restrictions test is used in this case to check the validity of the instruments.

On the other hand, in a model with a heterogeneous slope coefficient, the IVMG estimator is obtained by the cross-sectional average of the estimates of the instrumental variable in the first stage of the individual-specific slopes.

However, for the purposes of this research, the Pesaran and Yamagata (2008: pp. 50-93) test is used to select the appropriate approach.

To analyse the robustness of the results obtained via the two-stage instrumental variable (2SIV) method, we apply Driscoll and Kraay estimator (1998: pp. 549-560). This approach accounts for spatial correlation while allowing the calculation of standard errors that are robust to heteroskedasticity and serial correlation (Tsani, 2013: pp. 181-195). In addition to handling cross-sectional and temporal dependence, Driscoll and Kraay's estimator generates reliable estimates (coefficients) even when applied to balanced and unbalanced panel data with missing data series (Hoechle, 2007: pp. 281-312). Finally, Driscoll and Kraay estimate parameters by considering variables with a single lag, which overcomes potential endogeneity problems between variables (Cerra and Saxena, 2008: pp. 439-457). Furthermore, in this robustness analysis, the total unemployment rate is disaggregated into male and female unemployment rates.

3.3. Data

This research considers panel data for the period 2010-2022 for 35 sub-Saharan African countries (see Table A1 in the appendix). Direct health payments (OOPE), the dependent variable of this research, are measured by the logarithm of direct payments per capita in dollars, which is based on the work of (Ngepah and Ndzignat Mouteyica, 2024: pp. 1-17). The unemployment rate, which represents our variable of interest, is captured by the total number of unemployed individuals (% of the total labour force)[(1)] following the work of Grigorakis et al. (2018: pp. 1290-1312) and Łyszczarz and Abdi (2021). The income level is captured by the economic growth rate following the example of Oyedele (2023: pp. 314-334). Public health expenditures and external health expenditures, respectively, as percentages of total health expenditures are used following Frimpong et al. (2022 : pp. 1129–1137) and Grigorakis et al. (2018: pp. 1290-1312). Health insurance is quantified by voluntary health insurance schemes (% of current health expenditure) following the work of Edoh et al. (2021). Institutional quality (IQI) is captured by a composite index constructed via the principal component analysis method[(2)] of the World Bank's six (06) governance indicators (citizen voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, control of corruption). Tables A2, A3 and A4 in the appendix present the data sources, descriptive statistics and correlation table for the different variables used in this research, respectively.

4. Results and discussion

4.1. Preliminary tests

Table 1 shows the results of the preliminary tests. The results show that we cannot accept the hypothesis that there is no interindividual dependence, as the statistics of Pesaran (2015: pp. 1089-1117), Frees (1995: pp. 393–414) and Friedman (1937: pp. 675-701) are all significant at the 1% level. Second, Pesaran and Yamagata test (2008: pp. 50-93) does not reject the hypothesis that the panel is homogeneous. In addition, the Wooldridge (2002: pp. 245–254) and Baum (2024) statistics confirm the presence of serial correlation and heteroscedasticity, respectively. Finally, the Hausman (1978: pp. 1251-1271) test allows us to accept a fixed-effects model. In view of the results of these preliminary tests, the two-

stage instrumental variable (2SIV) approach of Norkutė et al. (2021: pp. 416-446) and that of Driscoll and Kraay (1998: pp. 559-560) are appropriate.

Table 1: *Results of preliminary tests for baseline models*

Specification	Issue	Test	Statistic	Conclusion
Model: out-of-pocket health expenditure	Cross-sectional dependence	Pesaran (2015)	6.883***	Presence
		Frees (1995)	11.071***	Presence
		Friedman (1937)	52.519***	Presence
	Homogenous test	Pesaran and Yamagata (2008)	0.883	homogeneity
	Serial correlation	Wooldridge (2002)	95.915***	Presence
	Heteroscedasticity	Wald Modified	1334.40 ***	Presence
	Fixed effect	Hausman (1978)	101.58 ***	Presence

Note: (***), (**) and (*) = significant at the (1%), (5%) and (10%) levels, respectively
Source: Authors

4.2. Effects of the total unemployment rate on out-of-pocket health expenditures

The results of the estimation of the effect of the unemployment rate on direct health payments are presented in Table 2. The results of the Hansen test show that the instruments used are valid for the 2SIV method, as the probability associated with the test is greater than the 1% threshold. Analysis of the results revealed that the unemployment rate has a positive effect on direct health payments. An increase in the unemployment rate of 1 percentage point leads to an increase in direct healthcare payments of 1%, ceteris paribus. This result could be explained by the fact that unemployed individuals, especially those in developing countries, do not benefit from universal health insurance, as this is not well developed. As a result, unemployed people (like many other people in the informal sector) are obliged to pay out of pocket for access to healthcare, as they do not have a permanent source of income that would allow them to subscribe to a voluntary private health insurance scheme. In addition, the effect of unemployment on out-of-pocket payments can be channelled through a deterioration in health resulting from certain risk-taking and other behaviours. Unemployment can lead to risk-taking behaviour, such as alcohol, cigarette and substance abuse (Browning and Heinesen, 2012: pp. 599-616). In addition, being unemployed can create stress and pressure, which can have a negative impact on health (Byaro et al., 2023)..

Finally, Byaro et al (2023) argue that the mechanism that could influence the negative effects of unemployment on health could be the role of poverty associated with a lack of income. A lack of income can affect the quantity and quality of goods and services consumed, which could have a negative impact on health. Since health is a necessity, any deterioration in health status would lead to an increase in direct payments (especially given the low level of development of health insurance) through the use of health services. Our results are supported empirically by those of Boundioa and Diallo (2025: pp. 228-249) and Grigorakis et al. (2018: pp. 1290-1312). On the other hand, they are contrary to those of Łyszczarz and Abdi (2021). This contradiction is explained by the poor development of health insurance (especially public health insurance) in SSA countries, whereas in Poland, unemployed individuals benefit from this system.

Public health expenditures and external health expenditures have a negative effect on direct health payments in SSA at the 1% threshold. More precisely, an increase of one (01)

percentage point respectively in public spending on health and external spending on health leads to a decrease of 0.9% respectively. In fact, an increase in public spending on health and external spending on health could be considered a subsidy for households. Public health expenditures and external expenditures could be considered financial support for households, which strengthens equity by reducing financial barriers and making health services more affordable. In addition, increased public spending on health and external spending can improve the health of the population, which can reduce the use of health services and lead to a reduction in out-of-pocket payments. All of these factors lead to a decrease in private healthcare payments, which is a burden on households. This result is in line with those of Frimpong et al. (2022: pp. 1129-1137) and Voto and Ngepah (2025: pp. 119).

Table 2: *Effect of total unemployment rate on out-of-pocket health expenditure*

Dependant variable	**Out-of-pocket health expenditure**	
Estimation Methods	**2SIV**	**Driscoll-Kraay**
Explanatory variables	**Coefficients (Standard errors)**	**Coefficients (Standard errors)**
Lag of Out-of-pocket health expenditure (log)	0.368***	0.767***
	(0.116)	(0.042)
Unemployment	**0.010***	**0.008***
	(0.005)	(0.004)
Gross Domestic Product	0.002	0.007***
	(0.002)	(0.001)
Domestic general government health expenditure	-0.009***	-0.004***
	(0.002)	(0.001)
External health expenditure	-0.009***	-0.008***
	(0.002)	(0.001)
Voluntary health insurance schemes	-0.005	-0.007**
	(0.003)	(0.002)
Institutional quality index	-0.400**	-0.303
	(0.172)	(0.175)
Constant	2.464***	1.064***
	(0.452)	(0.189)
Number of countries	35	35
Comments	385	420
Hansen test (P value)	14.758 (0.194)	
R^2		0.6838

Note: (***), (**) and (*) = significant at the (1%), (5%) and (10%) levels, respectively
Source: Authors

Institutional quality has a negative effect on direct healthcare payments at the 5% threshold. An improvement in institutional quality would result in a decrease in direct payments. This result could be explained by the fact that an improvement in institutional quality, characterised by a reduction in corruption, for example, makes it possible to reduce the waste of resources on the one hand but also to avoid the extortion of funds from patients by healthcare staff. The dissuasive effect is more pronounced when such behaviour is punished by institutions (with respect to the rule of law). Ngepah and Ndzignat Mouteyica (2024: pp. 1-17) reported similar results in 40 African countries. They show that improving the quality of governance will help ensure the equitable distribution of and access to healthcare and reduce existing disparities in direct healthcare payments.

The results of the estimation via the Driscoll–Kraay method demonstrate the robustness of most of the results of the 2SIV estimation. The results confirm that the unemployment rate has a positive effect on direct healthcare payments in SSA. The results also support that public health expenditures and external expenditures have negative effects on direct payments. However, the positive and negative effects of income and insurance, respectively, become significant, and the positive effect of institutional quality is no longer significant.

4.3. Effects of male and female unemployment rates on out-of-pocket health expenditures

Table 3 presents the effect of unemployment by gender on direct healthcare payments. Analysis of the table shows a significant and robust effect of the female unemployment rate (estimates 3 and 4) on direct payments. We find this result very interesting in that it allows us to understand that the socioeconomic vulnerability (especially in the case of unemployment) of women, unlike that of men, has a significant effect on out-of-pocket healthcare expenditures. On the one hand, this result can be explained by women making greater use of health services (spending on reproductive health) than men do. On the other hand, this result confirms the social support model. Indeed, when women are unemployed, health expenses, especially the most urgent expenses (reproductive health expenses), are systematically covered by households, which adds to the family health budget.

Table 3: *Effects of male and female sex Unemployment rates on out-of-pocket health expenditures*

Dependant variable	**Out-of-pocket expenditure (log)**			
	Unemployment , male		**Unemployment, female**	
	(1)	**(2)**	**(3)**	**(4)**
Explanatory variables	**2SIV**	**Driscoll-Kraay**	**2SIV**	**Driscoll-Kraay**
Lag of Out-of-pocket health expenditure (log)	0.365***	0.769***	0.362***	0.765***
	(0.118)	(0.042)	(0.111)	(0.042)
Unemployment	**0.008**	**0.005**	**0.009****	**0.007***
	(0.006)	**(0.004)**	**(0.004)**	**(0.003)**
Gross Domestic Product	0.002	0.007***	0.002	0.007***
	(0.002)	(0.001)	(0.002)	(0.001)
Domestic general government health expenditure	-0.008***	-0.004***	-0.009***	-0.004**
	(0.002)	(0.001)	(0.002)	(0.001)
External health expenditure	-0.010***	-0.008***	-0.009***	-0.008***
	(0.002)	(0.001)	(0.002)	(0.001)
Voluntary health insurance schemes	-0.006*	-0.007**	-0.005	-0.007**
	(0.003)	(0.002)	(0.003)	(0.002)
Institutional quality index	-0.376**	-0.326*	-0.429**	-0.299
	(0.168)	(0.174)	(0.175)	(0.173)
Constant	2.478***	1.093***	2.492***	1.068***
	(0.444)	(0.196)	(0.440)	(0.183)
Number of countries	35	35	35	35
Comments	385	420	385	420
Hansen test (P value)	14.464 (0.208)		14.911(0.186)	
R^2		0.6831		0.6841

Note: (***), (**) and (*) = significant at the (1%), (5%) and (10%) levels, respectively; standard errors are in parentheses.
Source: Authors

5. Conclusion and economic policy implications

The aim of this study is to analyse the effect of unemployment on direct healthcare payments in SSA. For the empirical analysis, panel data for 35 countries over the period 2010--2022 were used. To choose the method, preliminary tests were used and revealed the existence of interindividual dependencies and the absence of heterogeneity. To overcome this problem, we used the two-stage defactored instrumental variables (2SIV) method. The results show that unemployment has a positive and significant effect on direct health payments. This result implies that governments and the private sector in SSA should effectively combat unemployment by creating jobs and investment opportunities for unemployed individuals. This could involve measures on bank credit and policies to promote entrepreneurship and adapt training to the labour market. Governments must also create favourable conditions for investment by improving the business climate and good governance. In addition, the countries of SSA are characterised by subsistence agriculture and a large informal sector, which employs a large proportion of the population. Governments could therefore encourage the development of the agri-food sector, which would be a source of job creation for young people. In addition, social protection policies through the operationalisation of universal health insurance are important elements that could mitigate the effect of unemployment on direct payments. All these measures should pay particular attention to women, that are the section of the population that makes the most use of health services. Finally, improving institutional quality (e.g., by combating corruption) and increasing domestic spending on health by public administrations and external spending are necessary to reduce out-of-pocket payments for health by households in SSA.

Notes

(1) Modelled estimate from the International Labour Office

(2) Tables A.5 and A.6, respectively present the correlation between the institutional quality variables and the results of the principal component analysis. The index obtained is standardised using the min–max method ($IQI_{it} = \frac{QI_{it} - QI_{it_{min}}}{QI_{it_{max}} - QI_{it_{min}}}$) in order to facilitate interpretation.

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Appendices

Table A1: *List of countries*

1 Angola	8 Chad	15 Kenya	22 Mozambique	29 Sierra Leone
2 Botswana	9 Congo-Brazzaville	16 Liberia	23 Namibia	30 South Africa
3 Burkina Faso	10 Ivory Coast	17 Madagascar	24 Niger	31 Tanzania
4 Burundi	11 Ethiopia	18 Malawi	25 Nigeria	32 Togo
5 Cap Verre	12 Gabon	19 Mali	26 Rwanda	33 Uganda
6 Cameroon	13 Gambia	20 Mauritania	27 Sao Tome and Principe	34 Zambia
7 Central African Republic	14 Guinea	21 Mauritius	28 Senegal	35 Zimbabwe

Source: Authors

Table A2: *Sources of variables*

Variables	Abbreviation	Sources
Out-of-pocket health expenditure per capita (current US$)	OOPE	WDI (2024)
Unemployment, total (% of total labour force)	UNET	WDI (2024)
Unemployment, male (% of male labour force)	UNEM	WDI (2024)
Unemployment, female (% of female labour force)	UNEF	WDI (2024)
Gross Domestic Product growth (annual %)	GDPG	WDI (2024)
Domestic general government health expenditure (% current health expenditure)	DGGHE	WDI (2024)
External health expenditure (%current health expenditure)	EHE	WDI (2024)
Voluntary health insurance schemes (%Current Health Expenditure)	VHI	WHO (2024)
Institutional quality index	IQI	Authors' calculation using PCA

Source: Authors

Table A3: *Descriptive statistics*

VARIABLES	N	mean	sd	min	max
OOPE	455	28.96	41.32	1.868	301.2
UNET	455	7.609	6.833	0.316	34.01
UNEM	455	6.979	6.193	0.390	32.06
UNEF	455	8.446	7.909	0.216	36.26
DGGHE	455	32.34	16.21	3.723	76.60
EHE	455	23.93	17.51	0.157	70.79
GDPG	455	3.905	4.602	-36.39	21.45
VHI	455	5.911	9.906	0.00734	45.79
IQI	455	0.412	0.216	1.73e-08	1

Source: Authors

Table A4: *Pairwise correlations matrix variables*

Variables	(1)	(2)	(3)	(4)	(5)	(6)
(1) DGGHE	1.000					
(2) EHE	-0.439	1.000				
(3) IQI	0.579	-0.205	1.000			
(4) UNET	0.701	-0.409	0.418	1.000		
(5) GDPG	-0.101	0.066	0.031	-0.180	1.000	
(6) VHI	0.381	-0.336	0.374	0.635	-0.097	1.000
VIF	2.75	1.31	1.63	2.95	1.05	1.84
1/VIF	0.3637	0.7626	0.6143	0.3393	0.9534	0.5424
Mean VIF			1.92			

Source: Authors

Table A5: *Matrix of correlations of institutional quality variables*

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) iqi	1.000						
(2) cc	0.910	1.000					
(3) GE	0.940	0.826	1.000				
(4) PS	0.780	0.675	0.642	1.000			
(5) RQ	0.913	0.771	0.908	0.587	1.000		
(6) RL	0.967	0.864	0.932	0.705	0.892	1.000	
(7) VA	0.839	0.728	0.694	0.624	0.700	0.767	1.000

Source: Authors

Table A.6: *Results of the principal component analysis (PCA)*

Component	Eigenvalue		Proportion	Cumulative		
1	4.793		0.7989	0.7989		
2	0.490		0.0818	0.8807		
3	0.350		0.0583	0.9390		
4	0.218		0.0364	0.9753		
5	0.091		0.0151	0.9905		
6	0.057		0.0095	1		
Variables	**CC**	**RL**	**PS**	**VA**	**GE**	**RQ**
KMO index	0.9428	0.8650	0.9446	0.9349	0,9267	0.9006
Bartlett test of sphericity	*Statistics from χ^2 (P value)*			*Average KMO index*		
	3147.961 (0,000)			*0.9015*		

Source: Authors