ABSTRACT: Sub-Saharan Africa (SSA) is one of the highest recipients of remittances; however, this is inconsistent with the region's growth and the state of its weak healthcare systems. This paper therefore analyses the effect of remittances on health outcomes for 39 selected SSA countries over the period 1996 to 2016. It considers the channels through which remittances affect health outcomes, including financial development and institutional quality. Using dynamic panel estimation, we find that remittances sustain health outcomes, while both financial development and institutional quality complement remittances in this respect. SSA countries should therefore continue to improve their financial sectors and develop the quality of institutions to an adequate level. Achieving sound financial systems and institutions would both allow and attract a substantial amount of remittances, benefitting human capital and health outcomes and alleviating poverty.

KEY WORDS: remittances, health sustainability, financial development, institutions, SSA

JEL CLASSIFICATION: F22, I15, O5
1. INTRODUCTION

In recent years the financial sector of the global economy has witnessed a massive surge in its dependence on remittances as a considerable source of funding. The rise of remittance inflows in developing countries has had a developmental effect on the recipient nations’ economic growth and financial development. This economic growth may be in the form of improved healthcare services, education investment, or improved livelihoods. At the micro level, this money primarily covers household essentials such as food and shelter. It also contributes to basic education and healthcare expenses and business investments, and smooths fluctuations in overall household expenditure.

It is widely accepted that remittances play a key role in alleviating poverty and spurring economic growth in the developing world (Adams and Page, 2005; Lee, 2011; Ratha, 2005). The substantial inflow of remittances is driven by migration, as many people leave their home countries due to a lack of economic opportunity and earn a better income in other, mostly developed countries. Remittances become a source of financing for health outcomes in many developing countries as they continue to seek long-term solutions to critical health needs (Drabo and Ebeke, 2010). This external financing can improve health outcomes by enabling recipient households to purchase healthcare services and assist healthcare-related costs. However, low-income countries are facing challenges in reducing the mortality rate, preventing infectious diseases, and increasing the availability of efficient healthcare services. The changing needs of populations mean that these countries have to expand health coverage schemes, exerting pressure on public health expenditure (World Bank, 2016).

The inflow of remittances has been growing in recent years, constituting the largest foreign inflow in developing countries. The money sent home by migrant workers is estimated to have reached US$529 billion, surpassing foreign direct investment (FDI) and foreign aid (World Bank and KNOMAD, 2019). Moreover, it has become an integral part of the financial sector due to its stability and endurance when compared to FDI and foreign aid. These remittance inflows can support millions of families by lifting financial constraints on essential consumption needs and act as leverage to finance education and healthcare.
Remittance inflows in the developing world are determined by several factors, such as a substantial increase in migration and sustained good policies. Recent literature provides evidence that better functioning and performing institutions foster the inflow of remittances, thereby attracting remittances to investment opportunities in the recipient country (Ratha, 2005; Lartey and Mengova, 2016). Improved development of financial markets is also an essential element to drive remittance inflows in developing countries (Bang et al., 2013).

Health outcomes refer to the state of a population’s health, measured by changes in various facets of health status that result from healthcare interventions over a period of time (WHO, 2016). A range of indicators is used in the literature as a proxy for health outcomes, including mortality rates (infant, under-5, and maternal), life expectancy at birth, and health expenditure. Improving the well-being of children and mothers is a key public health goal across the globe, with emphasis on reducing child and maternal mortality. The consensus among scholars is that the most effective strategy to reduce maternal and child mortality is offering good quality healthcare (Aakvik and Holmås, 2006; Zhang et al., 2017; Alkire et al., 2018).

Investing in health is also essential for promoting economic growth, as healthier citizens are more productive, earn more, and work longer (Becker, 1962; Romer, 1990; Benhabib and Spiegel, 2005). Various factors contribute to the low health outcomes in this region, including the lack of effective health programmes, inadequate financial resources, lack of supportive policies, and political upheaval. According to the World Health Organization (2010), the cost of healthcare services can be a major challenge to reducing maternal and child mortality. This situation hinders efforts to implement health-related policies. SSA has been unable to sustain its health outcomes due to relatively low healthcare expenditure compared to other regions in the world (UNECA, 2019).

Although remittances may not always have a direct relationship with health outcomes, their effect on health may be actuated through other channels; for example, through financial development, institutions, and trade liberalisation (Giuliano and Ruiz-Arranz, 2009; Ahmed, 2012; Yol, 2017). Financial development is an important driver of the effect of remittances on health outcomes as it mobilises resources for receiving households to finance better
healthcare services. Several studies argue that a well-developed financial sector attracts remittance inflows by lowering the transaction cost of remittance transfers. This encourages remittances to flow through formal channels and mobilises this financial resource in the form of savings and investment to fund education and healthcare services (Giuliano and Ruiz-Arranz, 2009; Ahamada and Coulibaly, 2011; Bettin and Zazzaro, 2012). An increase in remittance income is a domestic financial sector motive for the recipient households to invest in more productive activities such as healthcare. With a more developed financial sector, remittances may be channelled into investment uses rather than consumption, and the greater the depth of financial sector development, the more it may facilitate a positive impact of remittances on health outcomes. If the financial sector is in place to attract remittances from migrants, it may lead to higher investment in health.

It is widely believed that low rates of economic growth in developing countries are due to a poor institutional setup and inadequate governance (North, 1990; Rodrik, 2004; and Acemoglu and Robinson, 2008; Radulović, 2020). Low institutional quality is associated with a less favourable policy environment and weak institutions are expected to outweigh the positive impact of remittances. In line with this view, Lartey and Mengova (2016) suggest that improvements in institutions can increase the inflow of remittances, and a more favourable macroeconomic environment is likely to attract migrants to send more remittances. Furthermore, from an investment perspective, an improved institutional quality is necessary to stimulate a different pattern of remittances. Catrinescu et al. (2009) suggest that remittances are more likely to generate growth where political and economic institutions are of high quality. In other words, an unstable political environment and weak institutions might not be conducive to investment and might deter remittance inflows. The key point here is that the patterns of investment of remittances and the subsequent health outcomes may depend on the competence of institutions in recipient economies.

The objective of this paper is to empirically analyse the effect of remittances on health outcomes in selected SSA countries. Because of the ambiguous and indirect relationship between remittances and health outcomes, the paper will investigate two possible channels - financial development and institutional quality - that influence the remittances–health outcomes relationship. The study is organised
as follows: the next section outlines the current state of remittances and health outcome in SSA, followed by a literature review in section 3. Section 4 explains the model, methodology, and data. Section 5 presents the results and discussion, while section 6 concludes.

2. REMITTANCES AND HEALTH OUTCOMES IN SUB-SAHARAN AFRICA (SSA)

The inflow of remittances to developing countries has dramatically increased in the past few decades. Remittances to Sub-Saharan Africa (SSA) increased by 38 billion between 1996 and 2015 (World Bank, 2016). The region’s major recipient of remittances, Nigeria, is among the top 10 receiving countries in the world, with 21 billion USD of remittances in 2016. The region also hosts a number of countries where remittances account for a significant share of GDP, notably Liberia with 26%, Comoros with 21%, and Lesotho with 15.6%. SSA countries face financial constraints and are searching for alternative funding for education, health, and poverty reduction in accordance with the changing needs of the population (Chireshe and Ocran, 2020).

Figure 1 shows the amount of remittance inflows of the top five recipients in the Sub-Saharan African region. Nigeria received more than half of the total remittance inflow in the region between 1996 and 2015. The increased flow of remittances in some countries in the region more recently may be due to stabilised political circumstances. For some time, SSA countries have been struggling with poor institutional infrastructure, mainly related to political and economic institutions, which can distort the inflow of remittances (Ajide and Raheem, 2016).

Figure 2 presents the top remittance inflows as a share of GDP in SSA countries between 1996 and 2015, showing that the region’s poorer and smaller economies have the highest remittance inflows as a share of GDP. Liberia has the highest inflow with 26%, followed by Gambia and Comoros, which both received 21%, while Lesotho received 15.6% of GDP from remittances.
Figure 1: Top five Sub-Saharan remittance recipients, 1996–2015


Figure 2: Top five Sub-Saharan African recipients of remittances as a share of GDP, 1996–2015

Source: World Development Indicators
When comparing SSA to other developing regions, it is evident that the growth rate of remittance inflows is relatively slow. Of all developing regions, SSA continues to have the lowest level of remittances when measured by the actual volume of inflows. However, it is noticeable that the trend in remittance inflows in SSA countries increased steadily during 1996–2015, as shown in Figure 1. Concerning remittances as a share of GDP, Liberia (26%), Comoros (21%) and Lesotho (15.6%) took the top three positions in SSA in 2016. Nigeria, which ranks as the top remittance recipient in actual inflows, is not ranked among the top 5 remittances–GDP recipients in SSA (World Bank, 2016) SSA countries present a pattern of less remittance inflows compared to other developing countries could be attributed to poor institutional quality and weak financial development. Meanwhile, international migration has increased dramatically over the past years due to conflict, war, and economic vulnerability (Maimbo and Ratha, 2005).

Many developing countries have made significant progress in providing health services and reducing child and maternal mortality rates. However, comparing global progress across various health-related indicators, it is evident that SSA lags behind the other global regions. Under-5 child mortality and maternal mortality rates are all close to double the world’s average rate. However, it should be noted that all regions have shown substantial progress, with the under-5 child mortality rate declining and the child survival rate accelerating during 1996–2015. For instance, the under-5 mortality rate in Europe and Central Asia decreased to only 11 deaths in 2015 from 27 deaths per 1,000 live births in 1996. Over the same period the under-5 mortality rate in SSA also decreased, from 170 to 83 deaths per 1,000 live births (Figure 3).
Figure 3: Under-5 child mortality rate by developing region (deaths per 1,000 live births), 1996–2015

Child mortality rates have improved dramatically globally, and the SSA region has also shown a substantial reduction, which reflects improved healthcare in the region. In 2015 the under-5 mortality rate in SSA was 83 deaths per 1,000 live births, followed by South Asia with 53 deaths per 1,000 live births. Europe and Central Asia had the lowest child mortality rate with 11 deaths per 1,000 live births, while East Asia and the Pacific had 17 deaths per 1,000 live births. Despite the substantial improvement, the mortality rate in SSA remains high compared to the other regions, and several challenges must still be overcome to successfully reduce child mortality on par with the rest of the world.

Most developing regions have successfully halved their maternal mortality rates since 1996, including SSA. Notably, the region has achieved the largest maternal mortality reduction of all the regions, with a 56% decline, from 916 deaths per 100,000 live births in 1991 to 547 deaths per 100,000 live births in 2015. However, the rate of 540 maternal deaths per 100,000 live births reported in SSA remains high compared to South Asia (182), the Middle East and North Africa (81), Latin...
America and the Caribbean (67), East Asia and the Pacific (59), and Europe and Central Asia (16). SSA recorded about 57% of the world’s maternal mortalities. Moreover, the numbers represent two-thirds of all maternal deaths per 100,000 live births worldwide. By contrast, Europe & Central Asia account for the lowest maternal mortality ratio compared to other regions, with only 16 deaths per 100,000 live births.

The factors suggested as contributing to the prevalent maternal and child mortality rates in SSA countries include the lack of good health programme management, lack of commitment to maternal and child health, lack or inadequacy of financial resources, lack of supportive policies, and, finally, political upheaval. According to the World Health Organisation (WHO) report (2010), the cost of healthcare services can be a significant challenge to reducing maternal and child mortality rates. In some countries, up to 11% of the population incurs high healthcare costs associated with maternal and child mortality, hindering efforts to implement health-related policies. In SSA the relatively low healthcare expenditure compared to other global regions means that it has been unable to improve health outcomes for women and children.

Due to the low healthcare expenditure in many developing countries, remittances are presumed to improve the health outcomes of the recipient households by procuring better healthcare services. Health investments are essential for economic growth, as healthy citizens are more productive, are able to work harder and longer, and earn more, which significantly impacts a country’s development and growth. Although increased remittance inflows have been widely advocated as a means to improve health outcomes in many developing countries, empirical evidence to support this is scarce and inconclusive.

3. LITERATURE REVIEW

The effectiveness of remittances in improving health outcomes has been debated extensively in the literature. Existing studies find contradictory effects. Frank and Hummer (2002), McKenzie (2006), and Amuedo-Dorantes and Pozo (2012), have shown that a persistent remittance income can increase a country’s rate of human capital, especially when these inflows are invested in healthcare services that consequently improve the health outcomes of the recipients. Drabo and Ebeke (2011) study the impact of remittances, public health spending, and foreign
aid on healthcare investment in developing countries and find that both remittances and foreign aid increase healthcare access. Amuedo-Dorantes and Pozo (2011) estimate the link between remittance income and healthcare expenditure. Their findings suggested that remittance income increases healthcare expenditure compared to other expenditure. Similarly, Kalaj (2015) examines the effect of remittances on health expenditure in Albania using the propensity score matching method. The results indicate a positive and significant relationship between remittances and health expenditure, suggesting that households increase their expenditure on medicines and other health services in the presence of remittance income. In line with the investment motives of remittances under the new economics of labour migration, Acosta et al. (2007) suggest that health conditions may be improved due to remittance income. They argue that remittances help to improve the health outcome of recipient households through purchasing better healthcare and nutrition. Thus, remittances have been associated with lower mortality rates, higher birth weights, and improved sanitation.

In contrast, Parinduri and Thangavelu (2011) study the effect of remittances on the Indonesian economy using household-level data and find that remittances have little impact on investment in health. They suggest that remittances are merely substitutes for household income and have no significant effect on households’ well-being. Similarly, Anton (2010) studies the impact of remittances on the nutritional status of children in Ecuador using household surveys in 2006. The findings show that when remittance flows are substantially reduced, children’s health is negatively affected and there is no compensatory behaviour of households.

Several studies have focused on the effect of remittances on mortality and life expectancy. The standard argument is that recipient families make relative investments in healthcare, which consequently reduce infant and child mortality rates (Hildebrandt and McKenzie, 2005; Antón, 2010; Kroeger & Anderson, 2014). Terrelonge (2014) analyses the role of remittances and health expenditure in improving child mortality in developing countries and concludes that remittances improve living standards, which leads to a reduction in child mortality. Zhunio et al. (2012) study the influence of remittances on education and health outcomes in 69 developing countries and find that remittances
increase life expectancy and reduce infant mortality. Similarly, Chauvet et al. (2013) investigate the effectiveness of remittances in reducing the child mortality rate in 84 developing countries. They find that remittances reduce the mortality rate while medical brain drain increases it. However, other studies suggest that migration and remittances may have a negative impact on child health outcomes, increasing the child mortality rate due to the disruptive impact of the absence of parents or family separation (Kanaiaupuni and Donato, 1999). Davis and Brazil (2016) show that remittances have a significant impact on nutritional outcomes in Guatemala. The authors argue that the absence of remitting fathers as a result of migration has a detrimental effect on the well-being of left-behind children.

### 3.1 Remittances and financial development

Until recently, only a few studies evaluating the empirical linkage between remittances and health outcomes had been conducted in Sub-Saharan Africa countries. Despite the significant impact of remittances on health outcomes, these studies do not investigate the role of financial development and institutional quality in the remittance and health outcome nexus. To address these gaps, we examine the role financial development and institutional quality play in the relationship between remittances and health outcomes.

Regarding the role of financial development in remittances, economists postulate that the development of the financial sector lowers the transaction cost of remittance transfers and encourages remittances to flow more through formal channels (Giuliano and Ruiz-Arranz, 2009; Ahamada and Coulibaly, 2011; Bettin and Zazzaro, 2012). In turn, remittances promote financial development in less developed countries (Aggarwal et al., 2011). These studies argue that financial development enlarges the flow of remittances, which may accelerate economic growth since more remittances may be used for productive activities such as health expenditure, rather than on basic consumption needs. Furthermore, a poor credit rating may be remedied by remittance inflows. Thus, by improving the allocation of capital, remittance transfers will contribute to alleviating credit constraints and accelerate healthcare spending and growth. Thus, the presence of a well-functioning financial system may help remittance recipients to access good healthcare services such as ante-natal care, screening and prevention of non-communicable diseases, and skilled child delivery services; all of which would improve health outcomes.
3.2. Remittances and institutional quality

One strand of empirical literature reveals the connection between remittances and institutional quality. Recent debate has mainly centred on the channels through which remittances can help the recipient country to foster productive investment and growth. Some studies support the hypothesis that remittances influence economic growth of recipient countries conditional on a certain threshold level of institutional quality (Catrinescu et al., 2009). Better institutions may help convert remittances into better investment projects that result in a higher rate of return. Ajide et al. (2015) further investigate how institutions impact the link between remittances and growth volatility in 71 remittance-recipient countries. They show that the impact of remittances on the reduction of growth volatility through well-functioning institutions is quite pronounced. Their empirical analysis also reveals that growth volatility is reduced when there is an interaction between remittances and six institutional-quality indicators.

Others have argued that remittances may themselves lead to a deterioration in institutions if they make it easier or less costly for governments to divert resources for its own use or that of their supporters. Abdih et al. (2012) find a negative and significant effect of remittances on institutional quality. Their study uses control of corruption, government effectiveness, and the rule of law as measures of institutional quality and suggests that an increase in remittance transfers might incur a risk of undermining the quality of institutions. They argue that institutions are complex in nature and that remittance-recipient countries should pay close attention to the potential adverse effects of a substantial increase in remittances.

A more recent study by Williams (2018) examines the role of political institutions in the link between remittances and growth. Using dynamic GMM on 109 developing countries from 1975 to 2014, he finds strong evidence to suggest that remittances are more effective in enhancing growth with strong democratic institutions. This sheds further light on the importance of the political environment in explaining the effect of remittances on growth in developing countries. This recent study indicates that the relationship between remittances and growth is far from straightforward, and the importance of institutional quality to remittance inflows is well recognized.
However, there has been no direct empirical study that tests the role of institutional quality in explaining the effect of remittances on health outcomes. This study intends to bridge this gap by focusing on the contingency role of institutional quality, which might be an important factor by conditioning the effects of remittances on health outcomes. Based on the above connotation, it is reasonable to expect that in countries with better institutional quality, recipients of remittances are more likely to spend on healthcare services or use their remittance income to increase health consumption activities, thereby lowering child and adult mortality rates.

4. MODEL AND METHODOLOGY

To achieve the objective of the study, we follow Terrelonge (2014) as the baseline model:

\[ HE_{it} = \beta_0 + \beta_1 HE_{i,t-1} + \beta_2 PREM_{it} + \beta_3 GHE_{it} + \beta_4 POP_{it} + \beta_5 GDPC_{it} + \eta_i + \mu_i + \epsilon_{it} \]  

(1)

where \( HE_{it} \) represents health outcomes, \( PREM_{it} \) denotes personal remittances, \( GHE_{it} \) denotes public health expenditure, \( POP_{it} \) denotes population, and \( GDPC_{it} \) denotes GDP per capita. \( \eta_i \) represents time-specific effect, \( \mu_i \) represents country-specific effects, and \( \epsilon_{it} \) represents the error term, while \( i \) represents the observations of all members of the panel data at time \( t \). We include \( FD_{it} \) (financial development) and \( INS_{it} \) (institutional quality) in our model to test the hypothesis that the effect of remittances on health outcomes depends on the level of financial development and institutional quality. The novelty of our study is that we extend the baseline model by including the interaction terms between remittances and financial development and remittances and institutional quality in order to investigate the indirect effects of financial development and institutional quality on health outcomes. The empirical model is as follows:

\[ HE_{it} = \beta_0 + \beta_1 HE_{i,t-1} + \beta_2 PREM_{it} + \beta_3 FD_{it} + \beta_4 (PREM_{it} \times FD_{it}) + \beta_5 GHE_{it} + \beta_6 POP_{it} + \beta_7 GDPC_{it} + \eta_i + \mu_i + \epsilon_{it} \]  

(2)

\[ HE_{it} = \beta_0 + \beta_1 HE_{i,t-1} + \beta_2 PREM_{it} + \beta_3 INS_{it} + \beta_4 (PREM_{it} \times INS_{it}) + \beta_5 GHE_{it} + \beta_6 POP_{it} + \beta_7 GDPC_{it} + \eta_i + \mu_i + \epsilon_{it} \]  

(3)
In Equations (2) and (3) we test whether financial development and institutional quality act as substitute or complement in the remittance–health relationship. Following Inoue (2018), we are interested in the marginal impact of remittances on health outcomes conditional on the financial development or the institutional quality in SSA countries. In Equation (2), if the interaction term ($\beta_4$) is negative, remittances and financial development complement each other in enhancing health outcomes in the sample countries. On the other hand, if $\beta_4$ is positive, financial level is a substitute, which means that remittances are better at sustaining health outcomes at a lower financial level. Similarly, in Equation (3), if $\beta_4$ is negative, institutional quality augments the effect of remittances on health, and if the interaction is positive the negative impact of remittances on health diminishes with low levels of institutional quality.

This study uses three alternative measures of health outcomes: infant mortality rate, under-5 mortality rate, and life expectancy at birth. Infant mortality refers to the number of infants dying before reaching 1 year per 1000 live births in a specific year. Under-5 mortality rate measures the number of new-borns dying before reaching the age of 5 per 1000 live births in a given year. Life expectancy at birth refers to the number of years a new-born would live if prevailing patterns of mortality stay the same throughout its life.

Personal remittances to GDP is used as proxy for remittance inflow and can be defined as a migrant fund transfer that is sent to country of origin. Following Terrelonge (2014), it is expected that remittances have a positive effect on health outcomes by means of the recipient countries purchasing better healthcare services. The coefficient of remittances is expected to be positive, since remittance funds improve health outcomes. Government health expenditure refers to total expenditure on health as a percentage of GDP. An increase in government expenditure on health implies a broader access to healthcare services that may help improve health conditions. Studies have shown that public health expenditure improves health outcomes in various developing countries (Gani, 2008; Amakom and Iheoma, 2014; Ahmad and Hassan, 2016). Following previous empirical studies on the effect of public health expenditure on health outcomes, we hypothesize that the coefficient of public health expenditure is positive.
Population refers to the total population and captures the view that health outcomes increase when the population size is bigger. Higher population in a given country leads to more demand for healthcare services because more people will require healthcare services such as access to good nutrition, ante-natal care, and skilled child delivery services. This health demand will create adverse health outcomes such as increased infant and under-5 mortality rates. Previous empirical studies confirm that population plays a detrimental role in health outcome indicators (Azizi, 2019). We expect that population has a negative effect on health outcomes, as it reflects good economic performance. The inclusion of GDP per capita in the model of remittances and health outcomes is based on the grounds that the larger the economy, the better the health outcomes.

Financial development refers to the set of institutions, financial markets, instruments, and financial regulatory permit transactions providing the key functions of the financial sector in the economy. We use the ratio of domestic credit to the private sector to GDP as a proxy for financial development. This indicator of financial development captures the efficiency of the banking sector to evaluate and identify viable and profitable investment ventures. It implies that a high ratio of this financial development indicator lowers transaction costs and increases financial services and the development of financial intermediation. This indicator is also used by Saci et al. (2009) and Giuliano and Ruiz-Arranz (2009). We expect a positive relationship between financial development and health outcomes.

Existing empirical studies have used different measures of institutional quality. However, this study uses two Worldwide Governance Indicators to capture institutional quality: political stability and regulatory quality. Political stability refers to people’s perceptions of the likelihood that their government will be destabilised or overthrown by unconstitutional or violent means, including motivated violence and terrorism (Worldwide Governance Indicators, 2016). Regulatory quality measures the perception of the government’s ability to formulate and implement sound policies and regulations that permit and promote private sector development (Worldwide Governance Indicators, 2016). In worldwide governance indicators the estimates of political stability and
regulatory quality range from –2.5, representing weak governance performance, to 2.5, indicating strong governance performance. The quality of institutions is an important factor that promotes investment and better allocation of resources.

Concerning remittances, better-quality institutions will result in better allocation and productive use of remittances. Institutions matter to the economic environment, especially regarding investment efficiency. They may also play an important role in determining the impact of remittances on health investment. For instance, preserving political stability as a sign of institutional quality makes remittances effective in the provision of better healthcare services, leading to improved health outcomes. Moreover, from the perspective of the recipient government, sound regulatory quality, which is an integral feature of good institutional quality, is one of the feasible criterions that remittance inflows may depend on. That is, the stronger the commitment of a recipient country towards a quality regulatory environment, the greater the amount of remittances and the contribution to healthcare services to overcome adverse health outcomes. All data are extracted from the World Bank World Development Indicators and World Governance Indicators. The sample comprises an unbalanced panel of 39 selected SSA countries covering the period 1996–2016. The sample years are chosen according to data availability.

Azizi (2019) postulates that remittances are endogenous to many factors, such as human capital, health outcomes, labour supply, and poverty. The endogeneity might be due to measurement errors, reverse causality, or omitted variable bias. Endogeneity is one of the violations of the standard ordinary least squares (OLS) regression that leads to bias and inconsistency in OLS estimation. To overcome the endogeneity problem we need to find instruments for remittances. The instruments selected need to be correlated with remittances but uncorrelated with the error term. Although existing studies suggest some possible instruments for remittances (see Adams and Page 2005 and Azizi 2019 for examples), finding suitable and valid instruments is not easy. Therefore, we resort to empirical methods that account for the endogeneity without using additional exogenous variables.

In this study we employ the dynamic model method, which is the generalised method of moments (GMM). GMM was first introduced by Holtz-Eakin et al.
(1988) and later modified by Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998). The GMM estimator is appropriate for and applicable to panel data with large cross section and small time series (N>T). Because of the dynamic nature of the relationship between the variables, the GMM estimator is preferred due to its ability to address the correlation between lagged dependent variables and the unobserved residuals of the model. The static OLS approach leads to biased estimates due to the correlation that exists between the lagged dependent variables and country-specific effects. The GMM estimator is also consistent in the presence of persistent time series, endogenous variables, or measurement errors (Bond et al. 2001).

To overcome the biased estimates and the weak instrumentation caused by differenced GMM, Arellano and Bover (1995) and Blundell and Bond (1998) proposed a system that combines both the differences and level equations, known as system GMM. This estimator is more efficient as it uses lagged first difference of the variables as the instrument in addition to the normal differenced procedure. The consistency and efficiency of system GMM depends on the over-identification and serial correlation tests. Since we are using the two-step system GMM, we use the Hansen J-test to test for the validity of the instruments. We should not reject the null hypothesis to ensure that the instruments are exogenous. To test for autocorrelation, we apply the Arellano-Bond test. We should reject the null hypothesis for AR (1) but not AR (2).

5. RESULTS AND DISCUSSIONS

We present the estimation results in this section. Our main focus is on the variables of interest, which are remittances, financial development, and institutional quality, although we also discuss the control variables. Table 1 presents the baseline model estimated using difference GMM and two-step system GMM. The baseline regression does not suffer from econometric problems since we do not reject the null for the over-identifying restrictions test (Hansen J-test). It also passes the serial correlation test.

1 We also conduct estimations using the static models (Pooled OLS, Random Effects, and Fixed Effects). Results are available upon request.
From columns 1–4 it can be concluded that remittances have a negative impact on infant and under-5 child mortality rates, which implies that remittances improve health outcomes measured by these two proxies. On the other hand, remittances are positively correlated with life expectancy, which means that higher remittance inflows contribute to higher life expectancy. These results are consistent with Azizi (2019), Drabo and Ebeke (2010), Amuedo-Dorantes and Pozo (2011), and Zhunio et al. (2012), among others. As regards the control variables, we have the expected result. Higher government expenditure and GDP per capita yield better health outcomes, while higher population increases infant and under-5 mortality as well as life expectancy. The lagged dependent variables are also significant, which proves the reliability and consistency of the dynamic method.

The results for the extended model with interaction terms are presented in Table 2 below. Since the system GMM is more efficient and powerful in handling estimation problems than difference GMM, the following table of results is based only on system GMM. Columns 1–3 present the results for the financial development model. The results indicate that a 1% increase in the interaction between financial development and remittances will lead to a 0.034% decrease in infant mortality rates and a 0.044% decrease in under-5 mortality rates at a 1% level of significance. The estimated coefficients of the interaction terms are negative and significant for two measures of health outcomes (infant and under-5 mortality rates), which suggests that financial development has a complementary impact in improving and sustaining health in SSA, such as lowering infant and under-5 mortality rates. On the other hand, the effect of the estimated coefficients of the interaction term (financial development and remittances) on life expectancy at birth are negative and statistically significant, suggesting that remittances substitute for financial development in the health-improving process shown in column 3 of Table 2.
### Table 1: Remittances and health outcomes: baseline model

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<td></td>
<td>[0.027]</td>
<td>[0.010]</td>
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<tr>
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<tr>
<td>Life Expectancy</td>
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<td><strong>Remittances</strong></td>
<td>–0.009*</td>
<td>–0.021***</td>
<td>–0.012**</td>
<td>–0.027***</td>
<td>0.006***</td>
<td>0.014***</td>
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<td>[0.005]</td>
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<td>[0.005]</td>
<td>[0.003]</td>
<td>[0.002]</td>
<td>[0.002]</td>
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<tr>
<td><strong>Expenditure</strong></td>
<td>–0.129***</td>
<td>–0.010**</td>
<td>–0.028**</td>
<td>–0.018***</td>
<td>0.006</td>
<td>–0.012**</td>
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<td>[0.004]</td>
<td>[0.013]</td>
<td>[0.005]</td>
<td>[0.005]</td>
<td>[0.003]</td>
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<tr>
<td><strong>Population</strong></td>
<td>0.397***</td>
<td>0.030***</td>
<td>0.157*</td>
<td>0.080***</td>
<td>0.026</td>
<td>0.097***</td>
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<td>[0.065]</td>
<td>[0.011]</td>
<td>[0.092]</td>
<td>[0.013]</td>
<td>[0.027]</td>
<td>[0.018]</td>
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<tr>
<td><strong>GDP</strong></td>
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<td>–0.011***</td>
<td>–0.217***</td>
<td>–0.019***</td>
<td>0.110***</td>
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<td>[0.052]</td>
<td>[0.004]</td>
<td>[0.016]</td>
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<td>0.046</td>
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Observations 186, 228, 186, 228, 186, 228
Instruments 31, 36, 23, 36, 23, 36
AR(1) 0.016, 0.015, 0.004, 0.005, 0.001, 0.002
AR(2) 0.089, 0.167, 0.096, 0.336, 0.560, 0.815
Hansen J-test 0.606, 0.257, 0.069, 0.174, 0.096, 0.357

**Note:** Standard errors in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01

Columns 4–9 present the results for the model incorporating the interactions between remittances and institutional quality. We use two measures of institutions: political stability and regulatory quality. The interaction terms between remittances and political stability (columns 4–6) are negative and
significant at 1%, suggesting that the effect of remittances on infant and under-5 mortality rates will be greater in SSA countries with stable politics. On the other hand, when the interaction effect between political stability as a feature of institutional quality and remittances on life expectancy at birth is considered (column 6), we find a significant substitute effect. The coefficient shows that a 1% increase in the interaction between political stability and remittances would decrease life expectancy at birth by 0.005%.

We also observe similar results for the role of regulatory quality. The interaction terms are negative and significant at the 1% level. As shown in columns 7 and 8 of Table 2, the coefficients of the interaction term between regulatory quality and remittances were found to be negative and statistically significant on reducing infant and under-5 mortality rates, suggesting a complementary effect of remittances and regulatory quality on improving health outcomes in SSA. In other words, with a negative marginal impact, the results show that remittances have a more beneficial effect on health outcomes in countries with better regulatory quality. The result is consistent with the assertion that better domestic institutions enhance growth and investment (Acemoglu and Robinson, 2008; Fajnzylber et al., 2008; Abdih et al., 2012; Fajnzylber and Lopez, 2008; Catrinescu et al., 2009).

In this study, however, the impact of remittances on health outcomes seems to work through better political stability, as the coefficient of the interaction terms is significant. This finding supports the view that societal conflict is harmful because it diverts resources from productive economic activities and investment in healthcare services that significantly improves health outcomes. This is in line with Rodrik (2000), who argues that regulatory institutions matter because in a country where corruption exists, investors are aware that some of the proceeds from future investments might be claimed by corrupt officials. Regulatory quality therefore is central to improving the effects of remittances on health outcomes in SSA countries.
### Table 2: Remittances and health outcomes: financial development and institutional quality

<table>
<thead>
<tr>
<th></th>
<th>Financial Development</th>
<th>Political Stability</th>
<th>Regulatory Quality</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Infant Mortality</td>
<td>Under-5 Mortality</td>
<td>Life Expectancy</td>
</tr>
<tr>
<td></td>
<td>0.958***</td>
<td>0.569**</td>
<td>0.600***</td>
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<tr>
<td>Under-5 mortality</td>
<td>0.986***</td>
<td>0.427***</td>
<td>0.561***</td>
</tr>
<tr>
<td></td>
<td>[0.011]</td>
<td>[0.029]</td>
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<tr>
<td>Life expectancy</td>
<td>0.763***</td>
<td>0.755**</td>
<td>0.773***</td>
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<tr>
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<td>[0.006]</td>
<td>[0.006]</td>
<td>[0.004]</td>
</tr>
<tr>
<td>Remittances</td>
<td>0.106***</td>
<td>0.427***</td>
<td>0.561***</td>
</tr>
<tr>
<td></td>
<td>[0.008]</td>
<td>[0.029]</td>
<td>[0.026]</td>
</tr>
<tr>
<td>Finance</td>
<td>-0.016**</td>
<td>0.009**</td>
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<tr>
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<tr>
<td>Remit*Finance</td>
<td>-0.034***</td>
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<tr>
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<td>-0.0003***</td>
<td>-0.005***</td>
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<td>[0.0001]</td>
<td>[0.0001]</td>
<td>[0.0002]</td>
</tr>
<tr>
<td>Expenditure</td>
<td>-0.017***</td>
<td>-0.017***</td>
<td>0.003</td>
</tr>
<tr>
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<td>[0.005]</td>
<td>[0.006]</td>
<td>[0.002]</td>
</tr>
<tr>
<td>Population</td>
<td>0.013</td>
<td>0.060***</td>
<td>0.009***</td>
</tr>
<tr>
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<td>[0.016]</td>
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<td>[0.002]</td>
</tr>
<tr>
<td>GDP</td>
<td>-0.001</td>
<td>-0.008***</td>
<td>0.004**</td>
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<td>[0.003]</td>
<td>[0.004]</td>
<td>[0.001]</td>
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<tr>
<td>Constant</td>
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<td>0.009***</td>
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<td>[0.074]</td>
<td>[0.079]</td>
<td>[0.021]</td>
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<tr>
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<td>223</td>
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<tr>
<td>Instruments</td>
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<td>38</td>
<td>30</td>
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<tr>
<td>AR(1)</td>
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<tr>
<td>AR(2)</td>
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<tr>
<td>Hansen J-test</td>
<td>0.187</td>
<td>0.134</td>
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**Note:** Standard errors in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01.
6. CONCLUSION

This paper analyses the interaction between remittances, financial development, institutional quality, and health outcomes in 39 selected SSA countries in the period 1996–2016. First, the findings of our study reveal that remittances have an improving effect on all categories of health outcome. Remittances ease the budget constraints of recipients and provide an opportunity for them to access healthcare services and improve health conditions in their country. Second, as a result of the interactive impact of financial development and remittances in sustaining health outcomes, we find that financial development plays a positive role in health outcomes in SSA countries. In particular, our study finds that sound financial development attracts higher remittance inflows and improves health outcomes such as infant and under-5 mortality rates. The significant negative interaction between remittances and financial development suggests that financial development in SSA complements the reducing impact of remittances on health outcomes, particularly in lowering infant and under-5 mortality rates. It is also worth noting that the interaction term between remittances and institutional quality is significant and negative, suggesting that well-functioning institutions in the recipient country further enhance or complement the impact of remittances on health outcomes. Thus, this study partially overcomes one of the shortcomings of previous studies that ignore the importance of financial development and institutional quality in the remittance and health outcome nexus. SSA countries should continue to develop their financial sector and the quality of their institutions to an effective level. Achieving sound financial systems and institutions would allow and attract a substantial amount of remittances and would benefit human capital and health outcomes. More precisely, it is imperative to ensure that policymakers in SSA countries devise the means to strengthen institutional quality through safeguarding political stability and improving regulatory quality.
REFERENCES


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