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Do remittances affect healthcare expenditure?: evidence from Kenya

Bharati Basu
Central Michigan University

Aranya Biswas
Central Michigan University

Abstract

Using the World Bank's data for migration and remittances in Kenya, this paper examines the impact of remittances on household healthcare expenditures. A Tobit analysis together with an instrumental variable approach reveals a significant positive effect of remittances on healthcare expenditures. The effect is bigger for internal and within-Africa migration compared to out-of-Africa migration. Households with a higher volume of remittances are more sensitive to this positive income effect compared to those with a smaller amount of remittance income. These insights may help Kenya and other lower-middle-income countries in incentivizing remittances and restructuring the healthcare system to achieve their goal of Universal Health Care.

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Contact: Bharati Basu - basu1b@cmich.edu, Aranya Biswas - aranyabiswas1@gmail.com.
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1. Introduction

Remittances, or money sent by migrants to families in their countries of origin, have become a significant source of income for many households worldwide. Although it is now well recognized that this additional income relieves the liquidity constraint of migrant families, recent discussions focus on whether the income effect of remittances in Lower Middle-Income Countries (LMIC) has dominated other offsetting effects in generating much-needed capital (physical, human, or social). This discussion is crucial for formulating migration-related policies in low-income labor-sending countries and the immigration policies of developed labor-receiving countries.[1]

We participate in the discussion by examining the association between remittance receipts and healthcare expenditures or a form of human capital investment that enables migrant families to access better healthcare services with positive implications for growth and economic development. However, the unintended consequences include over-reliance on external funding sources and unequal distribution of those resources resulting in disparities. Therefore, understanding the relationship between remittances and healthcare expenditures is crucial for policymakers and healthcare providers. This has significant implications when many LMICs are trying to achieve Universal Health Care (UHC) following the World Health Organization's commitment to UHC as the leading health agenda for this century (World Health Report, 2010).

We take advantage of the World Bank Survey of Household Migration and Remittances of Kenya to examine the relationship between remittances and Kenya's healthcare expenditures. Kenya is a lower-middle-income country and it has made significant efforts including changes in its constitution to achieve UHC. Only 17 % of Kenya's population has medical insurance and about 80% of its labor force is in the informal sector which does not provide any medical coverage. Unfortunately, not many studies have been done about the use of remittance income in Kenya although it is the third largest remittance-receiving country in Sub-Saharan Africa or SSA (Ratha, 2011).

Our methodology is an empirical one. Since remittance receipts and healthcare expenditures may be interrelated, there could be bias resulting from endogeneity, unobserved heterogeneity, and/or missing or omitted variable errors. To get rid of the endogeneity issue we use an instrumental variable approach. We also pay attention to the unique characteristic of the distribution of the remittance data which have a mixed distribution with both discrete and continuous values. We use the Tobit analysis recommended for this type of data (Wooldridge, 2013). The results show that remittances have a statistically significant positive association with healthcare expenditure. To verify the results, we also compare them with the estimates from two-stage least squares. The robustness of the relationship is also visible when we divide the sample according to the types of migration such as within Kenya migration, within Africa migration, and out of Africa migration, and estimate the connection between remittances and healthcare expenditures.

The question is why one would be interested in the relationship between remittances and health care expenditure. Remittances can be used for both consumption and investment. Even when the focus is on the investment use of remittances, a household has a choice among physical capital investment, human capital investment, and social capital investment. Our purpose is to

[1] There is now evidence that the remittances are used for consumption smoothing (Choi and Yang, 2007), increasing school enrolment (Koska et.al, 2013), increasing access to finance (Ambrosius & Cuecuecha, 2016) and access to quality health care (Amuedo-Dorantes & Pozo, 2011) reducing poverty level (R. H. Adams & Cuecuecha, 2013). These are only a few examples from a large body of literature on the impacts of remittances in LMIC.

investigate the connection between remittances and healthcare expenditure because it hints at a form of investment (human capital) that builds up a healthy labor force conducive to economic growth and development. It also stops the debilitating effect on an economy burdened with a population that suffers from malnutrition and all the malaise that results from it. The literature has recognized the possibility of a relationship by analyzing the data from other countries (see details in the literature review). Although there are some studies using data from SSA, no such analysis exists for Kenya which receives a significant amount of remittances in SSA. Our investigation complements the literature with a rigorous analysis of the relationship by checking its robustness with different estimation techniques and whether the finding holds with different types of remittance receipts. We also examine whether the results hold for households receiving different amounts of remittances.[2]

This has significant consequences because the analysis provides useful insights for policymakers who are making efforts to promote the effective use of international remittances in a vast majority of low- and middle-income countries like Kenya. This generates strong support for incentivizing remittance transfers and restructuring the healthcare services in migrant-sending regions. A secondary contribution of this study is to reveal the need for an improved data collection effort for remittance-receiving LMIC.

In the following, we provide a brief review of the literature in section 2 and useful background information about Kenya in section 3. Section 4 outlines empirical issues. Data description and results are provided in sections 5 & 6 followed by conclusions and their significance for policy purposes in section 7.

2. Literature Review

During the last few decades, using data from different countries, a group of studies has focused on the use of remittances for consumption (Chami, Jahjah & Fullenkamp, 2003, Choi and Yang, 2007; Simiyu, 2013 to name a few); while a few others have emphasized the use of remittances for investment (Glytsos, 2002; Woodruff & Zenteno, 2007; Adams & Cuecuecha, 2013; Amuado-Dorantes & Pozo, 2014, again to name a few). However, no in-depth analysis exists on the use of remittances in Africa (Ratha, et al., 2011). Since Kenya is the only country in Sub-Saharan Africa for which the data needed for an unbiased study of the relationship between remittance income and healthcare expenditures are available, we focus on Kenya.

Although a direct analysis of the association of remittance receipts and healthcare expenditure has not been done for Kenya, or even for any other country in SSA, the association between healthcare expenditure and remittances has received attention over the last few years. The studies have focused on Mexico and countries in South America. For example, Ambrosius and Cuecuecha (2013) show how national households (who don't receive remittances) in Mexico suffer from severe debts resulting from health shocks compared to transnational households (who receive international remittances). They use the difference-in-difference treatment effect model and fixed effect logit model to analyze how remittances serve as an alternative for credits. In our analysis, we not only compare migrant and non-migrant households, but we also discuss households who migrate to different destinations and households receiving a different amount of remittances. An analysis similar to that of Ambrosius and Cuecuecha was done by Ponce, Olivié, & Onofa (2011) using a different data set (Household Survey for Ecuador). Gupta et al. (2009) tackle the reverse causality problem by showing that remittances have a poverty-mitigating effect and financial

[2] We could not look into the relationship for households in different income brackets because data for other sources of income except remittances were not available.

development effect. Konte's study (2016) delves into the broader economic impact of remittances on household welfare, focusing on how these financial flows affect health, education, and overall living standards in remittance recipient households in SSA using data from the African Migration Project. Using Household Survey Data from Peru, Berloffa & Giunti (2020) conduct a demand-system analysis to address the reverse causality issue in studying the impact of remittances on health expenditure. Each of the studies mentioned above uses different estimation techniques that help to have meaningful insights into the data used. Since our data set presents only a one-time survey and since it has unique distribution characteristics, we enrich the literature by using different estimation procedures. The findings of the above studies suggest that there is a connection between remittance receipts and healthcare expenditure. This raises the significance of studying the relationship for a country like Kenya.

In addition, one crucial difference between the abovementioned studies and our analysis is that it focuses on a country like Kenya which not only receives a significant amount of remittances in SSA but its remittance receipts are growing at a high rate. Kenya presents an important case study in an era where most of the lower-middle income countries like Kenya are trying to meet the World Bank's mandate for Universal Health Care. As mentioned above, our study takes care of the endogeneity issue using an instrumental variable approach and compares the results with other estimation techniques to show robustness. Next, it shows the relationship for different types of migrant households and households receiving different amounts of remittances

It should be noted that about 20 percent of Kenyan remittance-receiving households say that they spend the money on basic necessities like food and medicine. The introduction of M-PESA mobile money in 2007 is a significant factor in increasing the flow of remittances to Kenya. Although no study has yet analyzed the connection, healthcare expenditure has gone up since then.

Regarding international remittances, Simiyu (2013) argues that remittances are used for food and utilities in Kenya. Using Kenya Integrated Budget Survey data of 2005, Kiiru (2010) emphasizes investment in education, health, and housing. A bivariate Probit analysis by Jena (2018) provides empirical evidence for investment in physical capital purchase.[3] These studies show that remittances have been used for healthcare expenditure. However, the literature lacks a detailed analysis of the use and impact of remittances on healthcare in Kenya even when about 68% of Kenyan households invest in healthcare expenditures. Thus, it provides an incentive to investigate those issues in a country like Kenya.

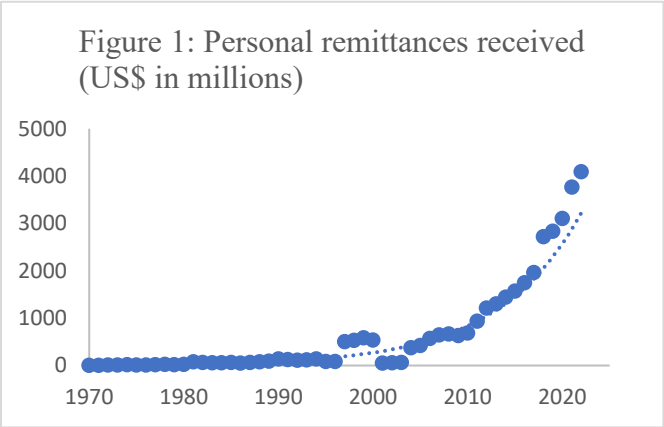
3. Background Information

Although Kenya ranks second in terms of per capita income (1278 USD) in SSA countries, it has a high rate of unemployment (9.6%).[4] At the same time, another fact that is observed is that the life expectancy of its population is quite high (60 years, the second highest in the group). This hints at the possibility that although a lot of people within the country do not have a job and most probably may have financial constraints, they are either healthy or they take care of their healthcare expenditures somehow. This suggests that in Kenya, healthcare may be one of the crucial items in deciding how to use remittances to improve the quality of life when its remittances (631.5 m) have

[3] Jena writes "physical investments may provide direct and indirect benefits through enabling households to undertake activities that potentially generate employment at the household or community level or improve farming and other productivity. Also, the acquisition of physical investments may boost local businesses if their demand is met locally. Thus, these types of investment are likely to have multiplier effects in the local economy". This indirectly removes some of the liquidity constraints to take care of the healthcare service purchases.

[4] See Table A1 in the appendix.

experienced an average growth rate of 31 percent from 1970 to 2020 (See Figure 1, World Bank).[5] This is supported by the fact that a considerable proportion of households in SSA prefer human capital investment over any other form of investment where healthcare expenditures dominate expenditures on education in all the countries in the region (see Table A3 and Figure A1a &A1b in the Appendix).[6]



Source: World Development Indicator

3.2 Health Insurance in Kenya

Kenya is a lower middle-income country (LMIC) and it is trying to come as close as possible to the system of Universal Health Care. In 2010, a new policy working towards Universal Health Care was implemented that is designed to remove the centrally controlled healthcare system. The plan has been to share the responsibility for providing healthcare assistance between the National Government (Central Government) and County level Government.

According to the Ministry of Health in Kenya, about 49 percent of the healthcare services are provided by the government in Kenya, while 48 percent of the healthcare services are provided by private companies. The government funds about 31 percent of the total healthcare expenditures, while private expenditure on healthcare is about 40 percent. The out-of-pocket expenditure covers 27 percent of the private expenditure which covers premiums to private health insurance, and contributions to community-based health insurance. A part of total healthcare expenditures (25%) is provided by donor funding, 90 percent of which is disaster-specific funds. With the liquidity constraint faced by a large section of the population, remittance

[5] This number presents only a part (personal remittances) of the total remittances (total remittances include workers' remittances, compensation of employees, and migrants' transfers) and it is from the World Development Indicator. The total remittances as reported by the International Monetary Fund in the Balance of Payments Manual (6th ed.) around 2010 is roughly 1.8b which includes all payments from workers' remittances, compensation of employees, and migrants' transfers.

[6] To have more insights, we present in the appendix (Table A2) information about Kenya's healthcare expenditure as a percentage of its GDP, out-of-pocket healthcare expenditure as a percentage of total healthcare expenditure and use of remittances in different types of expenditures.

receipts are expected to assist in healthcare expenditure (See the relationship Between Migration and Health Outcome of Those Left Behind in the Appendix).

Remittance receipts in Kenya provide a major source of foreign exchange just behind its export earnings. While the export earnings show a diminishing trend (International Organization for Migration), remittance transfers are increasing at an annual rate of 31 percent. On average, Kenya receives 60 percent of all remittances to East Africa and 10 percent of those to Sub-Saharan Africa (Ngugi, 2011). World Bank estimates suggest that Kenya was the third largest recipient of remittances in Sub-Saharan Africa in 2010. In 2010 Kenya received about USD1.8 billion in remittances while Official Development Assistance was USD 1.4 billion and Foreign Direct Investment was USD .1 billion. As regards the remittances as a percentage of GDP, Kenya was also among the top 10 remittance recipient countries with remittances amounting to about three percent of its GDP. According to a World Bank survey in 2010, each adult received USD 735 as remittance receipts per year and they spent that money on essential items like food, medicine, and daily expenditures.

4. **Empirical Issues**

Following our theoretical model (see Appendix), we start our empirical analysis where Healthcare Expenditure (HCE) is written as

$$HCE = \beta_0 + \beta_1 R + \beta_2 X_h + e \qquad (1)$$

where HCE = Health Care Expenditures, R = Remittance income, and X_h = all other variables including socioeconomic and demographic characteristics. Earned income is not included because information about any other sources of income is not available in this survey. Although everything else except remittance receipts remains constant, to have insights, we have included variables like *household size, location of the household, number of kids in the household, number of elderly people in the household, number of working members in the household* along with some other variables in X_h.[7] In estimating the relationship between remittances and healthcare expenditures, however, we face several econometric issues that need to be resolved to make the results acceptable. First, we may have a potential correlation between R and e. This correlation may come from omitted variable issues and the presence of unobserved heterogeneity. The remittance receipts may depend on a set of household characteristics that we don't observe such as household wealth, ownership of land or house, or family's health stock. These characteristics may also affect health expenditures. In addition, healthcare expenditure itself may affect the propensity to send remittances which raises the issue of joint determination of remittances and healthcare expenditures. To some extent, this issue of joint determination can be dealt with by studying the relationship between healthcare expenditures and lagged remittance income. Since the survey was conducted just for one year (2009), we do not have any data for lagged remittance income. However, the survey reports remittance receipts for the last 12 months and health expenditures for the past six months. We have regressed healthcare expenditures in the last six months on remittance receipts of the past twelve months. In that

[7] Since these variables may affect prices, they provide insights for policy purposes (for giving incentives for remittances and for re-structuring healthcare sector).

case, the association will be underestimated; however, it will provide hints to the direction of the association.

Still, the issue of endogeneity remains in the joint determination of healthcare expenditures and remittance receipts. To take care of that we use the instrumental variable approach. Instead of using the actual remittance receipts we use predicted remittance receipts derived from a regression of actual remittance receipts on an instrument (number of Cell Tower) along with some other variables. In case, remittance receipts may have been affected by some other characteristics of the economy itself, we also include per capita GDP, population density, and an index for infrastructure facilities.

In addition, the data on remittance receipts suggest a mixed distribution having both discrete and continuous values. The literature provides different techniques for estimation with this type of data set. We have chosen the Tobit model as a preferable way to estimate our equation. In writing the Tobit model we use Y for remittances and all the explanatory variables are included in the X vector. The Tobit model we estimate is presented by

$Y_i^* = X_i'\beta + \varepsilon_i$ with $Y_i = \max(0, Y_i^*)$ and $\varepsilon_i \sim N(0, \sigma^2)$.

Y_i^* is the latent remittances, X_i' represents the vector of exogenous variables presenting household composition, household characteristics, location of households, and the instrument.

The instrument is one of the variables included in X which is directly related to remittances but which does not affect HCE i.e., in our modeling of equation (1), this variable should not be included. The variable we choose is the number of Cell Phone Tower in a province. The number of Cell Phone Tower can serve as a reliable indicator of the inflow of remittance, as it plays a crucial role in facilitating communication between migrant workers and their families. The presence of these towers provides a vital link in the transfer of remittances, ensuring that funds reach their intended recipients in a timely and efficient manner. The number of cell towers in a province shows the Safaricom cell tower coverage in 2009. In 2007, Safaricom, the nation's top telecom provider, introduced M-PESA, a mobile banking platform that enables SMS (Short Message Service) money transfers among Kenyans (Jack and Suri, 2011). Mobile network coverage is strong in provinces with more towers. Higher coverage makes it easier to receive remittances, which will cause it to positively correlate with remittance receipt. We anticipate that having good coverage will boost both the likelihood of receiving remittances and the volume of remittances. Our instrument is significant at a 1% level. Furthermore, cell tower coverage is expected not to affect healthcare expenditures because there is no a priori theoretical explanation relating healthcare expenditures and the existence of cell towers.

To test the suitability of our instrument, following techniques used in econometrics, we present in Table 5 the results of the endogeneity test. The test of endogeneity is provided by the Durbin score and Wu-Hausman test. The "F" statistics validate the instrument and the test of endogeneity supports the model.

As regards the other variables, we also include the proportion of the population that has migrated as well as per capita GDP by province. Per capita GDP may pick up the regional

differences in the standard of living and the proportion of people migrated may help in networking. Remittances are expected to affect healthcare expenditures by relaxing monetary constraints. However, remitters can also transfer newly acquired health information and a changed preference for a better lifestyle to their households left behind. This can be captured by the networking facility. This networking may facilitate further migration and may affect the propensity to emigrate. However, this cannot affect the healthcare expenditures. In the next stage, in modeling healthcare expenditure, we follow equation (1) and run OLS estimates.

5. Data Description

We use data from the World Bank's Migration and Remittances Households Surveys in 2009. These are single-round cross-sectional surveys and have comprehensive information about migration, remittances, housing conditions, expenditures, and use of financial services together with other socioeconomic and demographic characteristics. The surveys provide information about households with no migrants, internal migrants, and international migrants, which we have used to create new variables presenting remittance receipts by types of migration.[8] We also use the data for the population and population density from the Kenya Census 2009.

The variable we want to focus on is the household healthcare expenditures during the last six months.[9] The key explanatory variable in our analysis is the predicted remittances which are derived from actual remittances over the last 12 months using an instrumental variable approach. The other explanatory variables are household characteristics such as household size, whether the household is located in an urban area, the number of children under five years and

[8] The 2009 Migration Household Survey was undertaken in Kenya to have better information on the socio-economic impact of migration and remittances. This World Bank-funded survey, conducted by the University of Nairobi, sampled 1,942 households nationally in 17 urban and rural districts. For this survey, a sampling frame from the Kenya National Bureau of Statistics (KNBS) has been used, yielding geocoded data representing a village and district description. The study uses a purposive survey methodology that first selected districts with the largest concentration of international migrants, and then selected clusters also with the highest concentration of international migrants. It considered three types of households: non-migrant, internal migrant, and international migrant households, giving a comprehensive view of their dynamics (for details about selecting the districts/villages/provinces, see Kenya-Migration Household Survey, 2009 by the University of Nairobi). The survey had a response rate of 96.2 percent which hints to the dependability of its results. The variables that are crucial for our analysis are household characteristics, housing conditions, assets, expenditures, financial service usage, and migration and remittances.

As regards health expenditures, information was available for out-of-pocket expenses and medical insurance availability. The survey records the proportion of total remittances allocated to health expenses (q5_22_3b), providing a relative measure of spending. Overall household health expenditures are captured for the past six months (q3_2_18), detailing out-of-pocket costs such as doctor fees, hospital visits, medicines, and drugs. The survey also collected data on the availability and use of medical insurance within households, shedding light on how households manage health costs.

However, the accuracy of this data may be affected by recall bias and may not capture all informal health expenditures, which are significant in rural and low-income settings. These details provide a clearer picture of the health expenditure data used in the analysis while acknowledging the limitations inherent in survey-based financial data collection.

[9] The healthcare expenditure is not available for a 12-month period. We thus expect that the results will be understated.

the number of elderly people (60 and above years old) in the household, the number of high school graduates, the number of college graduates, the number of full-time workers in the household, the proportion of emigrants and gross domestic product of the province where the household is located. We present descriptive statistics in Table 1.

Table 1: Descriptive Statistics

	Combined			Remittance			No Remittance			
VARIABLES	**N**	**mean**	**sd**	**N**	**mean**	**sd**	**N**	**mean**	**sd**	**t-stat**
Infrastructure Index	9,252	0.37	0.18	18	0.55	0.15	9234	0.37	0.18	5.169***
Emigration Proportion	8,343	12.17	4.69	18	17.53	2.50	8325	12.16	4.69	9.071***
Household Size	8,343	5.57	2.56	18	5.39	3.20	8325	5.57	2.56	-0.242
Urban	8,343	0.47	0.50	18	0.78	0.43	8325	0.47	0.50	3.093**
Number of Cell Towers	6,210	197.94	145.18	12	337.83	217.30	6198	197.67	144.90	2.233*
Number of Young Children	9,256	0.55	0.76	18	0.33	0.49	9238	0.55	0.76	-1.915
Number of Elderly Members	9,256	0.53	0.79	18	1.22	0.88	9238	0.53	0.78	3.355**
Number of Members Working Full-Time	9,256	1.41	1.13	18	1.33	0.77	9238	1.41	1.13	-0.438
Number of Members with High School Education	9,256	0.38	0.80	18	0.78	0.81	9238	0.38	0.79	2.112*
Number of Members with College Education	9,256	1.89	1.96	18	1.50	1.15	9238	1.89	1.96	-1.429
Natural Log of Remittance	3,410	10.44	1.83	18	0.00	0.00	3392	10.49	1.67	-366.971***
Natural Log of Healthcare Expenditure	5,974	7.67	1.76	14	7.77	0.73	5960	7.67	1.76	0.544
Natural Log of GDP per Capita	6,374	5.49	1.26	18	6.75	0.33	6356	5.49	1.26	15.645***
Natural Log of Population Density	6,595	2.85	1.08	18	3.34	0.48	6577	2.84	1.09	4.297***

Source: Kenya - Migration Household Survey 2009

6. Results

We present our main results in Table 2. Column (Col.). 1 presents the results of the first stage regression of remittances on the number of Cell Towers along with other explanatory variables and Col. 2 shows the effects of predicted remittances (derived from the first stage) and other explanatory variables on healthcare expenditures. In Col. 3 we present the results of Two Stage Least Square estimation as an alternative technique.

The results in column 1 (Tobit results) show that our instrument has a positive association with remittances and it is significant. All the statistically significant variables also have expected signs. For our main equation in col. 2 (OLS results), we see that remittances have a positive and statistically significant relationship with healthcare expenditure. It shows that for every 1 percentage point increase in remittances, healthcare expenditure goes up by more than one percent. That means that when calculated using the mean value of remittance receipts, the healthcare expenditures are about ten percentage points higher for the remittance-receiving households in 2009 compared to non-remittance-receiving households.

To check whether our results are robust, in col. 3 we present the coefficients and their standard errors for Two Stage Least Squares (2SLS). The results are very similar and they tell us that remittances have a statistically significant positive association with healthcare expenditure.

To gain more insights, we have divided the households into three groups, households with migrants within Kenya (Internal migration), households with migrants to other African

countries (Within Africa migration), and households with international migration outside Africa. We present the results in Table 3. Remittances have a positive association with healthcare expenditures for within Africa and Out of Africa migration. As it is observed for the total sample, the association is significant. In addition, after dividing the volume of remittance receipts into four quartiles, our study finds that the association between remittances and healthcare expenditures is stronger for households receiving moderately higher remittances compared to those receiving lower amounts of remittances.[10]

It is important to check whether there is a selection bias involving the decision to migrate although the households in our sample include both migrant and non-migrant households.[11] To test that, we have estimated the association between remittances and healthcare expenditures only for non-migrant households. The result is shown in Specification I in Table 4. The result shows a positive association. One may argue that explanatory variables like the number of young kids, the number of elderly people, and the household size may be endogenous to healthcare expenditure. Specification II in Table 4 shows the result when these variables are excluded. The robustness of our key results holds.

Table 2: Regression Results with all Types of Migration

	(1)	(2)	(3)
	Tobit	OLS	2SLS
VARIABLES	(lnRem)	(lnHealthexp)	(lnHealthexp)

[10] Detailed results can be made available upon request.

[11] Household remittances in this survey are the sum of remittances received from household members and remittances received from non-household members.

Number of household members under the age of 5	-0.0357	-0.230***	-0.413***
	(0.0593)	(0.0432)	(0.0831)
Number of household members aged 60 and above	0.0127	0.293***	0.295***
	(0.0466)	(0.0349)	(0.0663)
Number of household members with high school education	-0.0115	-0.105**	-0.239**
	(0.0595)	(0.0510)	(0.114)
Number of household members with college education	-0.0159	0.0885***	0.0270
	(0.0216)	(0.0160)	(0.0303)
Number of household members currently employed full time	-0.136***	0.116***	0.113**
	(0.0338)	(0.0278)	(0.0491)
Dummy variable indicating whether the household is located in an urban area	0.157	-0.412***	0.0637
	(0.0973)	(0.0762)	(0.143)
Proportion of household members who are emigrants	-0.0237*	0.0159*	0.0143
	(0.0139)	(0.00935)	(0.0179)
Natural log of GDP per capita in the province	-0.220***	0.104***	-0.0181
	(0.0470)	(0.0365)	(0.0710)
Natural log of population density in the region	0.100***	-0.0286	0.0145
	(0.0379)	(0.0305)	(0.0571)
Household size (number of household members)	-0.0118	0.0136	0.0109
	(0.0135)	(0.0105)	(0.0189)
Number of cell towers in the region	0.00355***		
	(0.000413)		
Infrastructure index	3.148***	-0.112	-1.185
	(0.236)	(0.349)	(0.774)
Predicted remittance (fitted values from Tobit)		1.047***	
		(0.0828)	
Natural log of remittance			1.068***
			(0.187)
Constant	10.05***	-4.071***	-3.138*
	(0.257)	(0.767)	(1.739)
Observations	1,998	3,229	1,434
R-squared		0.263	
LR Chi-squared	422.36***		
F-stat		95.75***	
Wald Chi-squared			265.54***

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3: Regression Results with Different Types of Migration

	Internal		Within Africa		International	
VARIABLES	Tobit (lnRem)	OLS (lnHealthexp)	Tobit (lnRem)	OLS (lnHealthexp)	Tobit (lnRem)	OLS (lnHealthexp)

Number of household members under the age of 5	-0.290	0.965	0.0426	-0.0966	0.0121	-0.506***
	(0.243)	(1.213)	(0.129)	(0.189)	(0.160)	(0.138)
Number of household members aged 60 and above	-0.401**	2.610	0.178*	0.0151	-0.140	0.759***
	(0.175)	(1.581)	(0.103)	(0.162)	(0.114)	(0.108)
Number of household members with high school	-0.284	1.646	0.203	-0.345	-0.146	-0.201
	(0.341)	(1.158)	(0.151)	(0.284)	(0.146)	(0.127)
Number of household members with college education	0.0499	-0.241	-0.0691	0.185**	-0.0200	0.0365
	(0.0793)	(0.234)	(0.0448)	(0.0729)	(0.0777)	(0.0631)
Number of household members currently employed full	0.185	-0.980	-0.0505	0.340**	-0.113	-0.0708
	(0.126)	(0.748)	(0.0983)	(0.133)	(0.0891)	(0.0734)
Urban	0.232	-1.031	0.412**	-1.141***	-0.430*	0.248
	(0.297)	(1.024)	(0.209)	(0.404)	(0.251)	(0.185)
Proportion of household members who are emigrants	0.135**	-0.737	-0.0203	-0.00529	-0.0317	0.0488
	(0.0627)	(0.564)	(0.0353)	(0.0400)	(0.0416)	(0.0410)
Natural log of GDP per capita in the province	0.0454	-0.326	-0.374**	0.241	-0.0617	-0.0413
	(0.189)	(0.324)	(0.168)	(0.281)	(0.179)	(0.186)
Natural log of population density in the region	-0.244	1.557	-0.221	0.213	0.189*	-0.117
	(0.162)	(0.980)	(0.245)	(0.328)	(0.107)	(0.106)
Household size (number of household members)	0.00197	0.0498	-0.0295	-0.0325	-0.0298	0.0642*
	(0.0542)	(0.0680)	(0.0261)	(0.0369)	(0.0377)	(0.0329)
Number of cell towers in the region	0.000762		0.00459***		0.00296***	
	(0.00195)		(0.00171)		(0.000921)	
Infrastructure index	4.560***	-21.94	2.531***	-0.972	3.837***	-1.591
	(0.773)	(17.58)	(0.519)	(1.657)	(0.600)	(1.242)
Predicted remittance (fitted values from Tobit)		5.737		1.425**		1.158***
		(3.824)		(0.575)		(0.256)
Constant	7.591***	-39.06	11.38***	-8.243	9.521***	-4.398*
	(1.184)	(28.67)	(0.514)	(6.483)	(0.867)	(2.395)
Observations	158	179	199	222	394	379
R-squared		0.231		0.208		0.396
F-stat		4.14***		4.59***		19.98***
LR Chi-squared	56.78***		109.02***		99.15***	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Results for A Few Other Specifications

Variables	Coefficient for HCE	P-value
Specification I		
Only for non-migrant households	0.91	0.00

All other variables included	Yes	
Observations	930	
R^2	0.15	
Specification II		
When variables that could be endogenous to HCE excluded	0.97	0.00
All other variables included	Yes	
Observations	2524	
R^2	0.09	

7. Conclusion

Our results reveal that remittance-receiving households in Kenya in 2009 spent more on healthcare compared to non-remittance-receiving households. The results remain robust with the use of different specifications and when the effect on households with different types of migrants is considered. Since remittances are more closely associated with healthcare expenditures for within-Africa migrants and out-of-Africa migrants, policymakers may plan to incentivize remittances for specific groups of migrants and can also restructure healthcare provisions for specific households with certain characteristics.

This implies that Kenyan households are interested in human capital formation and invest in human capital when the liquidity constraints get relaxed because of remittances. Since the formation of human capital is conducive to economic growth, it is expected that more remittance flow into Kenya will reduce poverty and improve the health outcome of the country. Since the countries in the African Migration Project in Sub-Saharan Africa have similar economic characteristics, the results in this study will provide insights for the study of migration and remittance receipts in other African countries and boost human capital formation in a Sub-Saharan country like Kenya.

It would have been consequential with regards to the policy prescription, if we could analyze whether healthcare expenditure varies by sources of income, e.g., remittance income versus non-remittance income. Maybe, that should be the direction for future data collection and research.

Table 5: Tests of endogeneity

Endogeneity Test	
H_0: variables are exogenous	
Durbin (score) chi2(1)	29.19***
Wu-Hausman F(1,1857)	29.51***

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

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