

The Effect of Diaspora Remittances on Health Outcomes in Kenya

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Abstract:

Background: A healthy population positively impacts on a country's economic growth. However, two measures of health outcomes in Kenya -life expectancy at birth and under-five mortality rate, on average are 58.2 years and 85.9 deaths per 1000 births against government targets of 72 years and 24 deaths per 1000 births respectively. The consequences of the above scenario have hampered country's productivity, national income and poverty reduction initiatives. The general objective of the study was therefore to determine the effect of diaspora remittances on health outcome. Specifically, this study examined the effect of diaspora remittance on life expectancy at birth, and the effect of diaspora remittance on under-five mortality rate.

Methods: Time series data for the period 1985 to 2018 were used in this study. Multivariate regression was specified and the Ordinary Least Square (OLS) estimation technique was used in estimating the direction and coefficients of diaspora remittance and control variables on measures of health outcomes (under-five mortality rate and life expectancy at birth). The research was informed by Grossman theoretical model with various inputs into health production function

Results: The study found that the coefficients of diaspora remittance, official development assistance were positive and statistically significant. While immunization uptake level negatively affected life expectancy at birth. The under-five mortality rate was negatively affected by diaspora remittances, private consumption and official development assistance, while immunization uptake level positively affected it. From the findings of the study, the government in collaboration with financial institutions should guarantee cheap, efficient, and safe remittance of employee compensation from abroad for the country to realize better health outcomes.

Key words: Remittances, Life Expectancy at birth, Under-five Mortality, Kenya

Date of Submission: 22-08-2021

Date of Acceptance: 06-09-2021

I. Introduction

1.1 Background

Better health improves the quantity and efficiency of human capital (Schultz, 1961). Individuals demand healthcare to improve their stock of health which is used as a productive resource (Grossman, 1972). Health outcomes are the effects brought by acquired healthcare activities on people. As input for production, healthy human resources may positively impact income, workers' productivity, savings and investment, and economic growth (Acaroğlu & Ada, 2014; Bloom & Canning, 2008; Weil, 2007)

Population's health may impact the country's national income in four different ways (Bloom & Canning, 2000). Firstly, is on health's effect on labour efficiency in production. Healthy employees avail more hours to work than the sick and are highly productive at work. Secondly is the role that health plays in education. Health could directly affect intellectual development, the capability to learn and school attendance among schooling population. Non-schooling population support education by paying school fees and funding subsistence needs through their labour earnings but when they are ill, incentives for educational investment declines. Thirdly, is health's effect on the level of savings. A longer life expectancy could motivate an individual to save and invest in order to generate more wealth. The high cost of healthcare too can cause catastrophic health expenditure forcing individuals to be poorer. Lastly, is the population's health impact on population size and composition. In developing countries investment in health is cost-shared between the government and private investors. Individuals rely on their minimal income to finance healthcare and remittances received from abroad may form a substantive source of non-labour income to enable citizens of these countries to invest in health.

Health is assessed using outcomes of consuming healthcare especially life expectancy at birth, and mortality among various groups of people such as infants, under-five years children, youths and elders. Though countries report average outcome measures, health outcomes within the country are diverse. The difference in

health outcomes within a country is brought by skewed public health expenditure across rural/urban, sex, education levels and occupation. Kenya has not attained her long term target as outlined in Vision 2030 as shown in table 1.1.

Table 1. 1 Kenya health progress indicators

Health Indicators	1985-2018 Average	2030 Target
Life expectancy at birth (years)	58.2	72
Under 5 mortality rate (for every one thousand births)	85.9	24
Infant mortality rate (for every one thousand births)	55	30

Data Source: World Development Indicators 2019 and Kenya Health Policy 2012.

Table 1.1 shows the comparison between the target level of life expectancy at birth, under-five mortality rate and infant mortality rate by 2030 and the respective average between 1985 and 2018. As depicted in Table 1.1, mean of life expectancy at birth falls below the target value by 13.8 years. Both the averages of under-five and infant mortality rates are above the target figure by 61.9 and 25 deaths per 1000 births respectively.

The impact brought by migration is gaining attention in various fields of research, especially the benefits of migration to the countries of origin. Over 251 million individuals are living abroad. These constitutes approximately 3 per-cent of the world populace by 2015 (The World Bank, 2020). Although the numbers have been rising over time the percentages have been consistently constant at just above 3 per-cent of the world populace. Leading destinations are nations within the Organization for Economic Cooperation and Development (OECD) and the Gulf. Migration between developing countries according to 2013 estimates was the highest at 38 per cent while between developing and developed countries was 34 per cent.

Worldwide remittances flows were estimated to have exceeded USD six hundred and one billion during the year 2015. Out of this figure, about USD 441 billion was sent to third world nations, which is about thrice the sum of Official Development Assistance (ODA). The actual amount of remittances, which includes unrecorded transfers via official and unofficial avenues, is thought to be considerably higher (The World Bank, 2020). The figure could be much higher had the cost of remitting be lower. In the third quarter of 2015, for instance, amounts spent to remit on average was 8 per cent – way higher than the three per cent goal established by Sustainable Development Goals (SDGs) (The World Bank, 2020). As such the remittances inflow forms the significant source of funds for household needs, which could better living standards in the third world. The remittances received to Sub-Saharan Africa on average were USD 30.56 billion from 2006 to 2015. The main recipient was Nigeria in 2015 with USD 20.8 billion (The World Bank, 2020).

Remittances to Kenya have increased consistently with an average of USD 965.4 million for the period 2006-2015 (The World Bank, 2020). The rise in remittances received is attributed to not only on accurate measurement of remittances received but also rising number of Kenyans living abroad. In 2013, the stock of emigrants was 1.1 % of the total population with the majority moving to OECD countries.

1.1.1 Diaspora Remittances Inflows to Kenya

Diaspora remittances to Kenya have been on a rise in the period 1985 to 2019. In 2019 remittances received from abroad stood at USD 2.54 billion second to ODA which was USD 3.25 billion while FDI was USD 1.3 billion. The figures were higher than in 2006 when remittances received were USD 570 million (The World Bank, 2020). The average remittances inflow over the same period was USD 535.184 million. The rise was attributed to factors including improved information and communication technologies giving rise to mobile-based money transfers systems, Kenya government engaging diaspora views in development agenda and increased emigration from the country (Ocharo, 2014). Figure 1.1 demonstrates the pattern of the diaspora remittances received from abroad to Kenya beginning 1985 until 2017.

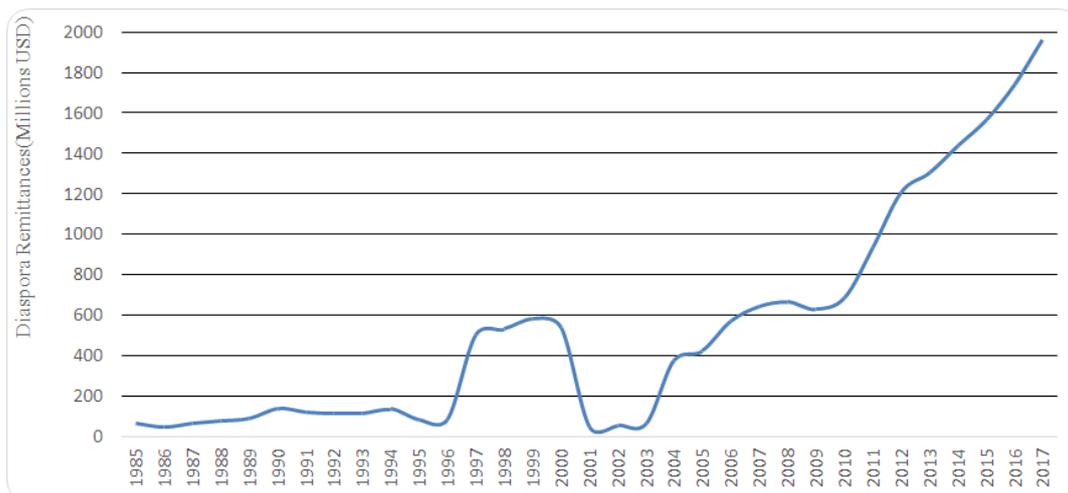


Figure 1. 1 Diaspora Remittances inflow in Kenya (1985-2017)

Data Source: World Development Indicators 2019

The considerable increase in diaspora remittances to Kenya from 1996 to 1999 is attributed to rising numbers of migrants to Gulf council countries in the early 1990s for opportunities in semi-skill and low-skill jobs and intensified migration to western countries in search for high skill work (Malit & Youha, 2016).

The temporary drop in diaspora remittances to the country in 2009 can be linked to the worldwide financial meltdown (Mwega, 2009). Increases in the rate of transmittals inflow into Kenya from 2010 is accounted for by the adoption of the new constitution which allowed dual citizenship, a passionate move by the Kenyan Government to engage her citizens living abroad in the country’s economic development (Ocharo, 2014) and lastly, reduced cost of sending remittances to the country. Kenyans used 9.8% of diaspora remittance on health amounting to about USD 150 million, education and foods recorded 29.4% and 22.8% respectively (Kenya National Bureau of Statistics, 2018). Figure 1.2 depicts the usage of diaspora remittances in Kenya in 2013.

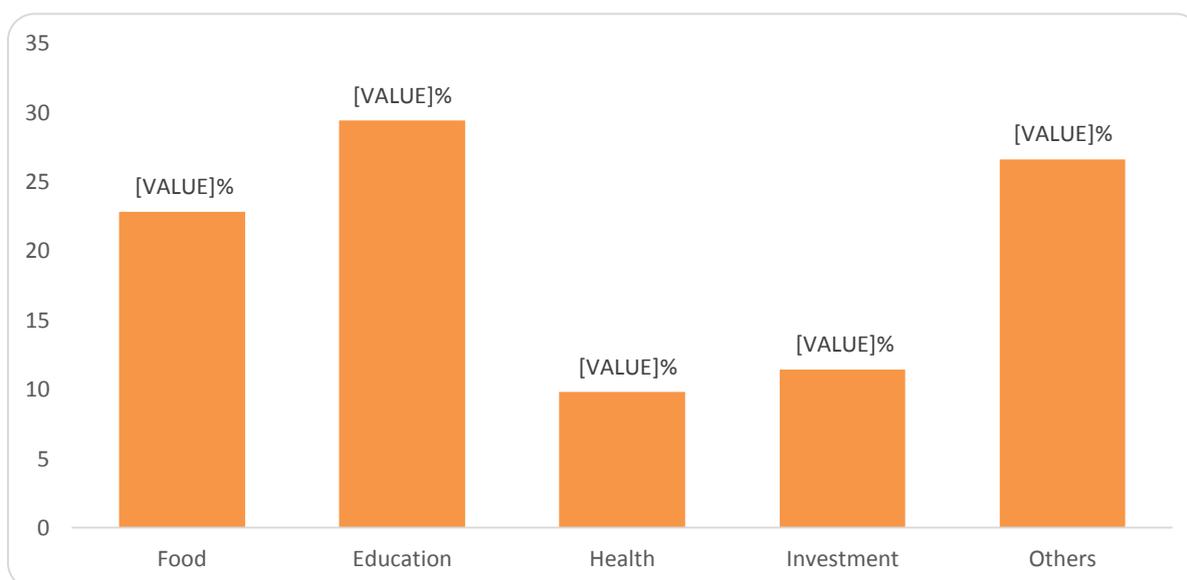


Figure 1. 2 Usage of Diaspora Remittances

Source: Kenya National Bureau of Statistics (KNBS), 2018.

1.1.2 Health Outcomes in Kenya

Kenya health sector developed the Kenya Health Policy (KHP) in 2012, a framework to guide the attainment of long term health outcomes targets as set by the government on health as outlined by the Vision 2030 and the 2010 constitution. The policy’s key measures of health outcomes are Adult deaths for every one thousand, Life expectancy at birth, Neonatal deaths per 1,000 live births, Maternal deaths per 100,000 live births, Under-five deaths per 1,000, Youth and Adolescent death per 1,000, Elderly deaths per 1,000 and years

lived with disabilities (The Republic of Kenya, 2012). Previous studies on health outcomes in Kenya employed Life expectancy at birth, under-five mortality or infant mortality (Kyalo, Korir, & Wainaina, 2013; Murunga, Mogeni, & Kimolo, 2019) because the availability of data over a long period, hence this study will use under-five mortality and life expectancy at birth as health outcomes variables.

Kenya's health outcomes indicators have shown improved results. In 2017, life expectancy at birth was 67.3 years up from 51.8 years in 2000 when it was at its all-time low and an average of 58 years recorded over the period 1985-2017 (World Health Organization, 2018). The improvement is attributed to a substantial increase in government expenditure on poverty alleviation programs. Figure 1.3 displays the trend of life expectancy at birth from 1985 to 2017.

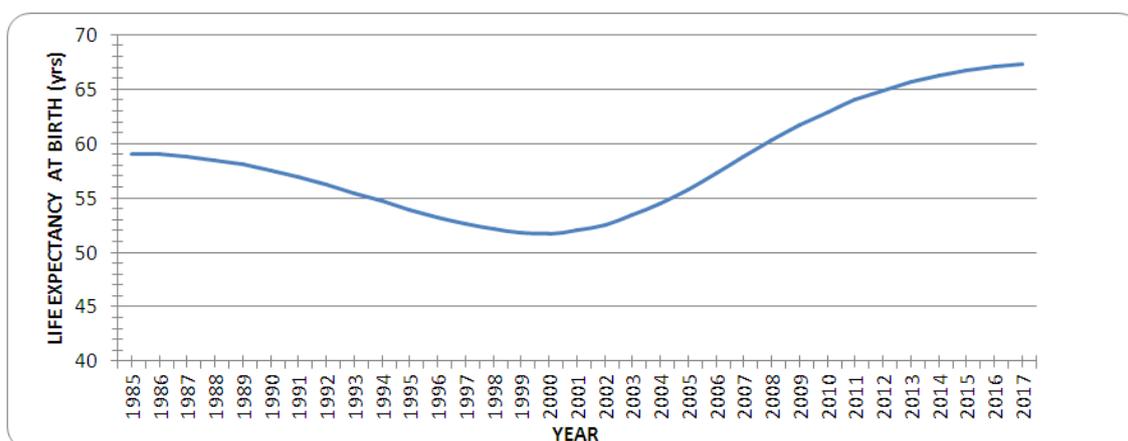


Figure 1. 3 Trend of life expectancy at birth in Kenya (1985-2017)

Data Source: World Development Indicators 2019

Life expectancy at birth was 59.1 years in 1985 and 51.8 years in 2000. The decline can be attributed to HIV/AIDS and malaria which were killer diseases during those periods. HIV/AIDS was first reported in the country in 1984 and the spread after was epidemic since no control was enforced. HIV/AIDS has negative effects on the health of the population through reducing the stream of family income due to reduced working hours, high rate of absenteeism and high costs of burials (Kimalu, Mburu, and Mwabu, 2013). The disease was declared a national disaster in 1999, signalling a first major step taken to counter its ever-rising prevalence.

Additionally, the decline in life expectancy at birth between 1985 and 2000 can also be attributed to the introduction of cost-sharing in health care provision in 1987 due to scarcity of resources. Since then the user fee has grown considerably with an average out-of-pocket health expenditure in Kenya for the period 2000-2016 being 36.5 per cent of current health expenditure. The existences of user fees in public health provision are known to limit accessibility to healthcare services and leads to inequity in its provision (Anangwe, 2008). The cost-sharing policy was moderated in 2002 by introducing a system of waivers and exemptions to address the challenge of affordability amongst the vulnerable. The initial beneficiaries of this system were children under five years, the mentally handicapped, patients attending family planning and AIDS. Therefore, life expectancy at birth improve after 2002.

Another measure of health outcome, Under-five mortality has portrayed the same trend as life expectancy at birth. It worsens in the period 1985-1996 before improving thereafter until 2017 although it is yet to reach the Vision 2030 target of 24 per 1000 births as shown in figure 1.4.

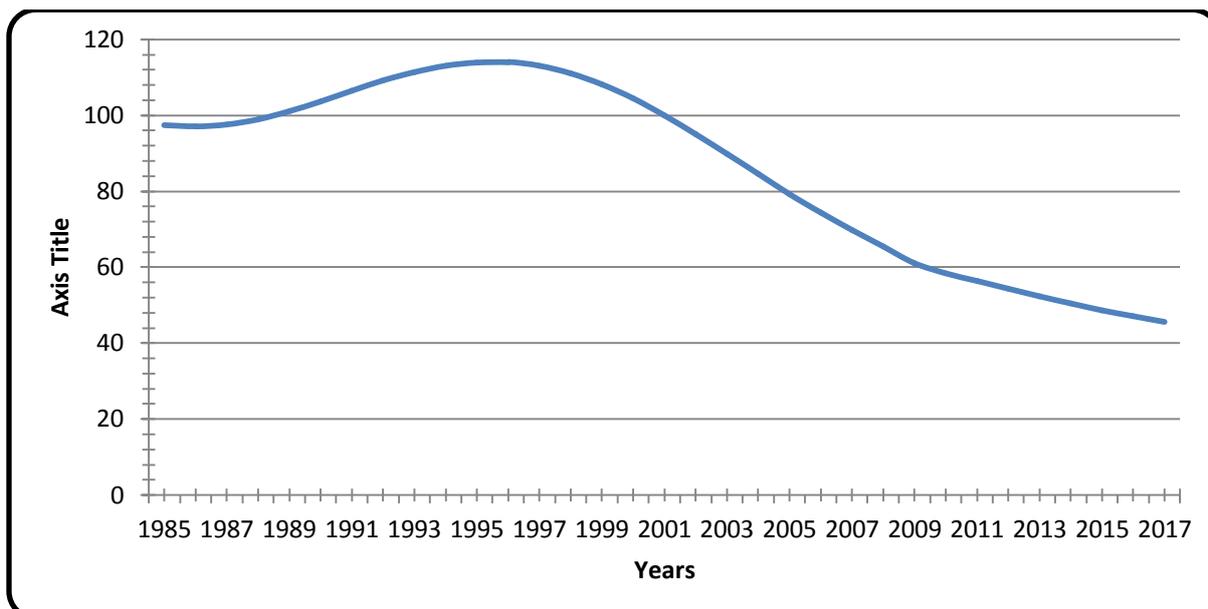


Figure 1. 4 Trend of Under-five Mortality in Kenya (1985-2017)

Data Source: World Development Indicators 2019

At it worse, under-five mortality rate was 118.5 deaths per 1000 live births in 1995. This indicate that one in every nine children succumb before his or her fifth birthday. However, the trend start to decline from 1996 and is fortified to reach vision 2030 target of 24 in every one thousand live births.

Improvements in under-five mortality rate in Kenya from 1996 could be partially attributed to advancement in country’s health system functioning. The core of health system comprising of payments for health services, staff, structures and supplies, health information systems, provision of services and governance are important inputs in achieving better health outcomes. Shortfall in any of the above building blocks can cause negative health outcomes for children (Keasts E.C, Macharia W, Singh N.S, *et. al.* 2018). Even though under-five mortality rate have not reached its vision 2030 target, the ensuing trends postulate that with the current understanding of health system inputs and their impacts during formulation of policies and strategies, the country is in the course of realizing the objectives.

1.1.3 Kenya’s Health Outcomes and Diaspora Remittances

Remittances from abroad to Kenya have grown considerably over time and have formed a better percentage of receiving households’ income. For the period 1985-1996, the remittances received was almost constant due to few numbers of Kenyans working abroad. During this period the health outcomes indicators were showing a worsening trend. The link between diaspora remittances and health outcomes can be shown in figure 1.5.

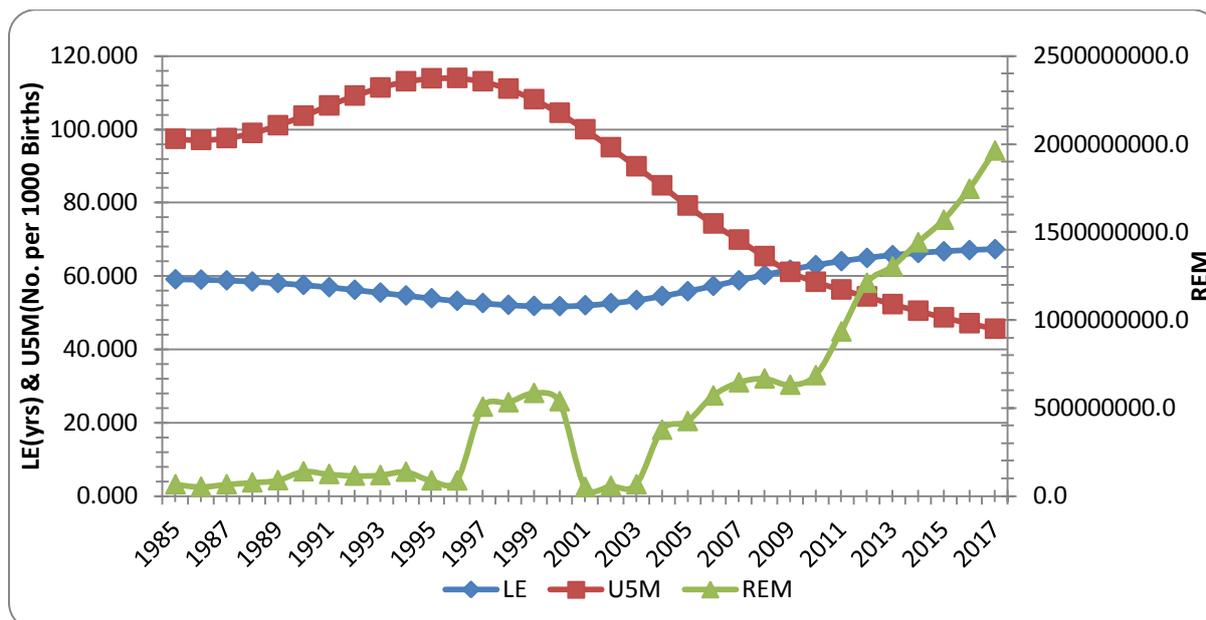


Figure 1. 5 The Link between Diaspora Remittances and Health Outcomes

Data Source: World Development Indicators 2019

From 1996 to 1999 personal remittances from abroad rose sharply and health outcome indicators showed initial improvement since 1985. For period 2001-2017 remittances, life expectancy and under-five mortality were on improving trends. This could be attributed to the use of remittances by the household to boost health expenditure in the country. The portion of remittances received channelled to the health sector have been increasing over time. Diaspora remittances have been documented in the literature to positively impact health outcomes in different periods and settings and Kenya is no different (Hildebrandt & McKenzie, 2005; Lu, 2013; Ponce et. al. 2011)

1.2 Statement of the Problem

A healthy population positively impacts on a country’s economic growth. An improvement in health status of the population which leads to a longer projected lifespan during birth and lesser under-five mortality rate is very important since it determines the level of productivity of the labour hence national income as well as poverty reduction. The improvement in both productivity and income in the economy will better the tax revenue to the Government of Kenya therefore enabling more public service deliveries.

For the period 1985-2017, life expectancy at birth first worsened from 59.082 to 51.751 years between 1985 and 2000 respectively, before improving to 67.2971 years in 2017. In the same period, under-five mortality firstly deteriorated from 97.4 deaths in every one thousand live births in 1985 to 114 deaths per 1000 live births during 1996 before hitting a low of 45.6 deaths for every one thousand live births during 2017. Life expectancy and under-five mortality have shown improved results with an average of 58.2 years and 85.9 deaths in every one thousand live births respectively between 1985 and 2017. Despite the effort made by both the government and non-government organizations which including increasing health expenditure, hospital centres, vaccination, cost sharing in health sector and improved health insurance coverage, the life expectancy at birth and under-five mortality is still below the of 72 year and 24 deaths per 1000 births respectively in the vision 2030. Diaspora remittance, a secondary income, when used in financing health spending could result in positive health outcomes in Kenya.

The studies on how diaspora remittances affect health outcomes has given mixed findings. Kanaiaupuni and Donato (1999) found that in the long run, remittances significantly reduce infant mortality risks in Mexico; Hildebrandt and McKenzie(2005) found that international transfers significantly better the health outcomes within Mexico; Thoumi(2016) found that remittances have a significant connection to the reduction in infant mortality rate and under-five mortality rate. Although Ponce, Olivie and Onofa (2011) did not find any long term significant association between diaspora transmittals and child health outcomes within Ecuador they found international remittances to significant effects on medicine expenditure when illness befell. This study distinguished itself from the mentioned studies by focusing in Kenya, using time series data and controlling for current health expenditure, official development assistance, private consumption, and immunization uptake levels. This study therefore, examined how diaspora remittances affect health outcomes in Kenya.

II. Selected Empirical Literature Review

McKenzie and Hilderrandt (2005) examine the effect of world-wide migration on health outcomes of children in rural Mexico while relying on a nationwide characteristic demographic review data conducted in 1997. Historic migration networks were adopted as tools for present household migration to the US for correcting the likely endogeneity and employed two-stage-least square (2SLS) technique. Health outcomes were measured using infant mortality and birth weight. The control variables were age of the mother, duration in school, number of members in a family, the number of doctors for every one hundred thousand people, beds available for every one hundred thousand individuals, the number of nurses for every one hundred thousand people, Availability of hospital facilities for every one hundred thousand people, GDP per capita. The study showed that an infant born to families who have a migrant member is projected to be 3 to 4.5 percent less likely to succumb before their first birthday. Additionally, the study established that homes that have a migrant member elevates birth-weight by 364 g, and by 335 g upon inclusion of state-level controls. Moreover, the study found that preventive health care, like lactating and immunizations, is unlikely for children within migrant homes. The study also investigated the ways in which migration might impact health outcomes and established indications that migration increases knowledge on health besides the direct effect on prosperity through remittances. The study, however, focused on two countries hence limiting policy implication to Kenya and uses data collected in 1997 and therefore did not analyses the effect of migration on health outcomes over time. This study did not restrict the source of remittances and adopt time-series data to point out the effect of diaspora remittances on health outcomes over time.

In investigating the implication of diaspora remittances in health outcomes in Ecuador (Ponce et al., 2011), relied on the 2006 Living Standard Measurement Survey's (LSMS) data and instrumental-variables approach. The study found that transmittals affect expense on health and preventive issues (de-worming and vaccination) however remittances insignificantly impacts on long-run height-for-age (stunting) and weight-for-age (underweight) z scores of children. Ponce et al. (2011) also found that remittances significantly affect expenses on medicine in the event of sickness implying that transfers serve preventive and emergency purposes. Besides the study established a significant positive relationship between remittances and health knowledge. This research furthered the study by Ponce et al. (2011) by looking at the effect of diaspora remittances on health outcomes in Kenya by using time-series data and employing OLS technique of estimation.

De and Ratha (2012) conduct a study on the developmental impact of international remittances on income, assets and human capital of recipient households in Sri Lanka. The study employed data from the Sri Lanka Integrated Survey 1999-2000 and Ordinary Least Square (OLS) technique was used. The study controlled for individual gender, individual age, the income of family, parents' educational level, the gender of the household's head and transfer earnings and used bias-corrected matching estimators to control for self-selection issues. The study found that total remittances earnings positively and significantly impacts on child health even after controlling for total income giving evidence that income may not be fungible between remittance and non-remittance income. The study argued that remittance income is targeted well and not as fungible like other transfer income avenues, as the remitters closely observe it. This study applauded the author's effort in demonstrating the usefulness of diaspora remittance in generating foreign currency. However, the study used cross-section data hence unable to analyze the behaviour of variables over time. This limit the establishment of the cause and effect and the time of the research is not guaranteed to be representative.

Lu (2013) examines the impact of household migration remittances on health in Indonesia. The study used longitudinal data from 1997 and 2000 waves of the Indonesia Family Life Survey and employed a fixed-effect regression model. The study found that grownups within immigrant homes were significantly less susceptible to become underweight unlike other counterparts within non-migrant homes. The improved nutritional status was restricted to people in households with labour migrants, highlighting the role of remittances in improving nutritional intake. The article illustrates the useful contribution of the remittances, in the health condition of family members. Improvement in transfers of remittances would help reduce the challenge of malnutrition in poor migrant-sending regions. The study lauds the author on focusing on the effect of remittances on health in a resource-constrained setting. Unlike the study by Lu (2013), the current study employed life expectancy at birth and under-five mortality as the measures of health outcomes.

Böhme et al. (2013) investigate the effect of migration on various dimensions of elderly health using the dataset drawn from the 2011 sampling frame of the National Labor Force Survey from Moldova. The study employed individual and household level variables and two-stage least square (2SLS) approach. The research established that migration positively affects body mass index (BMI), mobility and self-reported health but no effects were found on depression and cognitive capacity. The outcomes were associated with income effect that results in better nutrition and reallocating time usage among subsistence farming, leisure and sleep which may have further beneficial effects. The data used by the study were gathered at a specific time thus insufficient to determine the behaviour of health outcomes and remittances over some time.

Uzochukwu and Chukwunonso (2014) using data from World Bank's African Development Indicator, investigated the impact of international migrant remittances on health and education of sub-Saharan Africa countries. The study employed two-stage-least square (2SLS) technique in correcting endogeneity between variables. The study found that remittances impact positively and significantly on the health outcomes of selected countries. For every 10 per cent increase in remittances, health outcomes increase on the average by 1.2 per cent. Uzochukwu and Chukwunonso (2014), the results confirmed that transfers are a significant aspect in quickening enhancements in health outcomes within recipient third world nations after accounting for individual country heterogeneity. The study suggested to policymakers to develop a relevant inducement for migrants to remit, specifically policies touching on costs and avenues of remittances. The fact that the study was across many countries can limit the accuracy of the findings since different countries are faced with different socio-economic situations. This study is specific to Kenya and thus informed the subject in a better way.

Thoumi (2016) conduct a study on the effect of remittances on population health for the period 1995-2011. The study used data from over 200 countries sourced from world development indicator database and employed multivariate analysis and dynamic generalized method of moment (GMM) approach. The study established that there is no significant association between remittances and a decline in government health spending but have a positive correlation with the rate of infant mortality and under-five mortality rate. The study suggested the implementation of policy modifications in facilitating the movement of transfers, increased public health spending to upscale total health spending and the creation of alternative routes to increase household consumption. The generalized method of moments can lead to inaccurate findings especially with small samples, where the estimates yielded are outside the parameter space, hence unreliable. The study by Thiomi (2016) involved a shorter period and could therefore be faced with the small sample problem thus limiting the accuracy of the findings. This study used time-series data to establish a causal effect of diaspora remittance on health outcomes in Kenya.

Mang'eli, Mbuthia and Mwilaria (2016) investigated the effect of Diaspora remittances and human capital investment on Kenya's economic growth and to establish the causality between Diaspora remittances, human capital investment and economic growth in Kenya. The study used secondary annual time series data from the world development indicator spanning 1980-2013 and employed the ordinary least square (OLS) technique. The study acknowledges the findings that diaspora remittances and human capital investment granger cause economic growth meaning that the two variables have predictive power on the level of economic growth. The study suggested that the government should pursue policies that attract the inflow of remittances. The study used school enrolment as the measure of human capital which is a broad variable that entails health status among others. Unlike Mang'eli *et al.* (2016), this study examined how diaspora remittances affect health outcomes in Kenya.

III. Methodology of the Study

This research embraced a non-experimental time-series study design since it does not allow for manipulation. This research's methodology was tied to the Grossman Model. The model assumed that an individual is rational and aims at improving health status during the life cycle and that in the inter-temporal utility function, the lifespan as of a planning date is endogenously determined by the stock of health. When the stock of health is equal to its minimum level, death takes place. The typical consumer's inter-temporal utility function is given as;

$$U = U(\phi_0 H_0, \phi_1 H_1, \phi_2 H_2 \dots \dots, \phi_n H_n, Z_0, Z_1, Z_2 \dots, Z_n) \tag{1}$$

Where H_0 represent inherited stock of health, H_i is the stock of health in the i^{th} time period, ϕ_i is the service flow per unit stock, $h_i = \phi_i H_i$, is the total consumption of "health services," and Z_i is the total consumption of another commodity in the i^{th} period.

By definition, net investment in the stock of health equals gross investment minus depreciation:

$$H_{i+1} - H_i = I_i - \mu_i H_i \tag{2}$$

Where I_i is gross investment and μ_i is the rate of depreciation during the i^{th} period. The rates of depreciation are assumed to be exogenous, but they may vary with the age of the individual.

Consumer produces gross investments in health in the utility function according to a set of household production function:

$$I_i = i_i(M_i, TH_i; E_i) \tag{3}$$

In these equations, M_i is a vector of inputs purchased in the markets that contribute to gross investment in health, TH_i is time inputs and E_i is the stock of human capital exclusive of health capital. An individual optimization problem is to maximize inter-temporal utility subject to income and constraints in time. The first-order condition of the utility maximization gives a reduced form of health demand function and is stated as;

$$H_t = f(X_t) \tag{4}$$

Where H represent the measure of the individual health outcomes such as life expectancy and child mortality, and X are individual inputs to the health production function.

3.1 Econometric Model

To achieve the effect of diaspora remittances on health outcomes, equations 3.5 and 3.6 was adopted to approximate how diaspora remittances affects health outcome in Kenya. The equations were adopted to the theoretical framework.

$$\ln U5MR_t = \beta_0 + \beta_1 \ln Rem_t + \beta_2 \ln CHE_t + \beta_3 \ln ODA_t + \beta_4 \ln PC_t + \beta_5 \ln IUL_t + \mu_t \quad (5)$$

$$\ln LE_t = \alpha_0 + \alpha_1 \ln Rem_t + \alpha_2 \ln CHE_t + \alpha_3 \ln ODA_t + \alpha_4 \ln PC_t + \alpha_5 \ln IUL_t + \alpha_6 \ln LE_{t-1} + \rho_t \quad (6)$$

Where $\ln U5MR$ and $\ln LE$ are natural logarithms of under-five mortality rate and life expectancy at birth respectively and t is the time period. $\ln Rem$ is the natural logarithm of remittances received from abroad, $\ln CHE$ denote natural logarithm of current health expenditure, $\ln ODA$ represent the natural logarithm of official development assistance, $\ln PC$ stands for the natural logarithm private consumption, $\ln IUL$ stands for the natural logarithm of immunization uptake level and $\ln LE_{t-1}$ denote lag of the natural logarithm of life expectancy. μ and ρ are error terms that capture any omitted variables and β_i and α_i are the parameter coefficients.

3.2 Estimation Procedure

This study carried out an analysis on the correlation among the explanatory variables to examine the direction and extent of their associations. Working out on the size of correlations was convenient in finding the degree of multicollinearity. An association with a coefficient of correlation exceeding 0.8 point to the existence of severe multicollinearity (Gujarati, 2005).

The use non-stationary series invalidate the statistical inference obtained from a regression of time-series data. To avoid the problem, this study conducted the stationarity test. Kwiatkowski Phillips Schmidt-Shin (KPSS) unit root test was used to ascertain the stationarity of the data. The KPSS test for unit root was employed because it is effectiveness in checking for stationarity in the presence of a deterministic trend. The KPSS test non-stationarity against the null hypothesis of stationarity while ADF test stationarity against the null hypothesis of non-stationarity in the model.

To determine the effect of remittances on health outcomes Ordinary Least Square (OLS) estimation technique was employed. The dependent variables were life expectancy at birth and under-five mortality rate, and diaspora remittances as the primary explanatory variable. Other explanatory variables are current health expenditure, private consumption expenditure, and official development assistance and immunization uptake level.

The post estimation tests to ascertain the viability of the regression results was conducted. The Breusch-Godfrey Langrage Multiplier and the Breusch-Pagan-Godfrey tests for serial autocorrelation of residuals and heteroskedasticity respectively were conducted. The Ramsey RESET and Jarque Bera testswere used in determining whether the model was correctly specified and normality of the error terms respectively.

IV. Results, Interpretation and Discussion

4.1 Correlation Analysis

This study carried out an analysis on the correlation among the explanatory variables to examine the direction and extent of their associations. The outcomes for the correlation test were given in Table 4.1. The results showed that explanatory variables are not highly correlated hence there was no case of multicollinearity.

Table 4. 1 Correlation Matrix

	REM	CHE	PC	ODA	IUL
REM	1.0000				
CHE	-0.4469	1.0000			
PC	0.6009	-0.6531	1.0000		
ODA	-0.6798	-0.0573	0.1524	1.0000	
IUL	0.4998	-0.0738	0.2689	0.5991	1.0000

4.2 Unit Root Test

The stationarity tests were done to evaluate whether the variables have unit root or not. All the time series were subjected to unit root tests. The output for the tests are presented in Table 4.2.

Table 4.2 Unit Root Test

Time Series Variable	KPSS		Conclusion
	Intercept	Intercept +Trend	
Under-five Mortality rate	0.557840	0.169791	Stationary
Life Expectation at Birth	0.278952	0.17475	Stationary
Diaspora remittance	0.541233	0.173882	Stationary
Current health expenditure	0.596314	0.160321	Stationary
Private Consumption Expenditure	0.65569	0.145932	Stationary
Official Development Assistance	0.311255	0.147098	Stationary
Immunization uptake level	0.491551	0.089477	Stationary
Critical Values at 1%	0.739000	0.216000	
Critical Values at 5%	0.463000	0.146000	
Critical Values at 10%	0.347000	0.119000	

The Kwiatkowski Phillips Schmidt-Shin (KPSS) test for unit root was employed because of its effectiveness in checking for stationarity in the presence of a deterministic trend. The null hypothesis under KPSS tests is that the time series is stationary. Based on the results the null hypothesis could not be rejected because the langrage multiplier (LM) statistics were less than the critical values at a 1% level of significance. Since all the time series were found to be stationary under KPSS tests, cointegration analysis on the variables was not conducted. The outcome also supports the choice of traditional OLS estimation technique over other methods.

4.3 Residual Based Tests

The tests were performed to ascertain the normality of residuals over time to be assured of its constant variance, and to guard against autocorrelations of error term for different years. The outcome of the residuals based tests were displayed in Table 4.3.

Table 4. 1 Residual Based Tests Results

Dependent Variable	Under-five Mortality Rate		Life Expectancy at Birth	
	Test Statistics	Probability	Test Statistics	Probability
Jarque-Bera	0.24996	0.8825	0.63206	0.7290
Breusch-Godfrey	0.2874	0.2332	0.1041	0.0663
Breusch-Pagan-Godfrey	0.7721	0.5779	0.3837	0.8827

The normality property was ascertained using the Jarque-Bera statistic from the histogram-normality test. The null hypothesis of the Jarque-Bera test is that the regression residuals follow a normal distribution. The null hypothesis could not be rejected at 5 percent because the probabilities of the two models were more than 0.05 and therefore an indication that the residuals from the regressions were normally distributed. The normality of regressions' residuals implies that regressions' coefficients are also normally distributed since the linear combination of normally distributed variables yields a normal distribution (Green, 2008).

The autocorrelation test was conducted to guarantee the attainment of optimal estimates from the regression analysis. From Table 4.4 and Table 4.5, the Durbin Watson statistic was 1.496 and 1.421 respectively. Since Durbin Watson statistic is challenging to construe, the Breusch- Godfrey langrage multiplier test for autocorrelation was used. The null hypothesis for the Breush-Godfrey test is that there is no autocorrelation and from Table 4.3 the null hypothesis could not be rejected for both models because the probabilities of chi-square were more than 5 percent.

The Breusch-Pagan-Godfrey test for heteroskedasticity was carried out to check on the property of constant variance among the residuals over time under study. The test's null hypothesis is that the residuals have constant variance. The null hypothesis could not be rejected because the probabilities of the F-statistics for the two models are more than 5 percent hence signifying the presence of homoscedasticity in both models.

4.4 Model specification

To detect the misspecification error in the model of omitted variables, the Ramsey RESET test was applied. The Ramsey RESET test tests for the omitted variable, incorrect functional form, and econometric association amongst the explanatory and the residuals (Ramsey, 1969). Under those errors, least-square estimates will be biased and inconsistent thereby invalidating the inference procedures. The Ramsey RESET test tests for the null hypothesis of no omitted variable. Table 4.4 and Table 4.5 indicates that the null hypothesis could not be rejected at 5 percent. This is because the p-values of the F-statistics were greater than 0.05 for the two models.

Table 4.4. Ramsey RESET Test Results (LOG OF U5MR as Dependent Variable)

Ramsey RESET Test			
Omitted Variables: Squares of fitted values			
Specification: LNU5MR C LNREM LNCHE LNPC LNODA LNIUL			
	Value	Df	Probability
t-statistics	1.143501	27	0.2629
F-statistics	1.307594	(1,27)	0.2629
Likelihood ratio	1.607970	1	0.2048

Table 4.5. Ramsey RESET Test Results (LOG OF LE as Dependent variable)

Ramsey RESET Test			
Omitted Variables: Squares of fitted values			
Specification: LNLE C LNREM LNCHE LNPC LNODA LNIUL LNLE(-1)			
	Value	Df	Probability
t-statistics	0.805624	25	0.4281
F-statistics	0.649030	(1,25)	0.4281
Likelihood ratio	0.845787	1	0.3577

4.5 Effects of Diaspora Remittances on Under-Five Mortality Rate in Kenya

The results of the regression analysis when log of the under-five mortality rate was regressed against the log of diaspora remittances, the log of current health expenditure, the log of private consumption expenditure, the log of official development assistance and log of immunization uptake level is shown in Table 4.6.

Table 4. 6 Effects of Diaspora Remittances on the Under-Five Mortality Rate.

Dependent Variable: Log of Under-five Mortality Rate				
Method: Least Squares				
Included Observations: 34				
Variables	Coefficient	Std. Error	t-Statistics	Prob.
C	7.2712***	1.6841	4.3173	0.0002
LNREM	-0.1053***	0.0246	-4.2835	0.0002
LNCHE	0.0666	0.0611	1.0909	0.2846
LNPC	-1.0583***	0.3369	-3.1411	0.0040
LNODA	-0.4745***	0.0556	-8.5321	0.0000
LNIUL	1.1361***	0.3506	3.2409	0.0031
R-Squared: 0.89732		Durbin-Watson Stat.:1.4964		
Adjusted R-Squared:0.87899		Prob.(F-statistics): 0.0000		
F-statistics:48.9393				

Note: *** Shows that the coefficient is statistically significant at 1%, ** Shows that the coefficient is statistically significant at 5%, * Shows that the coefficient is statistically significant at 10%.

The F-statistics from the Table 4.6 is statistically significant at 1 percent. This demonstrates that the variation in the under-five mortality rate is jointly explained by variations in explanatory variables.

The coefficient of the log of diaspora remittances was found to be negative and strongly significant. It implies that with an increase in diaspora remittances under-five mortality rate will decline holding other factors constant. Diaspora remittance, eases financial constraints on households enabling them to access proper health care services. Similar findings were reported by Thoumi (2016) and Amega (2018) who found that remittances are significantly connected to a decline in the rate of under-five mortality. The results suggest that diaspora transfers have a vital role in Kenya's health sector. The reduced U5MR will aid the country in improving the stock of human capital and the market for goods and services due to an increase in population.

Log of official development assistance was found to be negative and statistically significant at 1 percent. This implies that when other factors are held constant, a 10 percentage point growth of log of official development assistance would results in a 4.745 percentage point decline in the log of under-five mortality rate. ODA that is channelled toward health-related activities helps relax resource constraints in the health sector and improve health service delivery. The findings is in tandem with the results of Burfeind (2014) and Negeri and Halemariam (2016) who found that an increase in development assistance saves the lives of the under-five population. The finding is contrary to the assertion that development assistance is ineffective in increasing overall health (Wilson, 2011).

The coefficient of the log of immunization uptake level was 1.136 meaning that holding other variables constant; a 10 percentage point increase in log of immunization uptake level would lead to an 11.36 percentage point increase in the log of the rate under-five mortality. The result is due to existence in variation in immunization uptake across regions in the country. Even though the country registered an average immunization

uptake level of over 80 percent, there exist disparities in vaccination uptake by county and across rural and urban areas (KDHS, 2014; Wanjala and Kioko, 2014). The finding contradicts the findings of Breiman and Streatfield (2004) who found that immunization uptake level substantially reduces mortality among children due to actual protection against diseases.

The coefficient of the log of private consumption expenditure was found to be negative and statistically significant at 1 percent. A growth in private consumption expenditure would lead to a decline in the rate of under-five mortality when all other factors are held constant. The results indicate that private consumption expenditure determines the rate of under-five mortality in Kenya. Traditionally, the amount of wealth directly affects the level of private consumption. The observation is due to better welfare associated with an increase in individuals' level of income in Kenya. As shown by Grossman (1972) income level determines the level of health.

4.6 Effects of Diaspora Remittances on Life Expectancy at Birth

The result of the analysis on the effect of diaspora remittances on life expectancy at birth is given by Table 4.7.

Table 4. 7 Effects of Diaspora Remittances on Life Expectancy at Birth

Variables	Coefficient	Std. Error	t-Statistics	Prob.
C	0.6321***	0.1876	3.3695	0.0024
LNREM	0.0041**	0.0017	2.3527	0.0265
LNCH	-0.0046	0.0038	-1.1905	0.2446
LNPC	0.0130	0.0215	0.6049	0.5505
LNODA	0.0291***	0.0050	5.7835	0.0000
LNIUL	-0.0769***	0.0225	-3.4141	0.0021
LNLE(-1)	0.8758***	0.0389	22.5044	0.0000

R-Squared: 0.9918
 Adjusted R-Squared: 0.9899
 F-statistics: 525.0322
 Durbin-Watson Stat.: 1.4210
 Prob.(F-statistics): 0.0000

Note: *** Shows that the coefficient is statistically significant at 1%, ** Shows that the coefficient is statistically significant at 5%, * Shows that the coefficient is statistically significant at 10%

From Table 4.7, the F-statistics from the regression results statistically significant at 1 percent meaning the variations in life expectancy at birth in Kenya are jointly explained via the variations in the stated explanatory variables.

The coefficient of the log of diaspora remittances was negative and statistically significant at 5 percent. The increase in the log of diaspora remittances by 10 percentage points will lead to an increase in the log of LE by 0.041 percentage point ceteris paribus. The result suggests that the amount of diaspora remittances determine the years of life expectancy in Kenya. This is due to financial gains to households which may enable them to acquire timely health care services. The findings support the results of Amega (2018) and Uzochukwu and Chukwunonso (2014) who found that diaspora remittances significantly improve overall life expectancy in Sub-Saharan Africa.

The coefficient of the log of official development assistance was found to be 0.02905. The coefficient was statistically significant at 5 percent. When all other factors remain unchanged, an increase in 10 percentage points in the log of official development assistance will increase the log of life expectancy at birth by 0.2905 percentage points. The finding showed that ODA determines the length of life in Kenya by breaking the poverty trap and propelling the nation into an era of the development cycle (Sachs et al., 2004). The results support the finding of Bendavid and Bhattacharya (2016) who found that official assistance toward health improves life expectancy in 140 aid-recipient countries.

The coefficient of the log of immunization uptake level was found to be -0.076872 with a probability value of 0.0021 indicating that it is statistically significant. The rise in the log of immunization uptake level by 10 percentage points when other variables remain constant will result in a decline in the log of LE by 0.76872 percentage points. The result suggests that the immunization uptake level is a determinant of years of LE in Kenya. This can be attributed to existence in variation in immunization uptake levels across regions in the country. There is enormous disparities in vaccination uptake by county, from 36 percent uptake in West Pokot to over 95% uptake in Nyamira, Nandi, Kiambu, Kirinyaga, and Tharaka-Nithi (Kenya Demographic and Health Survey, 2014). Moreover, the rural areas which form a huge part of the country had an average of 77 percent immunization uptake compare to 83 percent in urban areas. Contrary results were found by Agheli and Emamgholipour (2015) that immunization directly affects LE by reducing the burden of infectious diseases.

At 5 percent level of significant, the coefficient of a year lag of log of life expectancy at birth was found to be statistically significant. The coefficient was valued at 0.8758. This implies that a 10 percentage

point rise in a year lag of log of life expectancy at birth will contribute to an 8.758 percentage point growth in the log of life expectancy at birth given that other explanatory variables remain constant. Therefore, previously attained years of life expectancy at birth determine its current value.

V. Conclusion and Recommendation

This paper was conducted to determine the effect of diaspora remittances on health outcomes in Kenya. This study revealed that the diaspora remittances led to a decline in mortality among children aged five years and below, and it also raised the overall life expectancy at birth. This could be due to improved welfare associated with the receipt of diaspora remittances.

This study recommend that the government in collaboration with financial institutions should guarantee cheap, efficient, and safe remittance of employee compensation from abroad. Transfer of diaspora remittance should attract low charges, include lesser requirements and reach intended beneficiary safely. The government should also put in place measures to attract inflow of official development assistance. One way is improvement in management of ODA fund through better commitment to projects supported by the fund. Additionally, concerned ministries and state departments spearheading implementation of ODA projects need to be free from political interference to realize efficiency in utilization.

Moreover, this paper recommend that the government should readjust immunization programmes with the aim of raising the immunization coverage in susceptible areas. The Ministry of Health should map out such areas and initiate sustainable awareness campaign on importance of immunization to the society within those jurisdictions. Lastly, this study suggest that both national and county governments through their respective departments of economic planning should pursue policies that encourage an increase in the private consumption in the country. One of the ways to achieve this is by increasing government expenditure on domestic goods and services to accelerate labour supply in the country. The higher the government expenditure on domestic products the higher the aggregate demand hence firms will need to hire more workers to meet the excess aggregate demand. Given strong complementarity between employment and private consumption, private consumption will eventually increase.

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Weldon Kibet. "The Effect of Diaspora Remittances on Health Outcomes in Kenya." *IOSR Journal of Economics and Finance (IOSR-JEF)*, 12(5), 2021, pp. 29-42.