HIV/AIDS AND DEVELOPMENT INDICATORS IN WEST AND CENTRAL AFRICA: STYLIZED FACTS

RASAKI STEPHEN DAUDA
Department of Economics and Business Studies
Redeemer's University
Ede, Osun State, Nigeria

Abstract

West and Central Africa as a sub-region in Sub-Saharan Africa has 6.1 million HIV/AIDS infected persons, about 0.28 million AIDS-related deaths, 0.37 million new infections (the highest globally), around 2% prevalence among adults aged 15-49 years and approximately 0.55 million children aged 0-14 living with the virus. These figures are capable of undermining development indicators such as life expectancy, infant mortality rate, per capita income, nutrition, as well as education and health variables. This study examines the state of HIV/AIDS and development indicators in West and Central Africa, using stylized facts and literature review. The findings suggest that the burden of HIV/AIDS with respect to number of persons living with it, its prevalence, new infections and AIDS-related deaths appear relatively high in West and Central Africa while development indicators perform poorly. The study suggests that governments at all levels and other stakeholders in West and Central Africa should commit substantial resources to containing and hurting the spread of HIV/AIDS while treatment should cover all infected persons across the sub-region.

Key Words: HIV/AIDS, development indicators, West and Central Africa.

Introduction

Development is one of the critical macroeconomic policy objectives every country aimed at achieving. Although countries the world over have committed considerable amount of their resources to achieving this (which advanced economies have succeeded in attaining), several challenges still militate against this fundamental goal in Africa. One of such challenges is prevalence of communicable diseases of which HIV/AIDS belongs. West and Central Africa (henceforth WCA) has the third highest burden of HIV/AIDS in Sub-Saharan Africa, and it is capable of undermining development of the sub-region. Statistics available from UNAIDS (2018) suggest that as at the end of 2017, approximately 6.1 million people were living with the disease in WCA, 0.37 million were newly infected (the highest globally), with 0.28 million AIDS-related deaths while prevalence of the disease among adults ages 15-49 years was about 2.0%. This is capable of weakening the health of the population of the region, thereby depressing productivity and development. A healthy population improves life expectancy, accelerates economic growth, declines poverty, and enhances economic development (Tandon, 2005; Boutayeb, 2009; Haacker, 2010; Audibert, Motel & Drabo, 2012; and Dauda, 2018a and b).

The performance of WCA falls below expectation given facts on development indicators. The latest human development report shows most countries in WCA within the low human development category, with several of them recording very low per capita income (UNDP, 2018). Generally, the bulk of the countries at the lowest ebb of human development index (HDI) are in WCA. Similarly, literacy rate in the region has been very low while levels of poverty,

unemployment, infant, mortality under-five mortality, and maternal mortality remain high (see UNICEF, 2011; World Bank, 2018). Moreover, some countries in the region suffer from malnutrition, which has reached severe and acute level, as the case with Mali (see UNICEF, 2018). The low performance of the region in development indicators may not be unconnected with the menace of HIV/AIDS pandemic among other factors.

This paper therefore, accesses HIV/AIDS vis-à-vis its effects on indicators of development in WCA, using stylized facts and review of related literature. The remainder of the study covers stylized facts on HIV/AIDS and development indictors in WCA, a brief review of literature and concluding section.

HIV/AIDS and Development Indictors in West and Central Africa: Stylized Facts

HIV/AIDS in West and Central Africa: Situation Analysis

In most WCA countries, HIV/AIDS was first reported around the early and mid-1980s. Since these periods, cases and prevalence of the disease continue to increase. From the early to mid-1990s, the burden of the disease was severe in most countries of the sub-region, although not as the case with the Southern and East African countries. Currently, the WCA accounts for the third highest burden of HIV/AIDS and the highest burden of new infections globally (see UNAIDS, 2018).

From Table 1, which presents information on HIV/AIDS variables in WCA over the period 1990-2017, it is apparent that the state of the pandemic in the sub-region is something to worry about. For instance, prevalence among age 15-49 years is above 1% threshold that constitutes generalized epidemic while number of people living with HIV/AIDS (PLWHA) continues to increase, from 1.9 million in 1990 to 6.1 million in 2017. Moreover, AIDS-related deaths, which was 0.07 million in 1990 peaked at 0.43 million 2005 before declining to 0.28 million in 2017. The number of mothers who need Antiretrovirals for preventing mother-to-child transmission (MAMC) is high, increasing from 0.11 million in 1990 to 0.35 million in 2000 before declining slightly to 0.33 million in 2017 while new infections have also remained very high.

Table 1: **HIV/AIDS Statistics in West and Central Africa, 1990-2017**

Year	HIVP (%)	AIDSD (millions)	PLWHA (millions)	HIVI (per 1000)	MAMC (millions)	HIVN (millions)
1990	1.4	0.07	1.90	1.78	0.11	0.43
1995	2.6	0.19	4.10	2.48	0.26	0.69
2000	3.2	0.35	5.80	2.03	0.35	0.64
2005	2.8	0.43	6.10	1.35	0.35	0.48
2010	2.4	0.37	6. 00	0.99	0.33	0.41
2015	2.0	0.31	6. 00	0.80	0.33	0.38
2017	1.9	0.28	6.10	0.75	0.33	0.37

Where: HIVP = Adult (15-49) prevalence (%); AIDSD = AIDS-related deaths in adults and children; PLWHA = Estimated adults and children living with HIV; HIVI = All ages incidence rate (per 1000); MAMC = Mothers Needing Antiretrovirals for Preventing Mother-to-Child Transmission; HIVN = Adults and children newly infected with HIV

Source: UNAIDS (2018).

Country-Specific cases of HIV/AIDS as presented in Table 2 revealed that the disease still constitutes threat in WCA. Its prevalence is still a major concern in most of the countries presented in the table. In countries such as Cameroon, Central Africa Republic, and Guinea-Bissau prevalence among population aged 15-49 was above 3% as at the end of 2017 while PLWHA was as high as 3.1 million in Nigeria.

Table 2: Country-Specific HIV/AIDS Statistics in West and Central Africa, 1990-2017

Country	Year/HIV/AIDS Variable	1990	2000	2010	2017
Burkina Faso	**HIVP (%)**	3.5	2.5	1.0	0.8
	AIDSD (millions)	0.006	0.015	0.005	0.003
	PLWHA (millions)	0.16	0.17	0.098	0.094
	MAMC (millions)	0.01	0.012	0.006	0.006
	HIVN (millions)	0.026	0.008	0.0042	0.0043
Burundi					
	HIVP (%)	2.2	3.5	1.5	1.1
	AIDSD (millions)	0.002	0.009	0.005	0.002
	PLWHA (millions)	0.059	0.12	0.082	0.078
	MAMC (millions)	0.004	0.009	0.005	0.005
	HIVN (millions)	0.014	0.009	0.003	0.003
Cameroon					
	HIVP (%)	0.9	4.6	4.6	3.7
	AIDSD (millions)	0.001	0.017	0.025	0.024
	PLWHA (millions)	0.051	0.37	0.52	0.51
	MAMC (millions)	0.0035	0.026	0.033	0.03
	HIVN (millions)	0.016	0.055	0.034	0.028
Central Africa Republic					
	HIVP (%)	3.5	9.3	4.9	4.0
	AIDSD (millions)	0.001	0.013	0.009	0.005
	PLWHA (millions)	0.052	0.19	0.13	0.11
	MAMC (millions)	0.003	0.011	0.006	0.005
	HIVN (millions)	0.02	0.013	0.01	0.008
Cote D'Ivoire					
	HIVP (%)	4.1	7.7	3.6	2.8
	AIDSD (millions)	0.01	0.061	0.035	0.024
	PLWHA (millions)	0.32	0.83	0.52	0.50
	MAMC (millions)	0.015	0.042	0.029	0.025
	HIVN (millions)	0.082	0.057	0.029	0.03
Guinea-Bissau					
	HIVP (%)	0.3	2.6	4.0	3.4
	AIDSD (millions)	0.0001	0.001	0.002	0.002
	PLWHA (millions)	0.0015	0.018	0.037	0.04
	MAMC (millions)	0.0002	0.0013	0.0023	0.0022
	HIVN (millions)	0.001	0.004	0.003	0.0023

Liberia					
	HIVP (%)	4.1	4.2	2.0	1.4
	AIDSD (millions)	0.001	0.006	0.004	0.003
	PLWHA (millions)	0.044	0.068	0.045	0.04
	MAMC (millions)	0.003	0.004	0.002	0.002
	HIVN (millions)	0.011	0.004	0.003	0.0023
Nigeria					
	HIVP (%)	1.2	3.6	3.2	2.8
	AIDSD (millions)	0.02	0.13	0.18	0.15
	PLWHA (millions)	0.63	2.50	3.00	3.10
	MAMC (millions)	0.032	0.13	0.15	0.16
	HIVN (millions)	0.14	0.32	0.22	0.21
Togo					
	HIVP (%)	1.0	3.4	3.0	2.1
	AIDSD (millions)	0.001	0.005	0.007	0.005
	PLWHA (millions)	0.019	0.096	0.11	0.11
	MAMC (millions)	0.001	0.007	0.008	0.006
	HIVN (millions)	0.005	0.013	0.007	0.005

Where: HIVP = Adult (15-49) prevalence (%); AIDSD = AIDS-related deaths in adults and children; PLWHA = Estimated adults and children living with HIV; MAMC = Mothers Needing Antiretrovirals for Preventing Mother-to-Child Transmission; HIVN = Adults and children newly infected with HIV

Source: UNAIDS (2018).

Development Indicators in West and Central Africa

The performance of WCA in development indicators appears unimpressive. The latest human development indices released by the UNDP (2018) show most countries in the region under low human development category, with majority of them being at the bottom level of the Human Development Index. For instance, from the information presented in Table 3, Niger ranked 189th out of 189 countries in 2017, with her HDI being 0.354, making the nation the least globally. In the same vein, Central Africa Republic (CAR), Chad, Burundi, and Sierra Leone ranked 188th, 186th, 185th and 184th respectively. With the exception of Cameroon, which managed to move to the medium human development category, other countries presented in the table appear in the low human development group.

Furthermore, per capita GDP and literary rate in these countries remain very low. Only Nigeria recorded the highest per capita GDP (US$5338.45) in 2017, and this was due to the rebasing of her GDP in 2013. The least, US$661.24 was recorded by CAR. Literacy rate is as low as 15.46% in Niger while Cameroon has the highest, being 71.29%. Stunting, which shows the level of malnutrition is very high across the region. Guinea-Bissau recorded the highest (47%) while the least (27%) is found in Togo.

Table 3: Human Development Indices and Indicators of Selected Countries in West and Central Africa, 2017

Country	HDI Rank	Human Development Index (HDI)	Life Expectancy at birth	(GDP) Per Capita, PPP (constant 2011 International $)	Literacy Rate	Prevalence of Stunting (%) (2011)
Niger	189	0.354	60.4	926.00	15.46 (2012)	**46**
CAR	188	0.367	52.9	661.24	36.75 (2010)	**43**
Chad	186	0.404	53.2	1768.15	22.31 (2016)	-
Burundi	185	0.417	57.9	702.23	61.57 (2014)	-
Sierra Leone	184	0.419	52.2	1390.30	32.43 (2013)	**36**
Burkina Faso	183	0.423	60.8	1703.10	34.60 (2014)	35
Mali	182	0.427	58.5	2014.31	33.07 (2015)	38
Liberia	181	0.435	63.0	752.79	42.94 (2007)	39
Guinea-Bissau	177	0.455	57.8	1548.68	45.581(2014)	47
Guinea	175	0.459	60.6	1998.93	32.00 (2014)	40
Gambia	174	0.460	61.4	1561.77	41.95 (2013)	28
Cote D'Ivoire	170	0.492	54.1	3601.01	43.91 (2014)	40
Togo	165	0.503	60.5	1429.81	63.75 (2015)	27
Benin	163	0.515	61.2	2064.24	32.95 (2012)	43
Nigeria	157	0.532	53.9	5338.45	51.08 (2008)	43
Cameroon	151	0.556	58.6	3364.93	71.29 (2010)	36

Source: United Nations Development Programme (2018); World Bank (2018); and Fungo (2011).

HIV/AIDS and Development Indicators: A Brief Literature

Studies around the globe on HIV/AIDS have reported some negative and significant effect of the disease on various indicators of development. For instance, empirical findings showed that HIV/AIDS has depressed GDP and per capita GDP growth in countries with high prevalence (Kambou, Devarajan & Over 1992; Cuddington, 1993a and b; Arndt & Lewis, 2000; Bell et al, 2003 and 2004; Young, 2005; McDonald & Roberts, 2006; Arndt, 2006; Abdulsalam; 2010; and Dauda, 2018a). These studies reported negative and significant pressure of the disease on growth of GDP and per capita GDP through different channels such as fallen life expectancy, depressed savings and investments, reduction in school enrolment, and declined labour supply among others. Gross domestic product (GDP) measures growth of an economy's income, which is a prerequisite for development (see Costanza et al., 2009; and Todaro & Smith, 2012), a decline in this variable will hinder development because low level of income militates against all development indicators and acts to aggravate poverty. Similarly, per capita income is a traditional measure of development (see Jacobs & Šlaus, 2010; and Todaro & Smith, 2012). Its decline will hamper development and wellbeing of the people in the affected society.

Similarly, empirical findings have also presented negative and significant effect of HV/AIDS on some human capital variables (which are indicators of development), such as average life expectancy, in which its decline in some African countries was attributed to the

scourge of HIV/AIDS (see McDonald & Roberts, 2006; Gardner & Lee, 2010; Haacker, 2010; and Dauda, 2018b). Moreover, it has been reported that HIV/AIDS has aggravated infant mortality rate in affected countries (McDonald & Roberts, 2006) and led to increase in public and private expenditure on health care services, facilities, and utilization (Mahal et al, 2008). Likewise, the disease has contributed to increase in school drop-out rate (Wobst & Arndt, 2004); decline in enrolment rates at various levels of education (Desmond & Gow, 2002; Arndt, 2006; Case & Ardington, 2006; Evans & Miguel; 2007; Fortson, 2011; and Ferreira, Pessoa & Dos Santos, 2011); reduction in school participation rate among children and orphans due to premature deaths of HIV/AIDS-infected mothers (Bhargava, 2005); delay in school attendance (Ainsworth, Beegle & Koda, 2005); low school performance (Tu et al, 2009); and decline in quantity and quality of teachers, leading to compromise of education quality (see World Bank, 2002; Vass, 2003; McPherson, 2003; Katahoire & Kirumira, 2008; and Mahal et al, 2008).

HIV/AIDS and Nutrition

Nutrition plays a very significant role in health and human development. The HIV/AIDS pandemic has been reported to have imparted negatively on households' nutrition status in some countries severely affected. According to the United Nations programme on HIV/AIDS (UNAIDS, 2004, 41) the disease is erasing decades of hard-won health, "economic and social progress, reducing life expectancy by decades, slowing economic growth, deepening poverty, and contributing to and exacerbating chronic food shortages" in countries mostly affected. The agency reiterates that giving the strains HIV/AIDS adds on public health finances, staff and other resources may force more people to seek private health care and as such, many households may have to choose between health care and other essentials such as food.

In a study conducted by Ji et al (2007) in Anhui Province of China where HIV/AIDS prevalence is observed to be high, using qualitative and quantitative approaches, the results revealed among other things that the epidemic is isolating family and children; having negative influence on their education and performance; and also compromising children's health and nutrition. The disease has also been reported to have triggered food shortages in most affected countries in Africa due to ill-health and death of farmers from HIV/AIDS infection as well as withdrawal from farms by farmers to attend to HIV/AIDS infected household members (see de Waal & Whiteside, 2003; Arrehag, de Waal, & Whiteside, 2006; Ivers et al., 2009; Naysmith, de Waal, & Whiteside, 2009; Gill, 2010; and Gebremichael et al, 2018).

HIV/AIDS and Development in West and Central Africa

The earlier facts presented in section two of this study on the status of HIV/AIDS and some indicators of development in WCA show that the disease is still a threat in the sub-region.

Moreover, the poor performance of development indicators could be traced among other things to the scourge of the pandemic; particularly, with empirical stance. For instance, empirical findings have shown that HIV/AIDS has detrimental effects on some development indicators in the region. Using dynamic panel data analysis to determine how the disease has affected growth and human capital development in West Africa Dauda (2018a and b) reported that the pandemic has negative and significant effect on growth and human capital in the sub-region. Specifically, the disease depressed growth through its negative and significant impact on life expectancy. Boutayeb (2009) in his study on Africa, which includes several countries in

WCA has also found that "global human development of African countries" has been negatively affected due to the negative impact of HIV/AIDS on:

> *health and demographic indicators such as life expectancy at birth, healthcare assistance, age and sex distribution, economic indicators like income, work force, and economic growth, education and knowledge acquisition and other indicators like governance, gender inequality and human rights*.

Furthermore, Dauda & Olaniyan (2017) reported negative and significant effects HIV/AIDS infected children and AIDS-induced orphans on human capital development in West Africa while other studies have also found food shortages, food insecurity, and malnutrition due to HIV/AIDS in the region (see Adeoti & Adeoti, 2008; and Benzekri et al, 2015). UNICEF (2011) has reported that "life in West and Central Africa is marked by chronic poverty, recurring food insecurity and poor diets that have left a generation of children undernourished."

Similarly, other studies have also shown that HIV/AIDS has negative effect on education variables. Six West African countries featured in the study by Bicego *et al (2003)*, while that of Kürzinger *et al* (2008) included one, which is Burkina Faso. Case, Paxson & Bleidinger (2004) also included two West African countries (Ghana and Niger) in their study while Monasch & Boerma (2004) also covered some West and Central African countries. Moreover, the study of Ainsworth & Filmer (2006) focused on 51 countries divided into 15 East and Southern African countries, 20 West and Central African countries as well as 8 from Latin America, 2 from the Caribbean, and 6 countries in Asia. The overwhelming findings from these studies revealed that HIV/AIDS has lowered school attendance and enrolment rates among others.

Conclusion and Policy Implications of the Study

This study examines the state of HIV/AIDS and development indicators in West and Central Africa. Facts on the status of the disease as well as indicators of development in the sub-region were presented in addition to brief review of related literature. The findings suggest that the burden of HIV/AIDS with respect to number of persons living with it, its prevalence, new infections and AIDS-related deaths appear to be high in the sub-region while development indicators perform poorly. Moreover, finding of empirical literature showed that in West and Central Africa, HIV/AIDS has detrimental effects on growth and development indicators. It is therefore recommended that governments at all levels and other stakeholders should commit all resources to containing and hurting the spread of the pandemic while policies should be put in place to improve development outcomes in the sub-region.

References

Abdulsalam, S. (2010). Macroeconomic effects of HIV/AIDS prevalence and policy in Nigeria: a simulation analysis. *Forum for Health Economics and Policy*, 13(2), 1-24.

Adeoti, A. & Adeoti J.O. (2008). HIV/AIDS and farms' production efficiency in Benue State, Nigeria. *African Journal of Biomedical Research*, 11(2), 145 – 153.

Ainsworth, M., Beegle., K & Koda, G. (2005). The impact of adult mortality and parental deaths on primary schooling in North-Western Tanzania. *The Journal of Development Studies,* 41(3), 412-439.

Audibert, M., Motel, P.C & Drabo, A. (2012). Global burden of disease and economic growth. Centre d'Etudes et de Recherches sur le Développement International (CERDI), Clermont Université – 65, bd François Mitterrand, 63000 Clermont-Ferrand, France. Accessed August 10, 2012 from, http://halshs.archives-ouvertes.fr/docs/00/67/87/13/PDF/2012.pdf.

Arndt, C. (2006). HIV/AIDS, human capital, and economic growth prospects for Mozambique. *Journal of Policy Modeling*, 28(5), 477-489.

Arndt, C & Lewis, J. (2000). The macroeconomic implications of HIV/AIDS in South Africa: a preliminary assessment. *South African Journal of Economics,* 68(5), 390-392.

Arrehag, L., de Waal, A & Whiteside, A. (2006). "New variant famine" revisited: Chronic vulnerability in rural Africa. *Humanitarian Exchange Magazine*, 33, 7-10.

Bicego, G., Rutstein, S., & Johnson, K. (2003). Dimensions of the emerging orphan crisis in sub-Saharan Africa. Social Science & Medicine, 56 (6), 1235–1247.

Bell, C., Devarajan, S & Gersbach, H. (2003). The long-run economic costs of AIDS: theory and application to South Africa. World Bank Working Paper 3152. World Bank: Washington DC.

Bell, C., Devarajan, S & Gersbach, H. (2004). Thinking about the long-run economic costs of HIV/AIDS. The macroeconomics of HIV/AIDS. M. Haacker. ed. Washington DC: International Monetary Fund. Chapter 3: 96-133.

Benzekri, N.A et al. (2015), High Prevalence of Severe Food Insecurity and Malnutrition among HIVInfected Adults in Senegal, *West Africa. PLoS ONE* 10(11), 1-17.

Bhargava, A. (2005). AIDS epidemic and the psychological well-being and school participation of Ethiopian orphans. *Psychology, Health & Medicine*, 10(3), 263-275.

Boutayeb, A. (2009). The impact of HIV/AIDS on human development in African countries. *BMC Public Health,* 9(Suppl 1), 1-10.

Case, A & Ardington, C. (2006). The Impact of paternal death on school outcomes: Longitudinal evidence from South Africa. *Demography* 43(3), 401-420.

Costanza, R., Hart, M., Posner, S & Talberth, J. (2009). Beyond GDP-The Need for New Measures of Progress. Boston University, He Pardee Papers / No. 4. Accessed November 30, 2018 from https://www.bu.edu/pardee/files/documents/PP-004-GDP.pdf

Cuddington, J. (1993a). Modeling the macroeconomic effects of AIDS, with an application to Tanzania. World Bank Economic Review, 7(2), 173-189.

Cuddington, J. (1993b). Further results on the macroeconomic effects of AIDS: the dualistic labour-surplus economy. *World Bank Economic Review*, 7(3), 403-417.

Dauda, R. S., & Olaniyan, O. (2017). Children affected by HIV/AIDS and human capital development in West Africa: A panel data analysis. *Advances in Social Sciences Research Journal*, 4(19) 132-149.

Dauda, R.S. (2018a). HIV/AIDS and economic growth: evidence from West Africa. The *International Journal of Health Planning and Management*. doi: 10.1002/hpm.2633.

Dauda, R.S. (2018b). Impact of HIV/AIDS epidemic on human capital in West Africa. The *International Journal of Health Planning and Management*, 33(2), 460-478.

de Waal, A., & Whiteside, A. (2003). New variant famine: AIDS and food crisis in Southern Africa. *The Lancet*, 362(9391), 1234-1237.

Desmond, C & Gow, J. (2002). The current and future impact of the HIV/AIDS epidemic on South Africa's children. AIDS, public policy and child well-being. G. A. Cornia. ed. UNICEF.

Evans, D. K & Miguel, E. (2007). Orphans and schooling in Africa: a longitudinal analysis. *Demography,* 44(1), 35-57.

Ferreira, P.C.G, Pessoa, S.A & Dos Santos, M.R. (2011). The impact of AIDS on income and human capital. *Economic Inquiry*, 49(4), 1104-1116.

Fortson, J.G. (2011). Mortality risk and human capital investment: the impact of HIV/AIDS in sub-Saharan Africa. *The Review of Economics and Statistics,* 93(1), 1-15.

Fungo, R. (2011). An analysis of the nutrition situation, agro ecosystems and food systems of West and Central Africa. Accessed November 30, 2018 from https://www.researchgate.net/publication/259452694_An_Analysis_of_the_Nutrition_situation_Agro_ecosystems_and_Food_systems_of_West_and_Central_Africa

Gardner, L. K & Lee, S.H. (2010). The impact of HIV/AIDS on health capital and Economic growth: a panel study of 38 countries from 1999-2005. *International Journal of Management,* 27(1), 153-161.

Gebremichael,D.Y., Hadush, K.T., Kebede, E.M & Zegeye, R.T. (2018). Food Insecurity, Nutritional Status, and Factors Associated with Malnutrition among People Living with HIV/AIDS Attending Antiretroviral Therapy at Public Health Facilities in West Shewa Zone, Central Ethiopia. *BioMed Research International*, 1-9: doi: 10.1155/2018/1913534 Accessed December 1, 2018 from https://www.hindawi.com/journals/bmri/2018/1913534/.

Gill, T. B. (2010). Modeling the impact of HIV/AIDS upon food security of diverse rural households in western Kenya. *Agricultural Systems*, 103(5), 265-281.

Haacker, M. (2010). HIV/AIDS, economic growth, inequality. The socioeconomic dimensions of HIV/AIDS in Africa: challenges, opportunities, and misconceptions. D.E. Sahn. ed. New York: Cornell University Press. Chapter 1: 12–41.

Ivers, L.C. et l. (2009). HIV/AIDS, Undernutrition and Food Insecurity. *Clinical Infectious Diseases*, 49(7), 1096–1102.

Ji, G., Li, L., Lin, C., & Sun, S. (2007). The impact of HIV/AIDS on families and children-A study in China. AIDS. 21(Suppl 8):S157. doi:10.1097/01.aids.0000304712.87164.42.

Jacobs, G & Šlaus, I. (2010). Indicators of Economics Progress-The Power of Measurement and Human Welfare, Jacobs, Garry et al. (2010). http://www.cadmusjournal.org/files/pdfreprints/vol1issue1/Indicators%20of%20Economics%20Progress-The%20Power%20of%20Measurement%20and%20Human%20Welfare,%20Jacobs,%20Garry%20et%20al.pdf

Kambou, G. Devarajan, S & Over, M. (1992). The economic impact of AIDS in an African country: simulations with a computable general equilibrium model of Cameroon. *Journal of African Economies,* 1(1),109-130.

Katahoire, A. R. & Kirumira, E. K. (2008). The impact of HIV/AIDS on higher education institutions in Uganda. International Institute for Educational Planning, UNESCO.

Kurzinger, M.L., Pagnier, J., Kahn, J.G., Hampshire, R., Wakabi, T., & Dye, T.D.V. (2008). Education status among orphans and non-orphans in communities affected by AIDS in Tanzania and Burkina Faso, AIDS Care: Psychological and Socio-medical Aspects of AIDS/HIV, 20(6), 726-732.

Mahal, A., Canning, D., Odumosu, K. & Okonkwo, P. (2008). Assessing the economic impact of HIV/AIDS on Nigerian households: a propensity score matching approach. *AIDS,* 22(Supp.1), S95-S101.

McDonald, S & Roberts, J. (2006). AIDS and economic growth: a human capital approach. *Journal of Development Economics,* 80(1), 228-250.

McPherson, M. F. (2003). Macroeconomic models of the impact of HIV/AIDS. Center for Business and Government, John F. Kennedy School of Government, Harvard University. Retrieved July 5, 2011, from, http://www.heart-intl.net/HEART/0303005/MacroeconomicMode.pdf.

Monasch, R., & Boerma, J.T. (2004). Orphanhood and childcare patterns in Sub-Saharan Africa: An analysis of national surveys from 40 countries. AIDS, 18(Suppl. 2), S55-S65.

Naysmith, S., de Waal, A & Whiteside, A. (2009). Revisiting new variant famine: The case of Swaziland. *Food Security*, 1(3), 251-260.

Tu, X., Lv, Y., Li, X., Fang, X., Zhao, G., Lin, X., Hong, Y., Zhang, L., & Stanton, B. (2009). School performance and school behaviour of children affected by acquired immune deficiency syndrome (AIDS) in China. *Vulnerable Children and Youth Studies*, 4(3), 199-209.

Tandon, A. (2005). Macroeconomic impact of HIV/AIDS in the Asian and Pacific region. Asian Development Bank, Philippines, ERD Working Paper No. 75. Accessed February 13, 2011 from http://www.adb.org/sites/default/files/pub/2005/WP075.pdf

Todaro, M.P., & Smith, S.C. (2012). *Economic Development*. 11th edition, Addison-Wesley, Boston.

United Nations Programme on HIV/AIDS (UNAIDS). 2004. Report on the global AIDS epidemic. Retrieved Jan. 15, 2014, from http://www.unaids.org/en/media/unaids/contentassets/documents/unaidspublication/2004/GAR2004_en.pdf.

UNAIDS. (2018). HIV estimates with uncertainty bounds 1990-2017. Retrieved November 7, 2018 from http://www.unaids.org/en/resources/documents/2017/HIV_estimates_with_uncertainty_bounds_1990-2017.

UNICEF. (2011). West and Central Africa. Accessed Noveber 30, 2018 from https://www.unicef.org/hac2011/files/HAC2011_4pager_WCARO_rev1.pdf.

UNICEF. (2018). Nutrition Crisis in Mali. Accessed November 30, 2018 from https://www.unicef.org/wca/stories/nutrition-crisis-mali.

United Nations Development Programme. (2018). Human development indices and indicators. Accessed November 7, 2018 from http://hdr.undp.org/sites/default/files/2018_human_development_statistical_update.pdf.

Vass, J. (2003). The impact of HIV/AIDS. In *Human Resources Development Review,* 186-207.

Wobst, P & Arndt, C. 2004. HIV/AIDS and labor force upgrading in Tanzania. *World Development,* 32(11), 1831–1847.

World Bank. 2002. Education and HIV/AIDS: A window of hope. Retrieved March 19, 2013, from http://siteresources.worldbank.org/EDUCATION/Resources/278200-1099079877269/547664-1099080042112/Edu_HIVAIDS_window_hope.pdf.

World Bank. (2018). World development indicators. Accessed November 23, 2018 from http://wdi.worldbank.org/tables.

Young, A. (2005). The gift of dying: the tragedy of AIDS and the welfare of future African generations. *Quarterly Journal of Economics*, 120(2), 243-266.