



REVIEW

HIV epidemiology in Nigeria



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Abstract Nigeria realizes the devastating effects of HIV/AIDS on its people, health, economic, and social progress fairly recently. This paper analyses descriptively the HIV epidemiology in Nigeria based on the sentinel surveillance system in place. Recently, it is estimated that about 3, 229, 757 people live with HIV in Nigeria and about 220, 393 new HIV infections occurred in 2013 and 210,031 died from AIDS related cases. People practicing low-risk sex are the driving force of HIV epidemic in Nigeria while the high risk groups involving female sex workers, men who have sex with men and injecting drug users contribute substantially to new infections. In conclusion, HIV prevalence among adults in Nigeria is relatively low (3.2%), yet Nigeria is an enormous country where HIV infection remains an issue that demands a systematic and highly tailored intervention. © 2016 The Authors. Production and hosting by Elsevier B.V. on behalf of King Saud University. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

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1. Introduction

HIV infection has spread over the last 30 years and has a great impact on health, welfare, employment and criminal justice sectors; affecting all social and ethnic groups throughout the world. Recent epidemiological data indicate that HIV remains a public health issue that persistently drains our economic sector having claimed more than 25 million lives over the last three decades (WHO Fact Sheet, 2014). The estimated overall number of People Living with HIV (PLWHIV) by the end of 2014 was approximately 36.9 (34.3–41.4) million and Sub-Saharan Africa was the most affected region, having 25.8 (24.0–28.7) million PLWHIV and 66% of all people with HIV infection living in the region (Joint United Nations Global Fact Sheet, 2015).

Of all people living with HIV globally, 9% of them live in Nigeria (UNAIDS, 2014a). The country already burdened by political instability and endemic political corruption as a result of almost 33 years of military rule now seems prepared to 'wipe out' the virus within a few decades (Nigeria National Agency for the Control of AIDS, 2012). Notwithstanding the progress in institutional reforms and political commitment to tackle the disease, the country has seen more citizens placed on life saving medication of active antiretroviral therapy (AART) to increase the survival of such HIV seropositive individuals (Nigeria National Agency for the Control of AIDS, 2012).

This present review surveys the dynamics of HIV transmission in Nigeria, its emerging trends and the sentinel surveillance system put in place by the governmental and non-governmental institutions, and international organizations. Finally, a discussion on how this information could aid HIV/AIDS prevention and best behavioural practices among the highly risk individuals is presented.

2. Methods and data sources

2.1. Geographical area

Nigeria is a West African country, bordered in the North by the Niger Republic; in the East by the Republic of Chad and Cameroun; in the West by the Republic of Benin and in the South by the Atlantic Ocean. The nation covers a total surface area of 923, 768 km² and 800 km of coast line and lies within latitudes 4°1' and 13°9' North and longitudes 2°2' and 14°30' East. Nigeria is divided into 36 states of the federation (divided into six geopolitical zones) including the Federal Capital Territory (FCT) in Abuja and is home to a population of 170 million.

2.2. HIV/AIDS surveillance system

The method adopted in this paper was a descriptive analysis of the HIV epidemiology in Nigeria, based on the sentinel surveillance system. The most comprehensive national data on HIV/AIDS in Nigeria is through the sentinel surveillance system adopted by the government. Data are collected regularly from all zones, states, towns and rural areas in the country and with the target population being pregnant women aged between 15 and 49 years attending antenatal clinics (ANC) in selected health facilities in all states in the country (National Population Commission, 2009; Federal Ministry of Health, 2009, 2010a,b). The assessment of the epidemiological situation in Nigeria is not based on the analysis of the routine notifications of newly diagnosed HIV infections delivered by physicians and/or laboratories because the monitoring and evaluation system in place though relatively strong at the national level is much weaker at the state and local government levels, and across other sectors (public, private, and civil society). In addition, the harmonization of monitoring and evaluation system in the area of data collection and reporting tools and templates is poor across partners and service delivery areas, thus burdening data collection at lower levels (Measure Evaluation, 2010).

The information retrieval system used in this study included a search of databases (PubMed) and the identification of fugitive literature (governmental and other institutional reports).

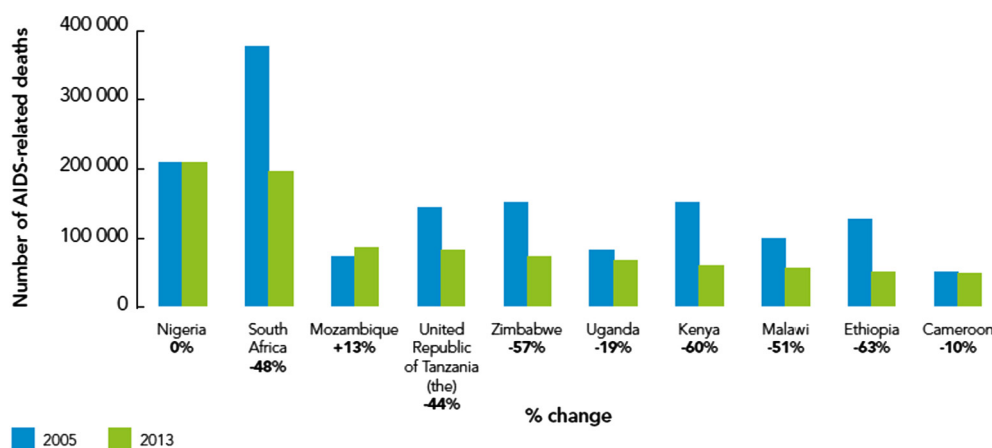
3. HIV/AIDS in Nigeria: an overview

The first two AIDS cases in Nigeria was diagnosed in 1985 and reported in 1986 in Lagos one of which was a young female sex worker aged 13 years from one of the West African countries (Nasidi and Harry, 2006). The news of this first AIDS case sent panic, doubt and disbelief to the whole nation as AIDS was perceived as the disease of American homosexuals. Some people saw the story about AIDS as a ploy by the Americans to discourage sex and many acronyms, one of which was 'American Idea for Discouraging Sex' emerged at the time. This earlier perceptions, skepticisms and reactions of the Nigerian public towards the 'foreign' AIDS case and HIV/AIDS in general has been well documented in the introductory part of a fairly recent doctoral thesis on 'Modelling HIV/AIDS Epidemic in Nigeria' that can be found online (Eze, 2009).

Notwithstanding the above misconception by the Nigerian public, since the beginning of the epidemic in the mid-1980s, a total of 220,000 new HIV infections have been reported in 2014 (Table 1). Most cases were adults over the age of 15 years. A substantial number of new HIV-infected children

Table 1 HIV/AIDS in Nigeria, 2014 (UNAIDS, 2014a,b,c; UNAIDS Gap Report, 2014; USAID, 2014; UNAIDS Data at <http://data.un.org/Data.aspx?d=UNAIDS&f=inID%3A32>).

Indicator (in millions or otherwise indicated)	Nigeria	Sub-Saharan Africa	Global
Estimated number of people living with HIV/AIDS 2014	3.2	25.8	36.9
Estimated number of children living with HIV/AIDS, 2014	0.4	2.3	2.6
Estimated number of deaths due to HIV/AIDS, 2014	0.21	0.79	1.2
Estimated number of new HIV infections, 2014	0.22	1.4	2.0
-Adult (15 yr. +)	0.17	1.2	1.8
-Children (<15 yr.)	0.058	0.19	0.22
Number of adult population (15 yr. +) estimated to be living with HIV/AIDS, 2014	3.0	20.3	34.3
-Adult women (15 yr. +)	1.7	12.1	17.4
-Children (<15 yr.)	0.36	2.3	2.6
% of young women (15–24 yr.) estimated to be living with HIV/AIDS, 2014	1.3	3.4	0.4
% of young men (15–24 yr.) estimated to be living with HIV/AIDS, 2014	0.7	1.4	0.3
Estimated number of AIDS orphans (0–17 yr.), 2014	1.6	10.9	13.3
Number of people estimated to be receiving ART, 2014	0.75	9.1	12.9

**Figure 1** Trends in AIDS-related deaths in sub-Saharan Africa, 2005 and 2013. Source: UNAIDS 2013 Estimates.

(<15 years) was also noted in 2014 ($n = 58,000$). Notably, previous data had linked the infections of a substantial number of HIV-infected children to their mothers' infections (Nigeria National Agency for the Control of AIDS, 2012). The table also indicates that 1.6 million AIDS orphans were estimated to be in the country in 2014. The number of people estimated to be receiving ART was 747,382 with 3.0 million adult populations estimated to be living with the disease as of 2014. Albeit due to its population size, Nigeria is now the second largest HIV disease burden in the world with 3.2 million after South Africa which has 6.8 million burden of the disease though prevalence is stable at 3.4% (FMoH, 2013; Nigeria National Agency for the Control of AIDS, 2012; United States Agency International Development, 2013). Table 1, also indicates a dearth of access to treatment and care to PLWHIVA. Perhaps, this has led to the seemingly unchanged trends in AIDS-related deaths in Nigeria between 2005 and 2013 (Fig. 1).

By states, HIV prevalence as shown in Fig. 2 clearly varies. While HIV/AIDS tends to be generally low in most parts of the country, the highest numbers of HIV prevalence were found mostly in Benue, FCT, Anambra, Bayelsa and Akwa Ibom States of the federation. These marked differences in the prevalence rates among these states could be due to a

number of factors including but not limited to cultural differences, varying levels of education, religion and differing socio-economic structures. Indeed, there must be interplay of these factors on HIV/AIDS outcomes in these states. The variations in socio-cultural and religious practices among about 400 different ethnic groups in Nigeria have implications on the risk of HIV transmission. Notably, some practices that include multiple and concurrent sex partners, delivery outside the health facility without a skilled birth attendant, female genital mutilation, unsterile traditional bloodletting and traditional marking and tattooing will lead to an increase in the risk of HIV transmission (Nigeria National Agency for the Control of AIDS, 2010a,b).

4. HIV reporting

Following the first AIDS case reported in 1986, the Federal Ministry of Health (FMoH) that same year set up the National Expert Advisory Committee on AIDS (NEACA) and requested the assistance of WHO leading to the establishment of several HIV testing centres in the country and the coming up with a comprehensive medium-term plan for the nation's battle against HIV/AIDS. However, no serious efforts at

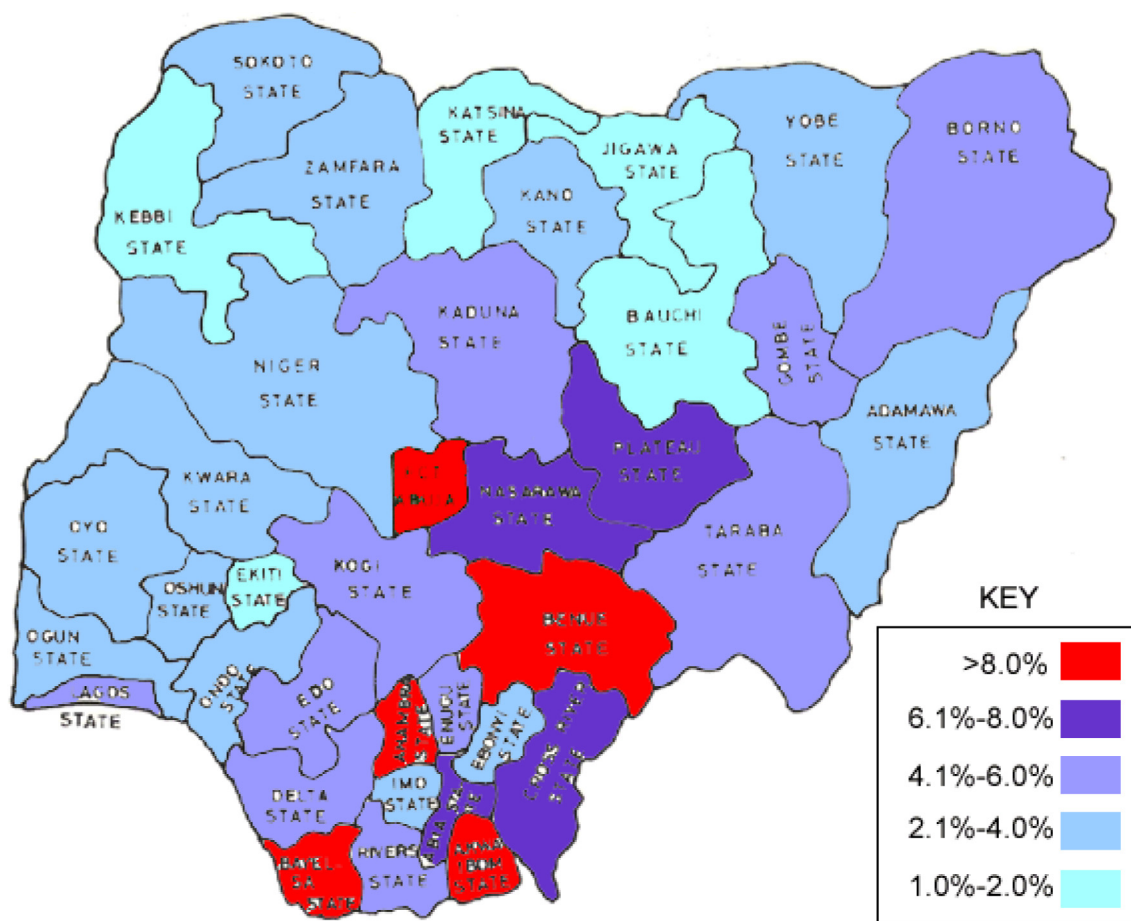


Figure 2 HIV/AIDS prevalence by States in Nigeria, 2012. Source: Nigeria National Agency for the Control of AIDS (2012).

tackling the epidemic were evident until the restoration of democracy in the country in 1999 (Nasidi and Harry, 2006).

Following this restoration of democracy, the government 'kick starts' the race against the epidemic in the country, fostering links with many international organizations to carry out surveys on some aspects on HIV/AIDS including the National Demographic and Health Survey (National Population Commission, 1999, 2003), the National HIV/AIDS and Reproductive Health Survey (NARHS) (Family Health International, 2000) and the Behavioural Surveillance Survey (BSS) (Daily Trust Newspaper, 2003).

The Nigerian Institute of Medical Research (NMR) also published the most comprehensive data on reported cases of HIV/AIDS in Nigeria in 2000. The institute retrieved data from the records of 1,057 health and laboratory facilities (comprising 289 public and 370 private hospitals and 181 public and 217 private laboratories) on all diagnosed HIV infections, AIDS cases and AIDS related deaths between 1989 and 1999 as cited in Eze (2009).

5. Trends in HIV reporting from 1991 to 2014

The first HIV/AIDS sentinel survey in Nigeria was conducted in 1991 with 1.8% prevalence reported. This was followed by 3.8% in 1993, 4.5% in 1996, 5.4% in 1999 and a 5.8% peak in 2001. From 2001 a somewhat decline in trends were noted,

starting with 5.0% in 2003, 4.4% in 2005, 4.6% in 2008, 4.1% in 2010 and 3.4% in 2013 (NARHS, 2013; Nigeria National Agency for the Control of AIDS, 2012, 2010a) (see Fig. 3). It is now clear that HIV prevalence in the country is relatively stable. This positive trend is largely attributed to an effective reporting and intervention system (UNAIDS, 2014b).

6. Dynamics of HIV transmission

Heterosexual intercourse is the major route for HIV transmission in Nigeria accounting for over 80% of the infections with the majority of remaining HIV infections among key affected populations (Nigeria National Agency for the Control of AIDS, 2014, 2010b). Other modes of transmission such as intravenous drug use and same-sex intercourse are now growing in importance (Nigeria National Agency for the Control of AIDS, 2010b). In fact, it has recently been modelled that the high-risk groups which constitute about 1% of the general population in Nigeria and involving men that have sex with men (MSM), female sex workers (FSWs) and injecting drug users (IDUs) will significantly contribute to new HIV infections in the coming years (Nigeria National Agency for the Control of AIDS, 2012). These groups and their partners will contribute to 40% of new infections while people practicing low-risk sex (heterosexual) in the general population will contribute to 42% of the infections due to low condom use and

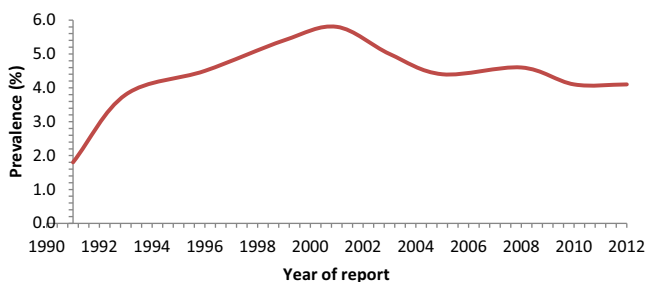


Figure 3 Trends in HIV prevalence in Nigeria.

high sexual networking (Nigeria National Agency for the Control of AIDS, 2012).

6.1. Sex workers

Following the diagnosis and report of the first AIDS case in a sex worker in Lagos, testing of sex workers began in the state in 1988–1989 with two per cent of the sex workers tested at the time reported to be HIV positive. The number of reports increased steadily to 15% in 1993 and by 1996, 31% of the sex workers in Lagos were HIV positive (Joint United Nations Epidemiological Fact Sheet, 2004). Today, the female sex workers (FSW) constitute the sub group most affected by HIV/AIDS in Nigeria (Joint United Nations Epidemiological Fact Sheet, 2004; Nigeria National Agency for the Control of AIDS, 2012). In an integrated biological and behavioural surveillance (IBBS) survey carried out by the Federal Ministry of Health in 2007 and 2010 respectively comprising five and eight states of the federation (e.g. Lagos, Kano, Edo, Anambra and Cross River) including the FCT, different HIV prevalence among female sex worker was noted in these states and such has been largely attributed to the varying use of condom and alcohol consumption by the sex workers (Federal Ministry of Health, 2008, 2010a,b). The prevalence of HIV/AIDS among sex workers in Nigeria was approximately 25% in 2012 while prevalence among people 15–49 years old in the country in 2011 was around 4% (Joint United Nations Global Report, 2012a,b).

6.2. Men who have sex with men

Men who have sex with men constitute the second most-at-risk populations affected by the epidemic in Nigeria according to 2010 IBBS survey with 17.2% average prevalence rate (Federal Ministry of Health, 2010a,b). The FCT was noted for having the highest prevalent rate (37.6%). A lower consistent use of condom than FSWs was reported by this subgroup of population albeit they appeared to have high levels of HIV prevention knowledge (Federal Ministry of Health, 2010a,b). A secondary analysis of the 2010 IBBS data involving 1545 MSM between 18 and 49 years showed that high number MSM practice risky sexual behaviour that is driven by alcohol and multiple male partners (Adeyemi et al., 2012).

6.3. Injecting drug users

While data from the 2010 IBBS survey revealed that injecting drug users (IDUs) were to a lesser extent affected by the HIV/AIDS epidemic in the six states surveyed, 4.2% of this

population was HIV positive with FCT having the greatest prevalence rate which was 9.3%. Of particular concern is that IDUs in FCT reported injecting drugs more than once a day and less than 40% consistently used sterilized needles. The report also noted that female IDUs had about seven times higher HIV prevalence than their male counterparts. Low condom use and with 20% reported sex with FSWs were also noted among the IDUs (Federal Ministry of Health, 2010a,b).

6.4. Gender and age distribution of HIV infections

Findings from the assessment of national HIV/AIDS response conducted in 2013 based on the secondary analysis of NARHS 2007 and 2012 indicated a feminization of the HIV/AIDS epidemic. The prevalence of infection is higher for females than male across all age groups except for the 35–39 years and the 40–44 years age groups. In addition, prevalence is highest among FSW followed by MSM. Prevalence is also disproportionately higher among female IDUs than their male counterparts. Several factors contributing to the gender gap and age distribution of HIV infections comprised of poverty, child marriage, gender-based violence, masculinity and femininity norms, disabilities, harmful traditional rites as well as human rights, legal and political factors (Nigeria National Agency for the Control of AIDS, 2015).

7. Discussion

Epidemiological data in Nigeria on HIV/AIDS as in other African countries stem mostly from the HIV/AIDS surveillance system. However, with the restoration of democracy in Nigeria together with the concerted efforts of the Federal Government since 1999 and its spirited declaration of action against HIV/AIDS, many international organizations and non-governmental organizations sprang up in the country, contributing substantially to data on HIV/AIDS in the country. This provides additional recent information on prevalence and behavioural data on HIV/AIDS. The HIV prevalence in Nigeria now appears to have assumed a downward trend following a relative stability from 2005 and 2010, yet a sustained and more effective intervention is still needed to avert increased incidence by the most-at-risk subpopulations in the country.

Most cases of HIV infection in Nigeria occur via heterosexual means with epidemics more pronounced among the females (Nigeria National Agency for the Control of AIDS, 2012, 2010b). Although women do have rights in Nigeria the patriarchal society dictates that their rights are weaker than that of men. For instance, if a woman has a girl first, she is more likely to have more children, have short periods between pregnancies, and be subjected to polygamy and less likely to use contraceptives. Each of these factors increases a woman's vulnerability to HIV (World Bank Policy Research Working Papers, 2014). Thus, the Nigerian HIV prevention plan should address these gender factors that increase female vulnerability to HIV, promote integration of services and evidence-based HIV programmes. Such programmes and services should be gender sensitive and responsive, with gender related barriers reduced to a minimum.

Recent data also show a growing rate of HIV infection among MSM, FSWs and IDUs (Federal Ministry of Health,

2008, 2010a,b). Risky sexual behaviours among these subgroups of people such as unprotected anal intercourse, low condom use as a result of alcohol consumption and other factors have been noted. For instance, HIV prevalence among FSWs has remained consistently high and the proportion of new diagnosed HIV cases among this subgroup is high. The behaviours indicators also reveal the existence of unsafe sexual practices most especially with their boyfriends (Federal Ministry of Health, 2010a,b). There is thus an overriding need for effective, systematic and highly tailored public health interventions in the country. It is also important to maintain and strengthen special surveillance activities on these subgroups of the population in order to obtain a clearer picture of their changes in trends over the next few years.

Young people recorded the most prevalence of HIV/AIDS in the country. Thus, educational, structural and cultural factors that can influence good sexual and behavioural practices among this group of people need to be fostered. Unfortunately, research on sexual networking among this group of people is sparse with few earlier surveys carried out between 1990 and 1995 in Ekiti (Orubuloye et al., 1991), Lagos (Oloko and Omoboye, 1993) and Calabar (Ogbuagu and Charles, 1993). A more recent research tailored towards the different subgroups of the Nigerian population including the most vulnerable to HIV/AIDS infection should be undertaken so as to be able to study and understand how the disease spreads within the social network and what core values, behaviours or norms are being shared and/or practiced with the network. Efforts should be also taken to prevent mother-child infection through proper medical provisions and care of the pregnant women.

8. Conclusions

Nigeria is an enormous country with a very high number of people living with HIV despite a relatively low HIV prevalence. The HIV epidemic in Nigeria is concentrated mainly among heterosexuals, yet the trend is now shifting towards most-at-risk in the populations. Enhanced and more strengthened surveillance system targeting the whole population and with special attention to the subgroup most-at-risk need to be implemented. More prevention campaigns should be planned and carried out while the monitoring system of HIV/AIDS in Nigeria requires improvement in terms of data complement and integration in order to allow for better assessment of the epidemic. Efforts should also be made towards effective sexually transmitted infection programming, proper integration of HIV/AIDS and sexual and reproductive health services and fostering of gender equality at the population level. Finally, encouraging HIV testing among the Nigerian population to ensure everyone knows their HIV status together with efficient linkage to care for newly diagnosed HIV cases is key to mitigate new infections and provide HIV treatment to all.

9. Future perspectives

While the prevalence of HIV/AIDS appears stabilizing in Nigeria, to think that the trend cannot take an upwards turn will be an understatement. Indeed, *'the prevalence of HIV*

disease will increase, while the future rate of new infections is uncertain' (Nikolopoulos et al., 2008).

References

- Adeyemi, A.O., Oyediran, K., Issa, K.B., Azeez, A., Atobatele, A., Fakunle, O., 2012. HIV risk among men who have sex with men (MSM) in Nigeria: a potential population for HIV vaccine trial. *Retrovirology* 9 (Suppl. 2), P223. Available: <<http://www.retrovirology.com/content/pdf/1742-4690-9-S2-P223.pdf>> .
- Daily Trust Newspaper, 2003. Nigeria. National HIV/Aids and Reproductive Health Survey: Health Ministry to Redirect Campaign, available: <<http://allafrica.com/stories/200312300251.html>> . (accessed 8 February 2013).
- Eze, J.I., 2009. Modeling HIV/AIDS Epidemic in Nigeria (Ph.D. thesis). University of Glasgow. Available: <<http://theses.gla.ac.uk/642/1/2009EzePhD.pdf>> (accessed 6 February 2013).
- Family Health International (FHI), 2000. HIV/AIDS Behavioural Surveillance Survey: Nigeria. Report and Data Sheet. Available: <http://gametlibrary.worldbank.org/FILES/689_BSS%20Nigeria%202000.pdf> (accessed 8 February 2013).
- Federal Ministry of Health, 2008. HIV/STI Integrated Biological and Behavioural Surveillance Survey 2007. Federal Ministry of Health, Abuja, Nigeria. Available: http://www.wisdomofwhores.com/references/blog_refs/NigeriaIBSSReport2008HV.pdf (accessed 10 February 2013).
- Federal Ministry of Health, 2010a. HIV Integrated Biological and Behavioural Surveillance Survey 2010. Federal Ministry of Health, Abuja, Nigeria. Available: <http://www.popcouncil.org/pdfs/2011HIV_IBSS2010.pdf> (accessed 10 February 2013).
- Federal Ministry of Health, 2010b. National HIV Sero-prevalence Sentinel Survey Among Pregnant Women Attending Antenatal Clinics in Nigeria. Federal Ministry of Health, Abuja, Nigeria, p. 2010. Available: <http://www.nigeriaaids.org/documents/2010_National%20HIV%20Sero%20Prevalence%20Sentinel%20Survey.pdf> (accessed 8 February 2013).
- Federal Ministry of Health, 2009. Assessment report of the National Response to young people sexual and reproductive health in Nigeria. Federal Ministry of Health, Abuja, Nigeria, p. 2009. Available: <<http://www.actionhealthinc.org/publications/docs/Assessment%20Report%20of%20National%20Response%20To%20Young%20People%27s%20Sexual%20and%20Reproductive%20Health%20in%20Nigeria.pdf>> (accessed 7 February 2013).
- Federal Ministry of Health, 2013. National HIV & AIDS and Reproductive Health Survey 2012, NARHS II.
- Joint United Nations Programme on HIV and AIDS, 2004. Epidemiological Fact Sheet on HIV/AIDS and Sexually Transmitted Infections in Nigeria: An update. Available: <http://data.unaids.org/Publications/Fact-Sheets01/Nigeria_en.pdf> (accessed 10 February 2013).
- Joint United Nations Programme on HIV and AIDS, 2012a. Global Fact Sheet on World AIDS Day. Available: <http://www.unaids.org/en/media/unaids/contentassets/documents/epidemiology/2012/gr2012/2012_FS_regional_ssa_en.pdf> (accessed 7 February 2013).
- Joint United Nations Programme on HIV and AIDS, 2012b. Global report: UNAIDS report on global AIDS epidemic, 2012. Available: <http://www.unaids.org/en/media/unaids/contentassets/documents/epidemiology/2012/gr2012/20121120_UNAIDS_Global_Report_2012_with_annexes_en.pdf> (accessed 5 February 2013).
- Joint United Nations Programme on HIV and AIDS, 2014a. The Gap Report: Children and Pregnant Women Living with HIV, Geneva.
- Joint United Nations Programme on HIV and AIDS, 2014b. Factsheet 2015: Global Statistics, Geneva.
- Joint United Nations Programme on HIV and AIDS, 2014c. Children and HIV: Fact Sheet, Geneva.
- Joint United Nations Programme on HIV and AIDS, 2015. Factsheet 2015: World AIDS Day 2015.

- Measure Evaluation, 2010. Report on the Status of the Nigerian National HIV Monitoring and Evaluation System. Assessment Using 12 Components System Strengthening Tool.
- Nasidi, A., Harry, T.O., 2006. The epidemiology of HIV/AIDS in Nigeria. In: Adeyi, O., Kanki, P.J., Odutolu, O., Idoko, J.A. (Eds.), *AIDS in Nigeria: A Nation on the Threshold*. Harvard Center for Population and Development Studies, Cambridge (Massachusetts). Available: <<http://www.apin.harvard.edu/Chapter2.pdf>> (accessed 7 February 2012).
- National Population Commission, 1999. Nigeria Demographic and Health Survey, 1999. Available: <<http://www.measuredhs.com/pubs/pdf/FR115/FR115.pdf>> (accessed 8 February 2013).
- National Population Commission, 2003. Nigeria Demographic and Health Survey, 2003. Available: <<http://www.measuredhs.com/pubs/pdf/FR148/FR148.pdf>> (accessed 8 February 2013).
- National Population Commission and ICF Macro, 2009. Nigeria Demographic and Health Survey 2008. Abuja, Nigeria, Available: <<http://www.measuredhs.com/pubs/pdf/SR173/SR173.pdf>> (accessed 6 February 2013).
- Nigeria National Agency for the Control of AIDS, 2010a. National HIV/AIDS Strategic Plan 2010–2015. Nigeria National Agency for the Control of AIDS, Abuja, Nigeria. Available: <<http://nigeria.unfpa.org/pdf/nsp.pdf>> (accessed 9 February 2013).
- Nigeria National Agency for the Control of AIDS, 2010b. United Nations General Assembly Special Session (UNGASS) Country Progress Report. Nigeria: January 2008 to December 2009. Nigeria National Agency for the Control of AIDS. Available: <http://data.unaids.org/pub/Report/2010/nigeria_2010_country_progress_report_en.pdf> (accessed 7 February 2013).
- Nigeria National Agency for the Control of AIDS, 2012. Global AIDS Response: Country Progress Report. GARPR, Abuja, Nigeria. Available: <<http://www.unaids.org/en/dataanalysis/knowyourresponse/countryprogressreports/2012countries/Nigeria%202012%20GARPR%20Report%20Revised.pdf>> (accessed 7 February 2013).
- Nigeria National Agency for the Control of AIDS, 2014. Global AIDS Response Country Progress Report, Nigeria.
- Nikolopoulos, G., Paraskevis, D., Hatzakis, A., 2008. HIV epidemiology in Greece. *Future Microbiol.* 3 (5), 507–516. Available: <<http://www.futuremedicine.com/doi/abs/10.2217/17460913.3.5.507>> .
- Ogbuagu, S.C., Charles, J.O., 1993. Survey of sexual networking in Calabar. *Health Transition Rev.* 3, 105–119. Available: <<http://htc.anu.edu.au/pdfs/Ogbuagu1.pdf>> .
- Oloko, B.A., Omoboye, A.O., 1993. Sexual networking among some Lagos state adolescent Yoruba students. *Health Transition Rev.* 3 (2). Available: <<http://htc.anu.edu.au/pdfs/Oloko1.pdf>> .
- Orubuloye, I.O., Caldwell, J., Caldwell, P., 1991. Sexual networking in Ekiti District of Nigeria. *Stud. Fam. Plan.* 22 (2), 61–73.
- United States Agency International Development, 2013. HIV/AIDS Health Profile: Sub-Saharan Africa. Available: <http://transition.usaid.gov/our_work/global_health/aids/Countries/africa/hiv_summary_africa.pdf> (accessed 7 February 2013).
- United States Agency International Development, 2014. Orphans and Vulnerable Children Affected by HIV and AIDS.
- World Bank Policy Research Working Papers, 2014. Son Preference, Fertility and Family Structure: Evidence from Reproductive Behaviour Among Nigerian Women.
- World Health Organization Fact Sheet, 2014. Global Update on the Health Sector Response to HIV, Geneva.