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Residence, Education, Wealth, and HIV/AIDS Prevention Knowledge Among Nigerian Adults

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

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Walden University
2025

Abstract

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MBA, Colorado Technical University, 2010

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Doctoral Study Submitted in Partial Fulfillment

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Abstract

HIV has remained the most prevalent and deadliest epidemic affecting humanity. It is pertinent to note that despite the number of years since the first case was reported in the early 1980s in the United States, and concerted efforts by local, national, and international governmental and nongovernmental agencies at curbing it, the level of knowledge of HIV transmission and the disease prevention, especially among Nigerians, is still not encouraging. Nigeria, the most populous country in Sub-Saharan Africa ranks second globally as the country with the highest number of people living with HIV/AIDS, which is currently estimated at 3 million. In this correlational study, secondary data from the 2018 Nigerian Demographic Health Survey were used to examine the relationship between the place of residence, wealth, and HIV/AIDS prevention knowledge among Nigerian adults as well as the moderating effect that education has on the relationship. The participants were adults 20–49 years old (N = 42,769) randomly selected from the 36 states and the Federal Capital Territory of Nigeria. Descriptive statistics and logistic regression models were used to analyze the data. The social cognitive theory grounded the study. The results indicated that 95% of respondents had heard about HIV, but there was a significant gap in comprehensive HIV knowledge about its transmission. Wealth (i.e., socioeconomic status) had a moderating effect on HIV knowledge. This study may lead to positive social change by enabling HIV workers including nurses, doctors, psychologists, social workers, community health educators, and public health practitioners to develop informed strategies for HIV prevention in Nigeria.

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Dedication

I dedicate this doctoral study to my father, Late Chief Robert A. Nwaru, and my sister, Late Mrs. Queen N. Ikonne, who in conjunction with the other members of my family encouraged me to pursue my doctoral studies and wished me well but unfortunately could not live to witness my graduation. I will ever remember you in my thoughts.

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Section 1: Foundation of the Study and Literature Review

Introduction

HIV AIDS has remained the most significant public health issue affecting humanity for over 4 decades. Although HIV/AIDS is preventable and widely researched, the number of fatalities attributable to the disease is alarming globally, especially in Sub-Saharan Africa (SSA), countries such as Nigeria (The Joint United Nations Program on HIV/AIDS [UNAIDS], 2018). The trend has resulted in several research efforts directed towards its control, with a few significant successes (Odimegwu et al., 2017). Odimegwu et al. (2017) observed that the slight progress achieved in HIV/AIDS prevention and control could be attributable to increased funding, which improved the provision of antiretroviral treatment and better approaches to treatment. However, despite concerted efforts to control HIV, especially in Nigeria, the most populous country in SSA, the country still ranks second globally as having the highest number of people living with HIV/AIDS (UNAIDS, 2021a). HIV has been shown to cause AIDS although the origin of the HIV disease itself is still not definitively known; however, theories are based on a United States-based, national case-controlled study on HIV/AIDS and several cases of the infection experienced among partners indicating that the disease has much to do with sexual transmission (De Cock et al., 2012). On the other hand, Morison (2001) opined that the cause of HIV/AIDS epidemics could be traced to complacency among individuals in their methods of injecting drug use (IDU) and other activities, such as sex work and men having sex with men.

Section 1 includes the study background and the problem statement highlighting the gaps in literature relating to HIV/AIDS prevention knowledge among the adult population in Nigeria that were addressed in this study. In Section 1, I also provide the purpose of the study, research questions and hypotheses, theoretical foundation, nature of the study, and literature search strategies. In an extensive literature review, I discuss peer-reviewed articles related to the research variables and questions. Section 1 also contains definitions of key terms, the assumptions, scope and delimitations of the study, and the significance of the study before concluding with a summary.

Background

During the 2021 United Nations High-Level Meeting on AIDS, world leaders noted that despite the immense success recorded in the fight against HIV/AIDS in the past 2 decades, the scale of the pandemic remains challenging, thereby prompting their adoption of a new political declaration for the urgent transformative action to end the threat of the global AIDS epidemics by 2030 (UNAIDS, 2021a). Faust et al. (2018) reported that knowledge of and engaging in prevention measures is crucial in controlling HIV/AIDS. In other words, knowledge of HIV prevention is essential in realizing the UNAIDS vision of ultimately reducing HIV infections, discrimination, and AIDS-related deaths to zero levels by 2030 (UNAIDS, 2021a). Therefore, in this study I explored the association between residence and wealth in predicting HIV/AIDS prevention knowledge among Nigerian adults as well as the moderating impact of education level on the relationship. The current study can help future efforts to fight HIV/AIDS by improving prevention knowledge through understanding the effect of sociodemographic independent

variables, such as residence, wealth, and education, on the knowledge of HIV/AIDS prevention. Although researchers have generally investigated this issue, there is little to no literature on the moderating effect of education level on the association between residence, wealth, and HIV/AIDS prevention knowledge among adult Nigerians. For example, previous studies have investigated issues, such as knowledge and attitude of HIV/AIDS among women in Nigeria in a cross-sectional study (Yaya et al., 2019) and HIV-related knowledge in Nigeria in a 2003–2013 trend analysis (Faust, 2018); however, the current study filled a gap in the existing literature related to the understanding of how the association between independent variables of residence and wealth and the dependent variable of HIV/AIDS prevention knowledge among Nigerian adults could vary by using education level as the moderating variable because the more educated people are, the better their knowledge of HIV/AIDS prevention (see Ma et al., 2014).

Problem Statement

HIV and AIDS are a global public health concern, resulting in the death of millions of people worldwide, especially in Nigeria. According to the World Health Organization (WHO) (2019a), the number of deaths resulting from HIV/AIDS infection since its discovery more than 3 decades ago is 33 million, and as of the end of 2019, 38.0 million people were living with the infection. In Nigeria, a country in West Africa with more than 195.9 million people based on the 2018 demographic and socioeconomic data (WHO, 2019b), the issue of HIV/AIDS still poses a significant challenge to health care providers. Nigeria has the second-largest number of HIV cases worldwide (Federal Ministry of Health Nigeria [FMoH], 2019). According to the WHO (2019b), a total of

1,900,000 people in the country were estimated to be living with HIV/AIDS as of 2018. In the same year, HIV infections among people of all ages was 0.52%, while the prevalence among individuals aged 20–49 years, which the study group falls into, was 1.3% (UNAIDS, 2020). The records also showed that in 2019 about 100,000 people in Nigeria were newly infected with HIV, and 45,000 deaths of all ages in the country were associated with the disease (UNAIDS, 2020).

The spread of HIV has had an unprecedented effect on health, welfare, employment, and all aspects of people's social lives, particularly among adults in Nigeria (Awofala & Ogundele, 2018), which according to the allocative efficiency hypothesis could be attributable to lack of knowledge about the disease and its preventive measures (Hoffman & Luz, 2019). The allocative efficiency hypothesis suggests that education improves a person's health knowledge and their ability to choose the more efficient input mix in the health production process leading to improved health outcomes (Hoffman & Luz, 2019). Sunday et al. (2017) noted that the HIV epidemic poses a threat to human health and imposes a heavy burden on families, communities, and the economy because productivity decreases due to loss of work hours resulting from HIV-related sickness and death. The specific research problem addressed through this study was that the high number of deaths and the negative socio-economic impact of HIV/AIDS globally, and specifically in Nigeria, despite efforts aimed at controlling it, has remained a challenge and source of concern to public health practitioners and other health care providers, thereby necessitating an investigation into how education level moderated and impacted

the association between place of residence, wealth, and knowledge of HIV/AIDS prevention among Nigerian adults aged 20–49 years old.

To address the gap in literature, which is that there are few studies on the moderating impact of education level on the association between residence, wealth, and HIV/AIDS prevention knowledge among adult Nigerians, I used the 2018 Nigerian Demographic Health Survey (NDHS) to conduct an in-depth comparative analysis of the variations in the effect of differences in the place of residence and wealth quantile on HIV/AIDS prevention knowledge level among the study population (i.e., adults 20–49 years old) in Nigeria as moderated by their level of education. The study results cna enhance the understanding of the impact that targeting and planning HIV/AIDS education based on differences in place of residence and wealth quantile would have on the knowledge of the disease prevention, thereby minimizing the negative impact of HIV/AIDS on the individual and the society.

Purpose of the Study

The purpose of this quantitative study was to examine the relationship between the independent variables of place of residence and wealth and the dependent variable of HIV/AIDS prevention knowledge in adults aged 20–49 years old in Nigeria as well as the effect of education as the moderating variable on the relationship. I used secondary data obtained from NDHS (2018) to explore how the place of residence and wealth varied in determining the HIV/AIDS prevention knowledge level in adult Nigerians aged 20–49 years based on their education while controlling for age and gender using moderated regression analysis.

Research Questions and Hypotheses

RQ1: What is the relationship between place of residence (urban versus rural) and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender?

$H_0$1: There is no significant relationship between place of residence (urban versus rural) and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender.

H_a1: There is a significant relationship between residence (urban versus rural) and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender

RQ2: What is the relationship between wealth and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender?

$H_0$2: There is no significant relationship between wealth and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender

H_a2: There is a significant relationship between wealth and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender.

RQ3: What is the relationship between residence, wealth, and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender?

$H_0$3: There is no significant relationship between place of residence, wealth, and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender.

H_a3: There is a significant relationship between residence, wealth, and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender.

RQ4: Does education level significantly moderate the relationship between residence, wealth, and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender?

$H_0$4: There is no significant moderating effect of education level on the relationship between residence, wealth, and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender.

H_a4: There is a significant moderating effect of education level on the relationship between residence, wealth, and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender.

Theoretical Framework

I used Bandura's (2004) social cognitive theory (SCT) as the theoretical framework for this study. SCT contains a core set of determinants: knowledge of health risks, perceived self-efficacy of one's ability to control health habits, outcomes expectations, set health goals, perceived facilitators for the behavior change, and the impediments to the sought change (Bandura, 2004). HIV/AIDS prevention requires people to have control over their behavior and their social environment; however, major

societal efforts designed to control the spread of HIV/AIDS have centered mainly on informing the public about the mode of transmission and how to safeguard against the infection (Bandura, 1994). Therefore, the theory was appropriate for the current study because it informs, enables, guides, and motivates people to learn or acquire knowledge within their social environment as well as behaviors and habits promoting health discouraging practices impacting health (see Bandura, 2004). For example, a person who learns that correct and consistent use of condoms during sex is essential for HIV/AIDS prevention would be more inclined to use condoms when having sexual relationships with people with unknown HIV status (National Institute of Mental Health [NIMH], 2001). Although the current study focused mainly on investigating how the identified sociodemographic variables of interest (i.e., residence, education, and wealth) were associated with knowledge of HIV/AIDS prevention, such knowledge grounded in SCT could lead to behavior modification that is essential for self-efficacy practices. The empirical literature has suggested that the existence of a causal relationship between self-efficacy and a variety of health risk behaviors, such as condom use and contraception, are strongest when the self-efficacy measures are tailored not only to specific risk behaviors but also to relevant situational factors (NIMH, 2001).

Nature of Study

To address the research questions in this quantitative study, I used the correlational analysis research design along with secondary data derived from the NDHS (2018) to examine the relationship between place of residence, wealth, and HIV/AIDS prevention knowledge among Nigerian adults aged 20–49 years old separately and

collectively as well as the moderating effect of education level on these relationships. I used descriptive and inferential statistics with binary logistic regression at the bivariate level as well as multiple logistic regressions at the multivariate level to test relationships between variables and the predictor model because I examined the relationship between resident, wealth, and HIV/AIDS prevention knowledge among Nigerian adults 20-49 years and where such a relationship existed as well as whether education level as a moderating variable had any effect on it. All statistical analysis was completed by using IBM Statistical Package for Social Sciences (SPSS) Version 28.

Literature Search Strategy

I employed several search tools to access relevant literature review materials and articles. The major databases searched for the review of literature included the NDHS, PubMed, EBSCO, ProQuest, BMJ, and Medline. Google Scholar, the Walden University Library services, and the Walden University's dissertation databases were also used during the searches for literature. The search terms included *HIV, AIDS, knowledge, residence, wealth, HIV education, prevention, and Nigeria.* The selected literature reviewed was categorized into the following groups to check for similarities and repeated key information: gender differences, regional differences, and socioeconomic disparities. I mostly included literature that was published between 2019 and 2024. Older articles and publications were also reviewed and incorporated in this study to provide context where newer articles were limited or not available.

Valid and peer-reviewed studies were prioritized in the search strategy. To determine the originality and reliability of the literature material source, I conducted a

critical review of the literature to ensure that it was extracted from academic journals or official government websites, such as World Health Organization, the Centers for Disease Control and Prevention (CDC), or the Nigeria Federal Ministry of Health. Most of the literature searched was focused on Nigeria's HIV/AIDS issues; however, relevant articles on HIV/AIDS-related studies carried out in other parts of the globe, especially in SSA countries, were also incorporated in the current study.

Literature Review

Epidemiology of HIV/AIDS Worldwide

HIV/AIDS and the adverse consequences of its infection to the health and well-being of people worldwide have become an issue of great concern to humanity. More worrisome to the case of the HIV/AIDS pandemic is that men and women, young and old, and Black and White are potential victims of the health implications brought about by HIV/AIDS infection when contracted. Innocent babies are not left out of the negative consequences of contracting HIV/AIDS because some mothers who engaged in unprotected sexual activities before pregnancy with a spouse who is infected with HIV/AIDS contract it, and infected mothers themselves can transfer the virus to their babies during pregnancy and in the process of breastfeeding the babies (Chilaka & Konje, 2021). De Cock et al. (2012) traced the origin of HIV/AIDS to a report published by Gottlieb et al.in 1981, referencing a case of five young, homosexual men who were cleared to be healthy medically before receiving treatment for pneumocystis carinii pneumonia at a Los Angeles hospital. According to De Cock et al., the individuals, upon being tested, presented signs of T-lymphocyte depletion, resulting in two deaths among

them, while additional cases of pneumocystis carinii pneumonia and Kaposi's sarcoma among men having sex with men and other associated infections were reported across some U.S. cities in the following months after the two deaths. According to Morison (2001), the spread of the HIV/AIDS epidemic is perceived as heterogeneous globally, but with qualitative variations in its prevalent trends across different countries and global regions. However, the reason behind this global heterogeneous spread has yet to be made known.

Comparing the trend of HIV/AIDS prevalence across all regions of the globe 30 years after the 1981 CDC report of the first unusual clusters of pneumocystis carinii pneumonia and Kaposi's sarcoma, mainly in gay men in parts of the United States, an estimated number of 21.8 million people died of the HIV/AIDS pandemic worldwide with about 36.1 million people living with the infection by 2001 (Morison, 2001). Morison (2001) opined that about 95% of those affected by the HIV/AIDS disease live in underdeveloped and non-industrialized global regions, where the financial resources needed to achieve social development and fight the HIV/AIDS epidemic are limited. Given the preceding, Morison identified the SSA region as the part of the world that experienced the worst impact of the HIV/AIDS pandemic, with an estimated rate of about 70% of the population being impacted by the pandemic. On the other hand, most Asian countries, unlike SSA countries, have not witnessed explosive cases of the HIV/AIDS epidemic. In the Morison suggested that the HIV/AIDS epidemic could be unpredictable in different regions of the world, such as the former Soviet Union in Europe but still capable of spreading across the region based on the prevalence of IDU cases. Some

Central America and Caribbean countries follow SSA countries in having the most HIV/AIDS cases, especially among the adult population (Fettig et al., 2014).

Current global HIV/AIDS statistics released by UNAIDS (2021a) showed that 37.7 million (between 30.2 million and 45.1 million) people were living with HIV in 2020, while 1.5 million (between 1.0 million and 2.0 million) people became newly infected with the disease in the same year. UNAIDS's HIV/AIDS statistics also indicated that 680,000 (between 480,000 and 1.0 million) people died from AIDS-related illness in 2020, 79.3 million (between 55.9 million and 110 million) have contracted the infection since the start of the pandemic, while 36.3 million (between 27.2 million and 47.8 million) people have equally lost their lives because of the HIV/AIDS pandemic since its inception. Despite the high number of people either living with HIV/AIDS or who have lost their lives due to the infection, Govender et al. (2021) found a significant improvement in curbing the HIV/AIDS pandemic globally. They reported that there has been a decrease in AIDS mortality in most regions of the world due to a concerted effort by governments and private organizations to fight the disease, which is encouraging.

Epidemiology of HIV/AIDS in Africa

SSA is one of the regions of the world that has witnessed the devastating effect of the HIV/AIDS pandemics. This might be because developing countries, particularly those in SSA, have poorly developed and underfunded health systems that cannot withstand the HIV/AIDS pandemic (Case & Paxson, 2011). Underinvestment in the HIV responses of low- and middle-income countries, especially in SSA, contributed to the nonrealization of the 2020 global HIV reduction target (UNAIDS, 2021b). The burden of HIV/AIDS in

Africa varies from region to region. Current regional HIV/AIDS data released by UNAIDS (2021a) showed that in Eastern and Southern Africa, 20.6 million (between 16.8 million and 24.4 million) people were living with HIV in 2020, while 670,000 (between 470,000 and 930,000) people became newly infected with the disease in the same year. UNAIDS's HIV/AIDS statistics also indicated that in the same region of Africa, 310,000 (between 220,000 and 470,000) people died from AIDS-related illness in 2020, and 16.0 million (between 15.4 million and 16.1 million) who have contracted the infection since the start of the pandemic have access to treatment. In Western and Central Africa, the HIV/AIDS epidemic looked better. The UNAIDS statistics for 2020 revealed that in Western and Southern Africa, 4.7 million (between 3.9 million and 5.8 million) were living with HIV, while 200,000 (between 130,000 and 330,000) were newly infected and 150,000 (between 100,000 and 210,000) had lost their lives from AIDS-related diseases, while 3.5 million (between 3.3 million and 3.5 million) people have access to treatment. The Middle East and North Africa seemed to be less impacted by HIV/AIDS epidemics based on the UNAIDS regional data for 2020. The Middle East and North Africa data combined showed that a lesser number of people, 230,000 (between 190,000 and 310,000), were living with HIV, 16,000 (between 12,000 and 28,000) were newly infected, and the number of AIDS-related deaths was 7,900 (between 6,000 and 13,000) with 96,000 (between 89,000 and 94,000) accessing treatment.

Among all the regions of Africa, Eastern and Southern Africa have remained the most devastated by HIV, accounting for up to 55% of all people and two thirds of all children living with the disease (UNAIDS, 2021b). Interestingly, both regions have

recorded some progress in mobilizing resources in response to the AIDS pandemic during the last decade. Political commitment to fighting the HIV pandemic is so strong across Africa that most countries have devised and implemented ambitious targets for program expansion and increased domestic resource allocation to end the HIV pandemic (UNAIDS, 2021b). In Western and Central African countries, the response to the HIV pandemic is not as strong as that witnessed among the nations in the Eastern and Southern regions of Africa, although there is a remarkable improvement. The Western and Central African areas saw 37% fewer new HIV infections in 2020 than in 2010 data, which indicates a gradual improvement but is still far below the 75% reduction target set by the United Nations General Assembly (UNAIDS, 2021b).

Epidemiology of HIV/AIDS in Nigeria

Nigeria is the most populous country in SSA with about 195.9 million people and has the second highest number of people living with HIV/AIDS (FMoH. 2019). According to the UNAIDS (2019), the number of those living with HIV in Nigeria as of 2018 was 1,900,000, with the number of newly infected people the same year being 130,000 and the number of deaths from AIDS-related illnesses being 53,000. The burden of HIV in Nigeria is such that there is a 0.65% incidence among people of all ages, and a 1.5% prevalence among people between the ages of 15–49 years old (UNAIDS, 2019).

Obidoa and Cromley (2012) showed that between 1991–2001, the rate of HIV/AIDS prevalence in Nigeria stood at 3.6% of the population, while about 3.3 million people already had the infection. They also reported that young people had a very high tendency of contracting the disease. The outstanding rate of HIV/AIDS prevalence in

Nigeria necessitates the need for the Nigerian government and health workers to determine the factors that promote its spread within the country's population. However, in assessing the impact of corporate social responsibility of multinational oil companies on HIV/AIDS prevalence in Nigeria's oil-producing communities, Uduji et al. (2019) found that the impact of HIV/AIDS on the businesses, contractors, families, employees, business partners, and host communities of multinational oil companies in Nigeria did not show a decline in its prevalence. On the other hand, a report by the Federal Ministry of Health (2014) indicated that the Niger Delta area of Nigeria has a rate of 5.3 % HIV/AIDS prevalence in comparison to the average national prevalence rate of 5%, while other surrounding states, such as Akwa Ibom, Cross River, Delta, and Rivers states, have either higher or same rate of HIV/AIDS prevalence in comparison to the national rate of prevalence.

Nikolopoulos et al. (2008) are of the opinion that the rate of new HIV infections remains uncertain because there will be an increase in the disease prevalence. However, while HIV/AIDS prevalence in Nigeria appears to be stabilizing, Awofala and Ogundele (2018) identified Nigeria as a country with an enormous population, but with a relatively low rate of HIV prevalence among its high population. Awofala and Ogundele stated that the trend of HIV infection among adult population in Nigeria is shifting. While the highest rate of HIV infection cases in Nigeria is found among heterosexuals, a new UNAIDS survey result on HIV prevalence in Nigeria by the National Agency for the Control of AIDS indicated that Nigerian women aged 15–49 years old are more than twice as likely to have HIV infection than men with a comparable ratio of 1.9% of

infected women versus 0.9% of infected men (Hollingdale, 2019). The survey results further indicated that the disparity in HIV prevalence between Nigerian women and their male counterparts is greatest among the young adults. The survey results showed that young Nigerian women within the age range of 20–24 years old had a HIV infection rate 3 or more times higher than young men of the same age group. According to Milazozzo (2014), the existence of a higher rate of HIV prevalence among Nigerian women than men is due to the patriarchal society of Nigeria offering women weaker rights than men in making decisions on certain factors that can increase the vulnerability to contracting HIV infection, such as becoming pregnant, having children, and the use of contraceptives. While Nigeria has made significant effort in recent years to reduce the rate of HIV infection among children, the survey results showed that there was a low rate of 0.2% among children aged 0–14 years old. Awofala and Ogundele opined that although the current trend of HIV prevalence in Nigeria appears to be following a downward path, as observed in the relative stability of data collected on its prevalence between 2005 and 2010, there will be need for the country to sustain a more effective intervention in order to prevent a higher rate of infection among the most-at-risk subpopulations, such as people who inject drugs, female sex workers, and men who have sex with men.

HIV Surveillance: Overview, Techniques, and HIV-Specific Surveillance

Overview of Epidemiological Surveillance

When defining surveillance in the context of infectious disease epidemiology, the focal ideal is the act of the implementation of strategies for the investigation, assessment,

and eradication of infectious disease factors that negatively impact the health and well-being of the population (Wolitski, Jenssen, Holtgrave, & Peterson, 2004). The World Health Organization mentioned the importance of surveillance in the generation of an early warning system, emergency planning, and evaluation of evidence-based public health operations (Bovbjerg, 2020). Burell et al. (2017) further defined infectious disease epidemiologic surveillance as the action planning of public health systems in the monitoring of population health; investigation of reported disease cases and trends; and the collection, analysis, and interpretation of epidemiological data. Investigating causative factors and developing action plans to control disease outbreaks through reporting and tracking systems are also necessary for the development of an effective infectious disease surveillance system (Burrell et al., 2017).

HIV Surveillance

In public health, HIV surveillance is driven by the investigation and collection of information on risk factors, population and location characteristics, and behavioral traits that provide clues to HIV disease and mortality trends for a specific group (WHO, 2015). While reviewing the existing research literature pertaining to HIV surveillance activities throughout Africa, I identified a recurring trend regarding the division of HIV surveillance research between Sub-Saharan and North Africa. There was very limited literature related to HIV surveillance efforts for *all* of Africa. Much of the reviewed literature in this section had its primary information derived from research conducted in SSA, which encompasses 48 out of 54 countries in Africa, or 88% of countries in Africa (World Bank Data, 2021).

HIV/AIDS Surveillance in Africa

Background of HIV in Africa

The presence of HIV in Africa can be traced back to its early recognition in the 1980s when it began its dispersion from Kinshasa, the capital of what used to be Belgian Congo (which is now the Democratic Republic of Congo) to the rest of Africa (Blower & Okano, 2019). The increased diffusion of the virus throughout Africa in the early 20th century was a result of novel modes of transportation and mobility across the continent, such as railways and increased population density (Blower & Okano, 2019). According to Blower and Okano (2019), the facilitation of travel between national borders throughout Africa has witnessed the presence of HIV in countries, such as Botswana, Zimbabwe, Lesotho, Namibia, and South Africa.

In a systematic review conducted to assess the availability of HIV Incidence data from SSA, Braunstein et al. (2009) observed that activities of HIV/AIDS surveillance in developing countries and resource-rich countries are being increasingly incorporated into the estimation of HIV incidence. Meanwhile, data for HIV/AIDS prevalence and behavioral risk factors are still highly essential for HIV control planning and prevention. However, certain factors such as the estimates of population-based HIV incidence and information on the presence of risk factors from sub-Saharan Africa though appear to be scanty, are increasingly available in the region. Braunstein et al. (2009) identified SSA as a region that has new infections more readily than other world regions with an estimated population of 1.9 million new infection cases observed in 2007, which accounted for two thirds of the new spate of global infection rate in the same year. Nonetheless, the

outcome of the risk factor remains increasingly available in SSA. Considering the significance of HIV incidence surveillance as a major strategy for combating the epidemic, especially in resource-rich settings such as SSA zones, Bertozzi et al. (2008) are of the opinion that the notable public health agencies have identified country-level monitoring of HIV incidence as a recommended approach of tackling the prevalence.

Primary HIV Risk Factors

These characteristics along with other characteristics mentioned in this section provided HIV an opportunity to increase in prevalence. In studies by Jin et al. (2021), Viswasam et al. (2020), and Kharsany and Karim (2016), HIV across the target populations in West, Central, East, and Southern Africa has a strong correlation with the sex trade market, sexual activity between men, prisoners, and transgender women, and intravenous drug use. Some of these characteristics, especially the ones that are an ongoing concern, have led HIV to be considered a present-day epidemic in most of SSA. This has prompted attention to the need to develop prevention programs through surveillance efforts and other public health interventions.

HIV Sentinel Surveillance

In a study by Goga (2019), cross-sectional surveys have been conducted in immunization clinics in three sub-Saharan countries Malawi, South Africa, and Zimbabwe. Only two of the three countries, South Africa and Zimbabwe returned national survey estimates (Goga, 2019). HIV health and demographic sentinel surveillance along with continuous demographic and health surveys are frequently mentioned in the literature as a surveillance method for the strengthening of HIV

prevention programs, especially among maternity care patients (Dwyer-Lindgren, 2019; Goga, 2019; Maheu-Giroux et al., 2019).

HIV Sentinel Surveillance Benefits

The benefit of applying sentinel surveillance in an HIV prevention program and research is that this method is ideal for observing the behavior risks, origins of transmission, and target population group and tailoring the development of an action plan and resources to combat the manifestation of the virus (Root et al., 2020). Root et al. (2020) identifies five criteria that would define the success of a sentinel surveillance program: the population is a high-risk target population, feasibility of population and economic access, regular testing, adaptation to changes in transmission factors, and ethical soundness of reporting. When applying these characteristics to the methods summarized in Dwyer-Lindgren (2019), Goga (2019), and Maheu-Giroux et al. (2019) conclusion can be drawn to understand the use of sentinel surveillance in HIV prevalence observation. For example, the high-risk target population is adults of reproductive age (antenatal serving as the sample, representative population); access to a health care facility to survey the sample population, signaling of transmission changes through available reporting, frequent testing can be established in a health care setting. Ethical consideration is dependent on the organizational culture and protocols of the healthcare environment.

HIV Surveillance and Sentinel Surveillance Barriers

Though the use of sentinel surveillance is a common and effective tool in measuring and representing HIV prevalence throughout most of Sub-Sharan Africa, the

method is not without obstacles such as bias (Dwyer-Lindgren et al., 2019), significant costs (Goga, 2019; Jin et al., 2021), and stigma (Viswasam et al., 2020). As Dwyer-Lindgren et al. (2019) noted, HIV sentinel surveillance is not effectively representative of the general adult population since it has been primarily applied to the study of HIV prevalence in antenatal populations with antenatal care being the focus. Goga (2019) notes that immunization surveys can be costly to conduct. In addition to funding and costs, Jin et al. (2021) discussed the presence of limited access to health and prevention services, issues with policy reform, and the number of affected persons has created obstacles in establishing control of the epidemic. In addition, surveillance systems that target specific characteristics associated with HIV prevalence are poorly established due to issues with resource allocation (Jin et al., 2021). Lastly, Viswasam et al. (2020) pointed out that stigmas and representation of the HIV epidemic in national surveys distort the adequacy of traditional surveillance program implementation.

HIV/AIDS Surveillance in Nigeria

The country of Nigeria remains among the top countries worldwide with the highest number of individuals diagnosed with HIV (Eluwa et al., 2019; Lo et al., 2021; Tahir et al., 2020). The behavioral, geographical, and population-based characteristics are congruent with the risk factors identified throughout SSA mentioned in the previous section. There are also studies that have identified the trend in the prevalence of HIV in the pediatric population (Inzaule et al., 2018; Olusola et al., 2021).

A new government survey result released on 14 March 2019 by UNAIDS in Abuja/Geneva on HIV prevalence in Nigeria, indicates the country has a national

prevalence rate of 1.4%, especially among adults within the age range of 15-49 years. The prevalence rate of HIV/AIDS in Nigeria, however, varies across the different regions that make up the country. While some zones experience a high impact of HIV/AIDS prevalence, other zones are mildly affected. For instance, UNAIDS (2019) indicated that the highest impact of HIV/AIDS prevalence is observed in the South-South zone of the country with a prevalence rate of 3.1% traced among 15-49 years old adults. The North Central zone comes second with an HIV/AIDS prevalence rate of 2.0%, while the South-East zone comes third with a rate of 1.9% prevalence among the same 15-49 years old adult population. On the other hand, the South-West zone of the country has a low prevalence rate of 1.1%, followed by the North-East zone with a prevalence rate of 1.1%, and the least affected zone, North-West, which has a prevalence rate of 0.6%. The result of a study carried out by Lo et al. (2021) on "Key Population Hotspots in Nigeria for Targeted HIV Program Planning: Mapping, Validation, and Reconciliation" reveals 13,899 key populations in seven states of Nigeria, including 1,297 cases in Akwa Ibom, 1,714 cases in Benue, 2,666 in Cross River, 2,974 in Lagos, 1,550 cases in Nasarawa, 2,494 cases in Rivers, and 1,204 cases in Federal Capital Territory. Out of this data, the most common hotspots have been identified to be areas frequented by female sex workers (69.0%), followed by people injecting drugs (19.6%) and homosexual men coming third (11.3%).

Although the HIV/AIDS prevalence measure in Nigeria could be considered a bit high at 1.4% based on the findings of the Nigeria National HIV/AIDS Indicator and Impact Survey, a test and treat policy adopted by the country in 2016 has helped the

government to achieve progress in providing people with HIV/AIDS access to treatment (UNAIDS, 2019). On the other hand, Lo et al. (2021) have identified the 2014 Same Sex Marriage (Prohibition) Act and the social pressure as well as the stigma people that engage in same-sex relationships or patronize gay activities face, as some of the reasons behind the lower number of hotspots for homosexual men in the key population hotspots than the number of hotspots for female sex workers and people who inject drugs across several states of Nigeria. In addition, Lo et al. (2021) concluded that community-based organizations have been able to identify several new hotspots and previously existing undocumented hotspots in different zones of Nigeria because of existing close collaboration between the community-based organizations and the key population.

HIV/AIDS Testing in Africa

HIV testing has been identified by Maheu-Giroux et al. (2019) as one of the crucial components of national HIV responses, while the knowledge of HIV diagnosis by those infected with the virus serves as the initial process in accessing antiretroviral treatment and care that could save a life. In consideration of the significant role of HIV Testing Services, the UNAIDS introduced a plan known as 90-90-90 targets, with the overall objective of helping 90% of people living with HIV be aware of their status, 90% of the people who are already aware of their HIV status get antiretroviral therapy for their infection, and 90% of the people who are receiving treatment for their HIV infection to have their viral load suppressed. To achieve the purpose of HIV/AIDS testing, Maheu-Giroux et al. introduced the "Shiny90," which is a mathematical model that is capable of synthesizing population-based survey and HIV Testing Services program data formally to

provide an estimate of the awareness status of HIV over time. The mathematical model could reproduce accurate longitudinal trends of sex-specific HIV testing.

Despite the effectiveness of the 90-90-90 mathematical model in carrying out HIV testing, UNAIDS 2016 Global AIDS response progress report indicates that the level of HIV/AIDS surveillance systems in Sub-Saharan Africa, where more than two thirds of people are living with HIV, is not adequately developed (Abuogi et al., 2018). Therefore, unlike countries that have comprehensive and robust surveillance systems for their HIV cases where the triangulation of HIV incidence and mortality with the annual cumulative number of new HIV diagnoses can be used to estimate the proportion of diagnoses for people living with HIV, the insufficient development of the 90-90-90 targets in SSA makes it difficult to obtain an accurate estimation of people that live with HIV. According to Maheu-Giroux et al. (2019), HIV serology and self-reporting from respondents about their HIV testing status constitute the Demographic and Health Surveys (DHS) as well as AIDS Indicator Surveys in SSA. A report from HIV-positive respondents who indicated that they have been tested for HIV is used as the upper bound for the HIV awareness level instead of the last HIV test that occurred before the person becomes seroconverted, which can become negative.

HIV Education and Health Promotion Interventions in Nigeria

Education and Promotion

Schools

The education about HIV in the Nigerian population is widespread and diverse. It can be conducted in settings such as school-based education to community education.

School-based HIV education can be found in the literature of Onyechi et al. (2016), Juliana and Funmilayo (2020), and Robinson et al. (2018), Adejimi et al. (2017), and Ezegbe et al. (2018). Surveys on perception (Onyechi et al., 2017) and self-efficacy Juliana et al., 2020) of HIV knowledge were presented to adolescents in Nigerian secondary schools. These methods provided researchers insight into the level of HIV transmission risk perceived by adolescents and how an education program, such as the Rational-Emotive Health Education Program (Onyechi et al., 2017) increases knowledge of lifestyle and health behaviors that can reduce the risk of HIV.

While much of the literature focuses on HIV prevention education among adolescents and school-aged children, education is not limited to only students. Parent-adolescent communication on HIV education was also found to be an educational strategy to reduce the attitudes and behaviors associated with increased HIV risks (Olanrewaju et al., 2020). A study by Ajala (2017) found that teachers would benefit from HIV and AIDS education being included in their training program as their general knowledge of HIV risks, prevention, and transmission ranked low after completing a HIV knowledge questionnaire. HIV education that was gender-specific and taught by teacher who were trained showed evidence of an increase positive outcome in HIV risk mitigation according to a study by Wood et al. (2015).

Community

In the community, HIV education can often be promoted and investigated to determine the underlying factors for knowledge disparities. Studies such as that conducted by Faust et al. (2018) reviewed the trend in HIV knowledge among Nigerian

communities and found that, though there was an increase in knowledge and awareness, there were still specific domains that presented gaps in overall community knowledge. In the example of a hospital setting, Shivalli and Kaup (2016) have identified the difference between antenatal patients who were willing to be screened and receive counseling for HIV after education versus those who did not participate. HIV education can also be gender-specific in the community, tailoring knowledge areas to promote and facilitate the acquisition of knowledge among those who have a binary and non-binary gender identity, and who identify with specific sexual orientations. An instance of gender-specific education can be seen in a study by Yaya et al. (2019). The conclusion of the study was that increasing HIV education among women in Nigeria will have a positive correlation with the efforts of global HIV epidemic eradication by 2030. Lastly, instances of HIV education implementation in communities that identify with different sexual orientations can be observed in studies such as by Jones et al. (2020) and communities that face discrimination due to misconceptions and lack of education in Okonkwo et al. (2017).

Intervention

Schools

The Family Life and HIV Education (FLHE) program, is one of Nigeria's regarded HIV intervention and education programs. Established in 2003, its primary goal is to promote HIV intervention strategies for youth and adolescents in school-based settings (Igbokwe et al., 2019; Nwokocha et al. 2017; Udegbe et al., 2015). Success and improvement in HIV knowledge and prevention among youth have been identified after the implementation of the program (Igbokwe et al., 2019; Nwokocha et al., 2017). Some

examples of positive outcomes observed include the drop of HIV/AIDS cases in youth ages 15 to 24 from 60% in 1998 to those ages 10 to 19 years accounting for only 7% of the HIV/AIDS population in Nigeria (Igbokwe et al., 2019). FLHE promotes self-awareness and positive attitudes, strengthens developmental skills in domains such as social, behavioral, cultural, and psychological; and acquires accurate information (Udegbe et al., 2015). Those who have participated in the program have had a better perspective on sexual health and behavior and life skills than those who have not participated in the program (Udegbe et al, 2015).

The FLHE program, overall, has demonstrated a positive trend in improving HIV prevention knowledge among those educated. Despite its success, there are still recognized issues and barriers that pose a concern for the continued progression of the program's success. In the study by Igbokwe et al. (2019), the impact of the program was evaluated and recommendations for innovating and strengthening the program were suggested with the purpose of maintaining and enhancing the success of the program's impact on HIV prevention in adolescents. Some strategies include revisiting policies, fostering stronger partnerships, and providing an ongoing evaluation for quality management (Igbokwe et al., 2019). Other observed concerns to the program include lack of resources, ignorance of those already sexually active, and non-uniformity of teaching curriculum across schools (Nwokocha et al., 2017). Udegbe et al. (2015) noted the need for more technical and financial support from the government and other supporting education to maintain the efficacy of the program.

Community

Nigeria has also established other HIV intervention programs that are outside the school setting and geared towards the community. Akeju et al. (2021) mentioned the establishment of key-population community-based organizations that are tailored to meet the intervention needs of specific populations (i.e., sex workers). The ICARE program in Nigeria combines the use of social media and peer influence to provide intervention and promote testing opportunities among young men at risk (Garofalo et al., 2022). This program was effective in connecting with difficult-to-reach populations and increasing HIV testing among young men at risk (Garofalo et al., 2022). Finally, Lo et al. (2021) researched "hot spots" that sex workers and those who inject drugs frequented with the goal of providing HIV intervention and prevention programs in those communities. The study identified 13,899 "hot spots" in seven Nigerian states; the congregation of these hot spots by sex workers and those who inject drugs was due to stigma and social attitudes towards these activities. In conclusion, the HIV intervention program is not standardized, but rather, tailored to the different needs of community members, available resources, population characteristics, culture, behaviors, and other factors.

Factors Related to HIV/AIDS Knowledge

HIV/AIDS has been identified by Haque et al. (2018) as one of the most pandemic diseases that spread worldwide. Despite the efforts made by health experts and scientists to fight the HIV/AIDS virus and ultimately bring down the rate of new infection cases globally, the UNAIDS opined that efforts made toward combating the global transmission of the virus will likely not achieve its objective of meeting global

targets as fast as it is anticipated (UNAIDS, 2018). However, Haque et al. (2018) recommended that a higher degree of HIV/AIDS awareness and proactive measures should be put in place to prevent the spread and prevalence of HIV/AIDS infection given the fact that there is currently no assurance of a complete cure for HIV.

Social and Economic Factors

Nigeria may be considered one of the countries in Africa with low HIV risk. However, considering some of the recent social and economic issues in the country such as rising unemployment, economic hardships lately, delays in paying workers' salaries, rapid urbanization, and migration (within and outside the country), it is possible that the case of HIV expansion within the country will be experienced. In addition, the possibility of HIV widespread in Nigeria is high due to the prevalence of the risk factors in the country. According to Hossain et al. (2014), the risk factors include poor medical facilities, unsafe sexual practices, and inadequacy or complete absence of HIV screening practices.

Gender and Education Factors

Apart from Economic and social issues, gender, age, and education could be considered as other closely related factors to HIV/AIDS knowledge globally. According to UNAIDS (2018), a worldwide study of HIV/AIDS prevalence suggests that young women face a greater risk of contracting HIV infections with 59% chance of getting new infections than other people within the same age range of 15-24 years. Similarly, Asaduzzaman et al. (2016) concluded that young women are considered as people in the HIV infection group more than others because of the lack of general and health education

opportunities in most countries. UNAIDS (2018) identified an increasing trend of HIV infection among Bangladesh women as the number of women living with HIV rose from 2800 in 2012 to 3900 in 2016.

Gap in the Literature

A few studies have been conducted in the past to find out the level of HIV/AIDS awareness among adults using both primary and secondary data (Asaduzzaman et al. 2016) and HIV epidemiology in Nigeria (Awofala & Ogundele, 2016). It is pertinent to mention that few or no studies on HIV/AIDS prevention explored education level as a moderator in conjunction with other independent variables such as residence and wealth. Most of the previous studies focused on finding socio-demographic factors and trends of AIDS among married adults (Asaduzzaman et al., 2016; Hosain & Islam, 2016; Yaya et al., 2016) and investigating the knowledge and awareness of HIV among married women (Haque et al., 2018; Nigerian National Agency for the Control of AIDS, 2012). In this case, further research is needed to know the status of HIV/AIDS prevention knowledge in Nigeria. Hence, the study is intended to investigate place of residence, education, wealth, and HIV/AIDS prevention knowledge among Nigerian adults, using the most recent 2018 NDHS data set for adults.

Definitions

AIDS: This is a chronic, potentially life-threatening health condition caused by untreated and advanced HIV infection that has destroyed the body's immune system (CDC, 2022). AIDS is diagnosed when there is a drop in the CD4 T cell count below 200 or there is a presence of AIDS defining complications, such as cancer (CDC, 2022).

HIV: A viral infection that attacks and weakens a person's immune system by destroying important cells in the body that fight against disease and infection, which is spread through sexual contact with infected person, illicit drug use or sharing needles, and from mother to child during childbirth or breast feeding (CDC, 2022). There is no cure for HIV, but it could be controlled by proper medical care.

HIV prevention: These are activities or behaviors aimed at reducing the chances of acquiring HIV infection such as wearing condoms during sexual contacts with individuals with unknown HIV status, using sterile needles for intravenous injections, and use of pre-exposure prophylaxis (National Institute of Health, 2021).

Nigeria: A lower- income, mixed economy country located in the western coast of Africa with its capital as Abuja and population of about 200 million people drawn from several ethnic and religious groups. Majority of the population live in rural areas and are engaged in peasant farming. The major languages spoken in the country include, Igbo, Yoruba, Hausa, Edo, Tiv, and English. Socioeconomic and financial resources are not evenly distributed, which negatively impacts healthcare availability and utilization (Udo, 2022).

Place of residence: This refers to the part of the country where an individual lives, which in the context of the current study could be urban or rural. People's place of residence with due consideration to other socio-economic factors could influence their ability to receive health information necessary to enhance knowledge of healthcare utilization and disease prevention (Lahana et al., 2011).

Socioeconomic status: This is a way of describing people based on their education, income, and type of job and could be said to be low, medium, or high. (National Cancer Institute, 2022). People in the lower level usually have less access to educational, financial, and social resources that could negatively impact health. In other words, higher social and economic health status could be attributed to an enhanced health status (Baker, 2014).

Assumptions

For this quantitative study, I assumed that the data obtained from the NDHS 2018, used in carrying out the research work were accurate, reliable, and valid according to international standards. The population used in the research study to examine the relationship between place of residence, wealth, HIV/AIDS prevention knowledge and the impact of education on the research variables is assumed to be exclusively Nigerian adults within the ages of 20-49 years. The use of correlational design for data collection and regression analysis in the research study, were assumed to be suitable approaches for the research methodology. This is in view of the types and nature of dependent and independent variables, which were involved in the study.

Scope and Delimitations

The scope of this study was limited to Nigeria's six geopolitical zones, which included the 36 states and the Federal Capital Territory. The NDHS 2018, from which the study data was obtained covers Nigerians both male and females ages 15-49 years. In other words, the data obtained from the survey was nationally representative and suitable for use in conducting the study. I developed the interest to concentrate this study on

adults between the ages of 20-49 years resident in Nigeria because this is the period at which the study population most likely had either completed their high school education, were independent from family economically and had chosen where to reside or were actively involved in sexual relationships, which predisposed one to getting HIV/AIDS if appropriate preventive measures were not practiced. Therefore, this quantitative study is purposeful in using a correlational methodology to examine the relationship between the independent variables, including place of residence and wealth and the dependent variable, HIV/AIDS prevention knowledge among Nigerian adults aged 20 to 49 years; and the impact of the moderating variable, education level on the relationship after controlling for age and gender by using moderated regression analysis.

There were other related problems to the study, which I could have chosen to broaden its scope such as using nomadic and incarcerated (prison) population. However, some of the related problems were rejected for several reasons including ambiguity, lack of feasibility, issue of relevance, etc. In view of the foregoing, the study was not intended to cover the nonadult Nigerian population and Nigerians residing outside their country of origin. In addition, while wealth is one of the independent variables in this study, the study was not intended to cover the scope or amount of wealth owned by individual Nigerian residents. The decision to exclude the nonadult Nigerian population, population of Nigerians living outside their country, and the scope or amount of wealth owned by the individual Nigerian adult population from the study was because the excluded criteria were not necessarily relevant to the study, and might be too problematic or not feasible to obtain accurate data from the rejected criteria to support the study.

Limitations

The major limitation was that the use of secondary data in conducting this study had the potential of producing bias results emanating from the self-report survey by the participants. There was the possibility of over or underreporting of the survey responses. Also, the DHS sampling procedure includes women in all sampled households and the corresponding men in only the subset of the households from the initial female sample, leading to a more excellent representation of females than males. External validity is limited due to the original data sampling strategy and findings not being applicable to persons in other countries. It was impossible to establish cause and effect in this study, rather only relationships existing between variables as I used a correlational methodology to conduct the study.

Significance

This study is significant in that there seems to be a less emphasis on and a decrease in the urgency about the continuous spread of and devastating effects of HIV infection within the Nigerian society over the years since the infection was first reported in the 80s. The loss of interest or attention in the danger posed by HIV/AIDS may relate to several factors such as an increase in population with its attendant social problems like violence, homelessness, terrorism, ethnic crisis, unemployment, and lack of investment in the education sector. Also, the ongoing issue of malaria and the emergence of the fatal COVID-19 disease has a substantial adverse effect on the attention people pay towards HIV/AIDS infection. The current study aimed to investigating if the education level of Nigerian adults aged 20-49 years, moderates the association between their place of

residence, their wealth quantile, and their HIV/AIDS prevention knowledge, which is essential for the control of the disease. The study may provide a better understanding of the role education level plays as a moderator variable in determining the strength of the association between knowledge of HIV/AIDS prevention for wealthy and non-wealthy adult Nigerians, aged 20-49 years, and their areas of residence such as urban and rural areas. The study result would help in making informed recommendations to the government of Nigeria on the importance of investing more in the formal education needs of the citizens at all levels and the reevaluation of the national HIV education programs for the improvement of prevention information to both urban and rural dwellers irrespective of their wealth status as education can improve an individual's knowledge of HIV/AIDS transmission and its prevention.

Summary and Conclusion

In summary, it is pertinent to note that despite efforts aimed at controlling the menace of HIV/AIDS globally, and SSA countries such as Nigeria, there remain a significant number of people living with the disease, especially in Nigeria, the most populous country in SSA, which still ranks second globally as having the highest number of people living with HIV/AIDS (UNAIDS, 2021a). This quantitative study involves the use of a correlational methodology to examine the relationship between place of residence, education, wealth, and HIV/AIDS prevention knowledge among Nigerian adults. The study includes a problem statement, which highlights the gaps in the literature relating to HIV/AIDS prevention knowledge among adult Nigerian populations. Also, the study reveals its purpose, the research questions used as well as the hypotheses

formulated. Also, in the study, the theoretical foundation employed, the nature, and the literature search strategies adopted were made known. The study equally contains an elaborate literature review, which discusses related scholarly articles to the research variables and questions from previous or other researchers. Finally, the study addresses the definitions, assumptions, scope, delimitations, and significance of the research topic.

This study used secondary data obtained from NDHS (2018) to explore how the place of residence and wealth varied in determining the HIV/AIDS prevention knowledge level among adult Nigerians aged 20-49 years based on their education, while controlling for age and gender using moderated regression analysis. The study uses the test of hypotheses to examine research questions, on the relationship between place of residence, urban versus rural; wealth (poorest, poorer, middle, richer and richest), and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender and tried to find out whether education level had modification effect on the relationships. The study used a correlational analysis of secondary data derived from the NDHS (2018) to examine the relationship between the variables in the study specifically to address the research questions. Finally, Bandura's (2004) SCT was used as a theoretical framework to help understand and interpret the study findings.

Section 2: Research Design and Data Collection

Introduction

The purpose of this quantitative study was to use a correlational methodology to examine the relationship between the independent variables of place of residence and wealth and the dependent variable of HIV/AIDS prevention knowledge in adults aged 20–49 years old in Nigeria as well as the impact of education as the moderating variable on the relationship. In the previous chapter, I highlighted the public health implications of the subject of study and its application to social change. A quantitative secondary data analysis was used to examine the research problem and hypotheses. In this section, I discuss the methodology used in the study, including the research design and rationale, target population characteristics, data source, data analysis tools, and threats to validity. A summary of data collection approaches used to ensure the scientific and ethical soundness of the study, including the requirements for accessing data sets and protection of respondents' rights and confidentiality, is also provided.

Research Design and Rationale

Study Variables

The two independent variables in this study were: (a) place of residence, which was assessed as 0 = Rural, 1 = Urban, and (b) wealth index combined, which was assessed as 0 = Poor (Poorer and Poorest), 1= Rich (Middle, Richer and Richest), The dependent variable was HIV/AIDS prevention knowledge, which was assessed as score 0 = not knowledgeable and 1 = knowledgeable based on responses to survey questions relating to HIV/AIDS knowledge, such as (i) reduce risk of getting HIV: always use

condoms during sex, 1 = Yes, 0 = No; (ii) reduce risk of getting HIV: have one sex partner only, 1 = Yes, 0 = No; (iii) a healthy-looking person can have HIV, 1 = Yes, 0 = No; (iv) can get HIV from mosquito bites, 1= Yes, 0 = No; and (v) can get HIV by sharing food with a person who has AIDS, 1 = Yes, 0 = No. It is pertinent to mention that a 1 (Yes) response to Questions iv and v shows that the individual has misconceptions about HIV transmission and prevention, meaning the person lacks knowledge. On the other hand, a 0 (No) response to Questions iv and v shows the individual does not hold any misconceptions and therefore has knowledge about HIV transmission and prevention. The moderator variable of education level was assessed as 0 = No education, 1= Educated (Primary, Secondary, and Higher). The confounding variables were gender (male and female) and age (see National Population Commission [NPC] & International Classification of Funding, Disability and Health [ICF], 2019).

Research Design and Connection with Research Questions

In this study, I employed a quantitative, cross-sectional design to determine relationships that exist between variables. Secondary data obtained from the NDHS (2018) were analyzed to test relationships between the independent and the dependent variables while controlling for the confounding variables of age and gender. I chose the 2018 NDHS data set because it is a nationally representative household survey containing data on a wide variety of indicators of population health, including HIV, malaria, and other pertinent health issues. The 2018 NDHS was ideal for this study because for the first time in a Nigeria DHS, the 2018 survey was implemented using a computer-assisted personal interviewing, which allows for more provision of data than the surveys

conducted in previous years (NPC & ICF, 2019) I was interested in using data on HIV, including awareness and prevention activities, such as condom use and limiting sexual relationship to one uninfected person, which formed the research questions. The 2018 NDHS data covers individuals between the ages of 15 and 59 years old, but this study focused on adults between the ages of 20 and 49 years old. I assumed that the 2018 NDHS data were appropriate to be used for the study.

Time and Resource Constraints

I had minimal time and a resource constraint while conducting this study because the NDHS (2018) from which the data were obtained had gone through a cleaning and editing process. I did not incur any costs relating to the use of the NDHS data set because the program is fully funded by the U.S. Agency for International Development, which also offers financial support and technical assistance for population and health surveys in countries worldwide (NPC & ICF, 2019). The only requirement to obtain the data for the study was for me to apply for free access to download the data, provide my research topic, and state the reason why I needed the data set. I obtained written permission to use the data set, which came with instructions on how to manipulate the file (see Appendix). The NDHS file was compatible with SPSS Version 28, which I used for my data analysis.

Consistency of Design

The NDHS data were appropriate for the current study because it saved me time and cost as well as reduced the burden on participants who would not need to be interviewed again. The data set contains key variables on residence, education, wealth, and HIV/AIDS prevention knowledge that allowed me to conduct the study based on the

SCT framework (see Bandura, 2014). In other words, the NDHS data set allowed for testing of the relationships and interrelationships existing between the study's independent variables and dependent variable. The data set was also large enough, which made it appropriate to generalize the findings for the entire country of Nigeria. Because I used secondary data for the study, extra care was taken to ensure that only the appropriate variables that would enable me to answer the research questions were used since the data set covered a wide range of health issues that were not necessarily related to the current study.

Methodology

Population

The 2018 NDHS targeted all women aged 15–49 years old and men aged 15–59 years old from the 36 states and the Federal Capital Territory of Nigeria. For the 2018 NDHS survey, participants were required to fall into two categories: permanent residents of the chosen households or visitors who had spent the night prior to the survey in these households (NPC & ICF, 2019). The survey's aim was to encompass half as many men as women, collecting comprehensive data at both household and individual levels. This survey data set constituted the foundational sampling framework for the current study, serving as the source from which individual-level data were extracted. The target population for the current study encompassed both males and females, aged 20–49 years old who had consented to participate in the 2018 NDHS and provided responses on topics, such as sexual activity and access to condoms. At the time of the survey, Nigeria

had a total population of 198.4 million people, which comprised 98.22 million females and 100.17 million males (NPC & ICF, 2019).

Sampling and Sampling Procedure Used in the Secondary Data Collection

Sampling Strategy

The sampling framework utilized for the 2018 NDHS originated from the Population and Housing Census of the Federal Republic of Nigeria (NPHC) conducted in 2006 by the NPC. Nigeria's administrative structure comprises states, further divided into local government areas (LGAs), and subsequently into wards (NPC and ICF, 2019). In the context of the 2006 NPHC, each locality was further subdivided into manageable units known as census enumeration areas (EAs). The fundamental sampling entity, referred to as a cluster for the 2018 NDHS, is established based on the EAs identified in the 2006 EA census frame (NPC & ICF, 2019). While the 2006 NPHC did not furnish household and population counts for each EA, population approximations were made available for all 774 LGAs.

The process involved merging data from cartographic resources outlining each EA with the LGA population estimates derived from the census (NPC & ICF, 2019). This fusion of information was employed to establish the roster of EAs, approximate the household count, and categorize EAs as either urban or rural within the survey sample framework. Prior to the selection of samples, every locality underwent individual classification into urban and rural regions based on predetermined minimal urban area sizes, delineated by specific cut-off points. Adhering to the official definition established

in 2017, any locality boasting a population exceeding the stipulated minimum size of 20,000 was designated as an urban area (NPC & ICF, 2019).

Sampling Procedure

The sample configuration for the 2018 NDHS comprised a two-stage stratified selection process, and the initial step involved stratification by dividing each of the 36 states and the Federal Capital Territory into urban and rural segments (NPC & ICF, 2019). This created a total of 74 distinct sampling strata. Within each stratum, samples were autonomously chosen through a two-stage process. Implicit stratifications were integrated into lower administrative tiers by arranging the sampling frame in accordance with administrative order. Probability proportional to size selection was employed during the initial sampling phase.

In the first stage, 1,400 EAs were designated using a probability proportional to the size of each EA, determined by the number of households within (NPC & ICF, 2019). A comprehensive listing of households was performed in all selected EAs, generating a roster of households to serve as the basis for selecting households in the second stage. In this subsequent selection phase, a consistent count of 30 households was chosen from each cluster using equal probability systematic sampling, which culminated in an aggregate sample size of roughly 42,000 households (NPC & ICP, 2019).

The household listing procedure was facilitated using tablets, while the random household selection was executed through computer programming (NPC & ICF, 2019). Interviews took place exclusively within the preselected households. To ensure impartiality, no substitutions or modifications were permitted during implementation. To

accommodate the unequal allocation of the sample among various states and the potential response rate of disparities, sampling weights were calculated, integrated into data files, and applied, which ensured the representativeness of outcomes at both the national and domain levels. Given that the 2018 NDHS sample was derived from a two-stage stratified cluster arrangement within the sampling frame, the computation of sampling weights was carried out distinctly for each sampling stage and every cluster, considering their respective sampling probabilities.

Inclusion and Exclusion Criteria

The 2018 NDHS included all women aged 15–49 years old in the sample households (NPC & ICF, 2019). Those who were either permanent residents of the selected households or visitors who stayed in the households the night before the survey were eligible to be interviewed. The men's survey was conducted in one third of the sample households, and all men aged 15–59 years old in these households were included. In this subsample, one eligible woman in each household was randomly selected to be asked additional questions about domestic violence.

Similarly, biomarker information was collected only in those households selected for the men's survey. The biomarkers included in this survey were height and weight for women aged 15–49 years old and children aged 0–59 months, hemoglobin testing for women aged 15–49 years old and children aged 6–59 months, and testing for malaria and sickle cell disease among children aged 6–59 months (NPC & ICF, 2019). The disability module, female genital cutting module, and fistula module were implemented in the two thirds of the households that were not selected for the men's survey.

Procedures for Recruitment, Participation, and Data Collection

The pretest training was strategically devised to equip the trainers for both the main training phase and to ensure their comprehensive familiarity with the NDHS questionnaires and protocols (NPC & ICF, 2019). This proficiency was vital to facilitate the evaluation of the questionnaires across various languages. The training encompassed comprehensive sessions dedicated to administering NDHS questionnaires, supplemented by a distinct module focused on collecting of biomarker data. Subsequently, the fieldwork for the 2018 NDHS was inaugurated on the 14th of August 2018 (NPC & ICF, 2019).

Sample Size Determination

A sample consists of individuals who have been chosen to participate in a survey. In the context of the NDHS, the sample was meticulously crafted to mirror the age group of 15–49 years old within the national population (NPC & ICF, 2019). In the case of the 2018 NDHS, this sample was designed to accurately represent both the entire nation and its constituent states, encompassing both urban and rural locales.

To generate statistics that faithfully encapsulate the entirety of the country as well as its 36 states and the Federal Capital Territory, the number of adults surveyed within each state proportionally contribute to the overall size of the national sample (NPC & ICF, 2019). However, if certain states possess smaller populations, adhering strictly to a sample allocation based on each state's population might have resulted in insufficient respondents for analysis. To overcome the issue, states with lower population sizes were deliberately oversampled. A process of weighting or mathematical adjustment was

employed to achieve statistics that genuinely reflected the demographic distribution of both women and men in the sample, and this manipulation ensured that the composition of the sample aligned closely with the actual distribution found within Nigeria's population NPC & ICF, 2019).

Only all adults aged 20–49 years old (n = 42,769) who participated in the 2018 NDHS, which covered individuals aged 15–59 years old (N = 55,132) residing within the 36 states and the Federal Capital Territory of Nigeria, were extracted, and used for the current study. Additionally, I adopted the original study database and sampling procedures as discussed above.

Instrumentation and Operationalization of Constructs

Study Instruments or Questionnaires

Four questionnaires were used for the 2018 NDHS: the Household Questionnaire, the Woman's Questionnaire, the Man's Questionnaire, and the Biomarker Questionnaire. The questionnaires, based on the DHS Program's standard Demographic and Health Survey (DHS-7) questionnaires, were adapted to reflect the population and health issues relevant to Nigeria. Comments were solicited from various stakeholders representing government ministries and agencies, nongovernmental organizations, and international donors (NPC & ICF, 2019). In addition, information about the fieldworkers for the survey was collected through a self-administered Fieldworker Questionnaire.

Validity and Reliability of the Instruments

The DHS standard questionnaires undergo a process of pretesting and testing, ensuring that they are comprehensible to the intended respondents (NPC & ICF, 2019).

These questionnaires are then refined based on insights gained from pilot exercises and previous surveys. The objective of these pretests, tests, and subsequent adjustments is to establish a shared understanding of the questions among respondents regardless of their backgrounds and locations. This process also aims to attain consistent and reliable responses.

The concept of validity pertains to the questionnaires' capability to yield accurate and genuine responses. It is essential to identify potential factors that could compromise the validity of the study and take measures to mitigate them (Creswell, 2014). The pretesting and testing of questionnaires address various aspects, including the appropriate sequencing and arrangement of questions (Creswell, 2014). Furthermore, the training provided to interviewers plays a crucial role in enhancing their interviewing skills and establishing rapport with participants (Creswell, 2014).

Operationalization of Variables

I aimed to investigate the relationship between place of residence and wealth and HIV/AIDS prevention knowledge among Nigerian adults aged 20–49 years old with education level serving as a moderator variable. There were two independent variables: place of residence, which was evaluated with the values of 0 = Rural and 1= Urban, and wealth index combined, which was measured using the following ordinal scale: 0 = Poor (Poorest and Poorer), 1= Rich (Middle, Richer, and Richest).

The dependent variable was HIV/AIDS prevention knowledge among Nigerian adults, which was assessed and coded as 0 = Not Knowledgeable and 1 = Knowledgeable based on responses to the following survey questions relating to HIV/AIDS knowledge:

(i) reduce risk of getting HIV: always use condoms during sex, 1 = Yes, 0 = No; (ii) reduce risk of getting HIV: have one sex partner only, 1 = Yes, 0 = No; (iii) a healthy-looking person can have HIV, 1 = Yes, 0 = No;(iv) can get HIV from mosquito bites, 1 = Yes, 0 = No; and (v) can get HIV by sharing food with a person who has AIDS, 1 = Yes, 0 = No.

Table 1 contains a further explanation of the HIV/AIDS knowledge variable name in SPSS, codes for the variable, and the interpretation and meaning of the codes. From this table, I was able to establish the frequency and percent of the responses to the survey questions, which were intended to assess or measure the comprehensive knowledge level of HIV transmission and prevention of the respondents:

Table 1

Measurement of Comprehensive Knowledge of HIV Transmission and Prevention

AIDS knowledge variable name in SPSS	Codes for the variable	Response and interpretation
Reduce risk of getting HIV: Always use condoms during sex	V754CP	**1**= **Yes**, 0 = No
Reduce risk of getting HIV: Have one sex partner only who has no other partner	V754DP	**1**= **Yes**, 0 = No
A healthy-looking person can have HIV	V756	**1** = **Yes**, 0 = No
Can get HIV from mosquito bites	V754JP	1= Yes, **0 =No**
Can get HIV by sharing food with person who has AIDS	V754WP	1 = Yes, **0 = No**

In Table 1, a 1 (Yes) response to V754CP, V754DP, and V756 questions showed that the individual had knowledge about HIV transmission and prevention methods. A 0 (No) response signified a lack of knowledge. On the other hand, a 1 (Yes) response to

V754JP and V754WP showed that the individual had misconceptions about HIV transmission and prevention, meaning the person lacked knowledge. A 0 (No) response to the V754JP and V754WP showed the individual did not hold any misconceptions and, therefore, had knowledge about HIV transmission and prevention. In order words: CKHTP = 1 if V754CP = 1 and V754DP = 1 and V756 = 1 and V754JP = 0 and V754WP = 0.

The moderator variable, which is education level is assessed and coded as 0 = No education, 1= Educated (Primary, Secondary, and Higher). In addition to these variables, there are confounding variables in play, namely gender (categorized as male and female) and age.

Data Analysis Plan

I retrieved the NDHS program data from the website and performed my analyses using SPSS version 28 for windows incorporating sample procedures and accounting for weighted survey data. Weighting is a correction technique used by survey researchers to statistically adjust survey data after they have been collected to improve the accuracy of the survey estimates (Bethlehem, 2018) The DHS program's data analysts had previously carried out data editing, cleaning, and imputation according to DHS program standards (NPC & ICF, 2019). The DHS team conducted thorough data cleaning, encompassing tasks such as coding open-ended questions, manually inputting questionnaires into CSPro software, and verifying the entered data for completeness and consistency (NPC & ICF, 2019). CSPro is a software solution designed and implemented collaboratively by ICF,

the U.S. Census Bureau, and other organizations, specifically for processing data and conducting data tabulation (NPC & ICF, 2019)

The DHS program adhered to established procedures for conducting data quality checks, addressing issues related to missing values and ensuring data quality. In the context of DHS, a "missing value" is defined as a variable that should have received a response but does not contain one. This absence of response could be due to the question not being asked (potentially an interviewer error) or the respondent choosing not to answer. As a standard practice, DHS assigns values to all "missing variables" during analysis, thereby including them in the dataset. The dataset may also contain other special responses and codes like "inconsistent," "don't know," and "blank." When calculating certain statistics such as means or medians, DHS excludes these "missing," "inconsistent," "don't know," and "blank" codes, but treats them as valid values in other contexts.

The DHS program collected data separately for households, women, and men, with most important variables present in each respective file. However, for my analysis needs, I merged four different DHS files. I followed the four-step guidelines provided by the DHS program for merging, which encompass (a) determining the common identifiers (identification variables), (b) sorting both data files by the identification variables (c) determining the base (primary) file, which establishes the unit of analysis, and finally, (d) merging the datasets by using the right commands depending on the software, which in this case is SPSS Version 28.

Research Questions

This study aims to explore the relationship that exists between place of residence and wealth in predicting HIV/AIDS prevention knowledge with education serving as a moderating factor. I conducted a comparative analysis of other pertinent respondent characteristics to assess potential differences across various demographic factors, including age, and sex. The research addressed the following four questions:

RQ1: What is the relationship between place of residence, urban versus rural, and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender?

$H_0$1: There is no significant relationship between place of residence, urban versus rural, and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender.

H_a1: There is a significant relationship between residence, urban versus rural, and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender.

RQ2: What is the relationship between wealth and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender?

$H_0$2: There is no significant relationship between wealth and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender.

H_a2: There is a significant relationship between wealth and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender.

RQ3: What is the relationship between residence, wealth, and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender?

H_03: There is no significant relationship between place of residence, wealth, and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender.

H_a3: There is a significant relationship between residence, wealth, and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender.

RQ4: Does education level significantly moderate the relationship between residence, wealth, and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender?

H_04: There is no significant moderating effect of education level on the relationship between residence, wealth, and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender.

H_a4: There is a significant moderating effect of education level on the relationship between residence, wealth, and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender.

Statistical Analysis

In the statistical analysis for this study, I used a predetermined significance level of < 0.05 for all tests and 95% confidence intervals while conducting a descriptive univariate analysis that used percentages and absolute numbers to provide a clear picture of the respondents surveyed. I conducted a binary logistic regression to test the relationship between each of the independent variables (place of residence and wealth) separately with the dependent variable (HIV/AIDS prevention knowledge). Binary logistic regression is ideal because it allows for the use of several predictor variables, which may be quantitative such as age and can equally include categorical variables such as sex. I equally conducted multiple logistic regression to test the relationship between the two independent variables and the dependent variable. It is pertinent to mention that in the statistical analysis, I calculated the variance inflation factors (VIF) for the predictor variables to test for multicollinearity. The VIF noted during the analysis were below 10 indicating that there was no severe multicollinearity. Finally, I conducted moderated multiple regression to test whether education level has a moderating effect on the relationship between the two independent variables (place of residence and wealth) with the dependent variable (HIV/AIDS prevention knowledge).

Threats to Validity

The NDHS program employed a two-stage cluster sampling technique, leveraging nationally representative sampling frames to ensure a diverse representation of respondents across various demographic profiles. The selection of interviewees at the household level was guided by well-established methods, and systematic procedures were

utilized to choose both female and male respondents. Data collection encompassed different administrative units, and the application of weights, derived from census data, enhanced the representativeness of the data at both national and subnational levels. This design conferred external validity to the NDHS, a characteristic it shares with the present study that also utilized NDHS data sets.

Both the NDHS and the current study are cross-sectional in nature, involving data collection at a single point in time. Consequently, internal validity threats such as history, maturation, and experimental mortality are not applicable to these investigations. Statistical regression bias was not introduced in the NDHS as systematic approaches governed household and respondent selection reliance on specific characteristics. Concerns related to construct validity, arising from inadequately defined or inappropriately measured study variables (Creswell, 2014), were checked by providing a comprehensive definition of all study variables and the provision of code frames within the data sets.

Ethical Procedures

The Walden University Institutional Review Board approval number for the current study is 06-27-24-0726620. It is pertinent to mention that the NDHS' survey methodology from where data were extracted for the current study was reviewed and approved by the National Health Research Ethics Committee (NHREC) of Nigeria and the ICF Institutional Review Board (NPC & ICF, 2019). Following the completion of the questionnaire development in English, translations were prepared for the three major

languages: Hausa, Yoruba, and Igbo. The 2018 NDHS employed computer-assisted personal interviewing as the mode for data collection (NPC & ICF, 2019).

Before commencing the interviews for the NDHS, the interviewers presented the informed consent statement to every eligible respondent. This statement outlined the rights of the respondents, the study's objectives and applications, the anticipated interview duration, and the possible advantages and drawbacks. Additionally, the informed consent statement supplied the contact details of principal investigators, should respondents require further clarification. In employing the informed consent statement as a tool, the interviewers underlined the voluntary nature of participation in the study. Respondents were assured of their right to abstain from answering any question and were informed that their identity and data would be treated with absolute confidentiality.

NDHS executed a series of measures prior to, during, and post data collection to safeguard information and uphold participant confidentiality. Comprehensive training was provided to all personnel engaged in the study, coupled with the requirement for them to sign confidentiality agreements prior to commencing their roles. These agreements outlined that discussions regarding data were limited solely to essential communications among NDHS personnel, including interviewers, health specialists, editors, and supervisors.

Ensuring utmost privacy, interviewers took care to conduct all interviews in the most discreet manner feasible. Specifically, interviews with eligible respondents were carried out individually, without the presence of another eligible respondent. Heightened privacy protocols were enforced particularly when eligible respondents were engaged in

intimate relationships, such as husband and wife. This stringent approach was adopted due to the inclusion of sensitive subjects, including sexual activity and domestic violence, within certain sections of the NDHS questionnaire.

The NDHS employed a numerical sequence encompassing enumeration areas, household numbers, and individual identifiers to uniquely associate respondents with their interviews. Following the data entry phase, NDHS eliminated questionnaire cover sheets containing these identifier numbers. Additionally, enumeration areas and household numbers were randomly reconfigured. Moreover, the geographic coordinates of each survey were subject to random displacement, ensuring a minimum separation distance of two kilometers.

Summary

In this section, I elucidated the procedures and undertakings I executed to establish the scientific and ethical robustness of the study. My approach encompassed a quantitative examination of NDHS data sets, aimed at discerning potential correlations between knowledge of HIV prevention as the dependent variable and factors (independent variables), such as residential location, socioeconomic status (i.e., wealth index), and the moderating influence of education on the relationships.

Within the study, I employed a methodology that ensured the adequacy of the sample size for conducting all requisite statistical analyses, ensuring substantial statistical power. I embarked on a series of statistical assessments, comprising descriptive univariate analysis, inferential bivariate analysis employing multiple logistic regression, to both characterize the sample and scrutinize the interconnected relationships.

Section 3: Presentation of the Results and Findings

Introduction

The purpose of this quantitative, correlational study was to examine the relationship between place of residence, wealth, and HIV/AIDS prevention knowledge among Nigerian adults aged 20–49 years old as well as the impact of education as the moderating variable on the relationship by using secondary data accessed from the 2018 NDHS with permission. I attempted to answer each of the following research questions with the corresponding hypotheses:

RQ1: What is the relationship between place of residence, urban versus rural, and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender?

$H_0$1: There is no significant relationship between place of residence, urban versus rural, and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender.

H_a1: There is a significant relationship between residence, urban versus rural, and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender.

RQ2: What is the relationship between wealth and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender?

$H_0$2: There is no significant relationship between wealth and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender.

H_a2: There is a significant relationship between wealth and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender.

RQ3: What is the relationship between residence, wealth, and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender?

H_03: There is no significant relationship between place of residence, wealth, and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender.

H_a3: There is a significant relationship between residence, wealth, and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender.

RQ4: Does education level significantly moderate the relationship between residence, wealth, and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender.

H_04: There is no significant moderating effect of education level on the relationship between residence, wealth, and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender.

H_a4: There is a significant moderating effect of education level on the relationship between residence, wealth, and HIV/AIDS prevention knowledge among Nigerian adults after controlling for age and gender.

In Section 3, I describe the study variables analyzed, procedures for analysis, and results.

Accessing the Data Set for Secondary Analysis

Data Collection Time Frame

The 2018 NDHS, which was implemented by the NPC in collaboration with the National Malaria Elimination Programme of the Federal Ministry of Health Nigeria, was completed within the same year. The fieldwork for the 2018 NDHS was launched under close supervision on August 14, 2018 in the clusters in the six zonal take-off centers. Thirty-seven teams, each consisting of one supervisor, one field editor, two male interviewers, three female interviewers, one lab scientist, and one nurse, were assigned across the different clusters in the zones (NPC & ICF, 2019). Fieldwork monitoring formed an integral part of the 2018 NDHS, and several of these monitoring units were carried out by the NDHS core team, the state coordinators from the NPC, National Malaria Elimination Programme, and ICF staff (NPC & ICF, 2019). In other words, the teams were closely monitored by the state coordinators and the quality controllers. After completion of the fieldwork in the zonal take-off centers in the first week, all the teams were brought back to the zonal office for a review session where they had an opportunity to clarify any questions they had. The teams were then dispatched to their respective states. Data collection lasted until December 29, 2018. In other words, the 2018 NDHS data were collected over a 5-month period from August 14, 2024 to December 29, 2018. The fieldwork in some states took longer than expected due to the security situation but were completed in the same year.

Recruitment and Response Rates

The 2018 NDHS consisted of four main questionnaires: the Household Questionnaire, the Women's Questionnaire, the Man's Questionnaire, and the Biomarker Questionnaire. Data on age, sex, and marital status of household members were used to identify women and men who were eligible for individual interviews (NPC & ICF, 2019). A total of 41,668 Nigerian households were selected for the interview sample, out of which 40,666 were occupied. A total of 40,427 households were successfully interviewed, which accounted for a 99% of response rate. In the interviewed households, 42,121 women aged 15–49 years old were identified for individual interviews, and these were completed with 41,821 women yielding a response rate of 99%. The subsample of households selected for male surveys identified 13,422 eligible men aged 15–59 years old, out of which 13,311 were successfully interviewed, yielding a response rate of 99% (NDHS, 2018).

In the current study, I concentrated on male and female adult respondents aged 20–49 years old (n = 42,769, 77.5%) extracted from the general NDHS population of individuals aged 15–49 years old (N = 55,132). For the purposes of the present study, I screened the collected data to exclude any respondents outside the 20–49-year-old age range, resulting in an analysis sample total of 42,769 respondents consisting of 33,398 women and 9,371 men. The data sets corresponding to the female and male respondents were combined into a single data file and analyzed using SPSS software.

Figure 1 represents the distribution of awareness about HIV among the sample population, which shows a high level of awareness. Out of a total population of 42,768

individuals, 95.0% (40,629 people) had heard about HIV, indicating widespread awareness. However, 5.0% (2,139 people) of the population reported that they had not heard about HIV. While most of the population were informed, the existence of a small percentage who lacked awareness highlights the need for continued education and outreach efforts to ensure comprehensive knowledge about HIV within the entire population.

Figure 1

Awareness of HIV Among the Study Population Showing the Distribution of Persons who Have Heard About HIV and Those Who Have Not Among the Sample Population

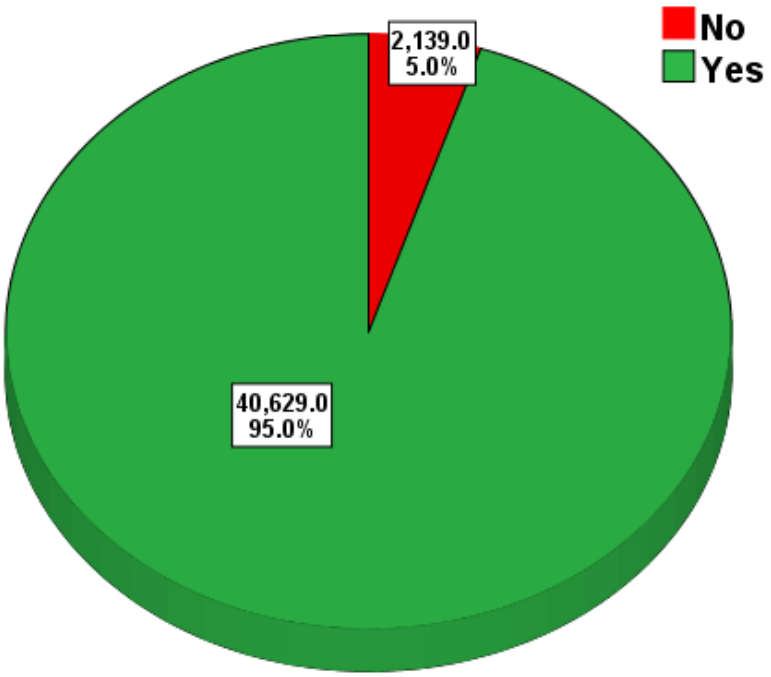

Table 2 displays descriptive statistics for the demographic control variables in this study. In the original 2018 NDHS, most of the respondents that fall within the age bracket (i.e., 20–49 years old) of the study population of interest in the sample were women (*n* = 33,398, 78.1%). The largest proportion of respondents in the total study

sample of 42,769 were in the 25–29-year-old age group (n = 8,821, 20.6%), whereas the smallest number of respondents fell within the 45–49-year-old age group (n = 5,060, 11.8%). The proportion of the sample (n = 42,769, 77.5%) used in this study out of the original NDHS sample (N = 55,132) was large to establish the external validity of the study.

Table 2

Descriptive Statistics for Demographic Control Variables

Variable	Frequency	Percent
Gender		
Male	9,371	21.9
Female	33,398	78.1
Age		
20–24	8,389	19.6
25–29	8,821	20.6
30–34	7,748	18.1
35–39	7,180	16.8
40–44	5,571	13.0
45–49	5,060	11.8

Results

Descriptive Statistics

The dependent variable in this study was HIV/AIDS prevention knowledge, which was measured based on the responses to five questions. Table 3 contains descriptive statistics for the questions comprising the dependent variable. Approximately 5% of the respondents were missing data for these questions. I assessed the responses of the respondents with data for comprehensive knowledge. Specifically, a response of "yes" to the first three questions and a response of "no" to the last two questions indicated comprehensive knowledge. Participants who provided the correct response to

all five questions were classified as having comprehensive knowledge, and those who did not were classified as lacking comprehensive knowledge. Table 4 displays descriptive statistics for the dependent variable of HIV/AIDS prevention knowledge. The largest proportion of respondents lacked comprehensive knowledge of HIV transmission and prevention (*n* = 20,841, 48.7%).

Table 3

Descriptive Statistics for HIV Knowledge Questions

Variable	Frequency	Percent
Reduce risk of getting HIV: always use condoms during sex		
No	6,372	14.9
Yes	32,308	75.5
Do not know	1,950	4.6
Missing	2,139	5.0
Reduce risk of getting HIV: Have one sex partner only, who has no other partners		
No	1,928	4.5
Yes	38,113	89.1
Do not know	589	1.4
Missing	2,139	5.0
A healthy-looking person can have HIV		
No	4,536	10.6
Yes	35,313	82.6
Do not know	781	1.8
Missing	2,139	5.0
Can get HIV from mosquito bites		
No	30,735	71.9
Yes	8,036	18.8
Do not know	1,859	4.3
Missing	2,139	5.0
Can get HIV by sharing food with person who has AIDS		
No	31,905	74.6
Yes	7,609	17.8
Do not know	1,116	2.6
Missing	2,139	5.0

Table 4

Descriptive Statistics for Comprehensive Knowledge of HIV/AIDS Prevention

Comprehensive knowledge of HIV transmission and prevention	Frequency	Percent
Lack of comprehensive knowledge	20,841	48.7
Comprehensive knowledge	19,789	46.3
Missing data	2,139	5.0

Table 5 displays descriptive statistics for the independent variables of place of residence and wealth. Most respondents lived in rural areas (n = 25,237, 59.0%). I recoded and analyzed wealth as two categories, with the poor category consisting of poorest and poorer, and the rich category consisted of middle, richer, and richest. Most respondents were classified as rich (n = 26,724, 62.5%).

Table 5

Descriptive Statistics for Place of Residence and Wealth

Variable	Frequency	Percent
Residence		
Urban	17,532	41.0
Rural	25,237	59.0
Wealth		
Poor	16,045	37.5
Rich	26,724	62.5

The moderator variable in this study was education level. Education level was recoded and analyzed as two categories, no education versus educated, with the latter category consisting of primary, secondary, and higher levels of education. Table 6 displays descriptive statistics for education level. Approximately two thirds of the respondents in the sample were educated (n = 28,474, 66.6%).

Table 6

Descriptive Statistics for Education Level (Moderator Variable)

Education level	Frequency	Percent
No education	14,295	33.4
Educated	28,474	66.6

Research Question 1

To answer Research Question 1, I performed a binary logistic regression. In this analysis, the dependent variable was HIV/AIDS prevention knowledge, and the independent variable was place of residence. Gender and age were included in the analysis as control variables. Prior to the analysis, I assessed the assumption of no severe multicollinearity by calculating VIFs for the predictors. The VIFs for residence (1.00), gender (1.00), and age (1.01) were all below 10, indicating that there was no severe multicollinearity.

The chi-square test results for the binary logistic regression model were significant, $\chi^2(3) = 968.22$, $p < .001$, Nagelkerke $R^2 = .03$, indicating that place of residence, gender, and age significantly predicted comprehensive knowledge of HIV transmission and prevention collectively. Table 7 presents the coefficient statistics for the regression. There was a significant relationship between place of residence and comprehensive knowledge of HIV transmission and prevention ($B = -0.63$, $p < .001$) after controlling for age and gender; therefore, the null hypothesis was rejected. The odds ratio for place of residence suggests that individuals living in rural areas were 0.54 times as likely (i.e., less likely) to have comprehensive knowledge compared to those living in urban areas.

Table 7

Coefficients for Binary Logistic Regression with Place of Residence Predicting Comprehensive Knowledge of HIV Transmission and Prevention

					95% CI Exp(*B*)	
Variable	*B*	S.E.	Sig.	Exp(*B*)	Lower	Upper
Residence [rural]	-0.63	0.02	< .001	0.54	0.51	0.56
Gender [female]	-0.09	0.02	< .001	0.92	0.88	0.96
Age	-0.02	0.01	.012	0.99	0.97	1.00
Constant	0.44	0.04	< .001	1.56		

Research Question 2

To answer Research Question 2, I performed another binary logistic regression. In this analysis, the dependent variable was HIV/AIDS prevention knowledge, and the independent variable was wealth. Gender and age were included in the analysis as control variables. Prior to the analysis, I assessed the assumption of no severe multicollinearity by calculating VIFs for the predictors. The VIFs for wealth (1.00), gender (1.01), and age (1.01) were all below 10, indicating that there was no severe multicollinearity.

The chi-square test for the binary logistic regression model was significant, $\chi^2(3) = 1{,}127.65$, $p < .001$, Nagelkerke $R^2 = .04$, indicating that wealth, gender, and age significantly predicted comprehensive knowledge of HIV transmission and prevention collectively. Table 8 presents the coefficient statistics for the regression. There was a significant relationship between wealth and comprehensive knowledge of HIV transmission and prevention ($B = 0.70$, $p < .001$) after controlling for age and gender; therefore, the null hypothesis was rejected. The odds ratio for wealth suggests that rich individuals were 2.01 times as likely (i.e., more likely) to have comprehensive knowledge compared to those who were poor.

Table 8

Coefficients for Binary Logistic Regression with Wealth Predicting Comprehensive Knowledge of HIV Transmission and Prevention

					95% CI Exp(*B*)	
Variable	*B*	S.E.	Sig.	Exp(*B*)	Lower	Upper
Wealth [rich]	0.70	0.02	< .001	2.01	1.93	2.09
Gender [female]	-0.07	0.02	.006	0.94	0.89	0.98
Age	-0.01	0.01	.019	0.99	0.97	1.00
Constant	-0.39	0.04	< .001	0.68		

Research Question 3

To answer Research Question 3, another binary logistic regression was performed. In this analysis, the dependent variable was HIV/AIDS prevention knowledge, and the independent variables were place of residence and wealth. Gender and age were included in the analysis as control variables. Prior to the analysis, I assessed the assumption of no severe multicollinearity by calculating VIFs for the predictors. The VIFs for residence (1.25), wealth (1.25), gender (1.01), and age (1.01) were all below 10, indicating that there was no severe multicollinearity.

The chi-square test for the binary logistic regression model was significant, $\chi^2(4) = 1{,}450.92$, $p < .001$, Nagelkerke $R^2 = .05$, indicating that place of residence, wealth, gender, and age significantly predicted comprehensive knowledge of HIV transmission and prevention collectively. Table 9 presents the coefficient statistics for the regression. There was a significant relationship between place of residence and comprehensive knowledge of HIV transmission and prevention ($B = -0.41$, $p < .001$). Additionally, there was a significant relationship between wealth and comprehensive knowledge of HIV transmission and prevention ($B = 0.51$, $p < .001$). Therefore, the null hypothesis was

rejected. The odds ratio (Exp(B) = 0.67) for place of residence suggests that individuals living in rural areas were 0.67 times as likely (i.e., less likely) to have comprehensive knowledge compared to those living in urban areas. The odds ratio (Exp(B) = 1.67) for wealth suggests that rich individuals were 1.67 times as likely (i.e., more likely) to have comprehensive knowledge compared to those who were poor.

Table 9

Coefficients for Binary Logistic Regression with Place of Residence and Wealth Predicting Comprehensive Knowledge of HIV Transmission and Prevention

					95% CI Exp(*B*)	
Variable	*B*	S.E.	Sig.	Exp(*B*)	Lower	Upper
Residence [rural]	-0.41	0.02	< .001	0.67	0.64	0.70
Wealth [rich]	0.51	0.02	< .001	1.67	1.60	1.75
Gender [female]	-0.07	0.02	.003	0.93	0.89	0.98
Age	-0.02	0.01	.008	0.98	0.97	1.00
Constant	-0.02	0.04	.623	0.98		

Research Question 4

To answer Research Question 4, another binary logistic regression was performed. In this analysis, the dependent variable was HIV/AIDS prevention knowledge, and the independent variables were place of residence and wealth. Education level was included as a moderator variable. To test for moderation, interaction terms were computed between the independent variables and education level. Gender and age were included in the analysis as control variables. Prior to the analysis, the assumption of no severe multicollinearity was assessed by calculating VIFs for the predictors. The VIFs for residence (1.27), wealth (1.54), education (1.39), gender (1.03), and age (1.02) were all below 10, indicating that there was no severe multicollinearity.

The chi-square test for the binary logistic regression model was significant, $\chi^2(7) = 1{,}598.76$, $p < .001$, Nagelkerke $R^2 = .05$, indicating that the variables significantly predicted comprehensive knowledge of HIV transmission and prevention collectively. Table 10 presents the coefficient statistics for the regression. The interaction between place of residence and education level was not significant ($B = -0.01$, $p = .909$), indicating that the relationship between place of residence and knowledge was not moderated by education level. The interaction between wealth and education level was significant ($B = 0.23$, $p < .001$), indicating that the relationship between wealth and knowledge was moderated by education level. Therefore, the null hypothesis was rejected. The odds ratio (Exp(B) = 1.26) for the significant interaction suggests that the likelihood of having comprehensive knowledge increases by an additional 1.26 times for individuals who were both rich and educated.

Table 10

Coefficients for Binary Logistic Regression with Place of Residence, Wealth, and Education Level Predicting Comprehensive Knowledge of HIV Transmission and Prevention

					95% CI Exp(*B*)	
Variable	*B*	S.E.	Sig.	Exp(*B*)	Lower	Upper
Residence [rural]	-0.37	0.05	< .001	0.69	0.63	0.76
Wealth [rich]	0.25	0.04	< .001	1.28	1.17	1.39
Education [educated]	0.18	0.06	.003	1.20	1.06	1.35
Rural x educated	-0.01	0.06	.909	0.99	0.89	1.11
Rich x educated	0.23	0.06	< .001	1.26	1.13	1.40
Gender [female]	-0.03	0.03	.186	0.97	0.92	1.02
Age	-0.01	0.01	.141	0.99	0.98	1.00
Constant	-0.18	0.06	.004	0.84		

Summary

The results of the binary logistic regression analysis for Research Question 1 showed that there was a significant relationship between place of residence and HIV/AIDS prevention knowledge after controlling for age and gender, and therefore the null hypothesis was rejected. Individuals living in rural areas were less likely to have comprehensive knowledge compared to those living in urban areas. For Research Question 2, the results showed that there was a significant relationship between wealth and knowledge after controlling for age and gender, and therefore the null hypothesis was rejected. Rich individuals were more likely to have comprehensive knowledge compared to those who were poor. For Research Question 3, the results showed that there were significant relationships between place of residence, wealth, and knowledge after controlling for age and gender, and therefore the null hypothesis was rejected. Finally, the

results for Research Question 4 showed that education level significantly moderated the relationship between wealth and knowledge, and therefore the null hypothesis was rejected. The likelihood of having comprehensive knowledge was additionally increased for individuals who were both rich and educated. In the next section, I will discuss these findings, including the limitations of the study, my recommendations, and implications for professional practice and social change.

Section 4: Application to Professional Practice and Implications for Social Change

Introduction

The purpose of this quantitative study was to examine the relationship between the independent variables of place of residence and wealth and the dependent variable of HIV/AIDS prevention knowledge in adults aged 20–49 years old in Nigeria as well as the effect of education as the moderating variable on the relationship. The study included secondary data obtained from NDHS (2018) to explore how the place of residence and wealth varied in determining the HIV/AIDS prevention knowledge in adult Nigerians aged 20-49 years based on their education level while controlling for age and gender using moderated regression analysis. With the first independent variable, place of residence, I considered differences in the HIV/AIDS prevention knowledge among rural versus urban dwellers within the study population. The aim of this variable was to determine whether urban dwellers were more knowledgeable about HIV/AIDS prevention than the rural dwellers or vice versa, including other factors that had influenced the differences. The second independent variable, wealth index, was dichotomized into two categories (i.e. poor and rich) to assess the HIV/AIDS prevention knowledge level of the study population based on whether they fell within the poor or the rich categories. The 2018 NDHS from which the dependent variable of HIV/AIDS prevention knowledge was derived covered HIV/AIDS knowledge, transmission, and prevention methods and included a series of questions to measure respondents' knowledge and attitudes regarding HIV/AIDS. Married women and men aged 20–49 years old that fell among the survey population were first asked whether they had heard

of HIV/AIDS. Those who reported having heard of HIV/AIDS were asked additional questions regarding the various modes of prevention, including whether it is possible to reduce the chances of getting the HIV virus by having just one faithful sex partner and using a condom during every sexual encounter. To allow for an assessment of the extent of possible misconceptions, respondents were also asked whether they think it is possible for a healthy-looking person to have the HIV/AIDS virus as well as whether a person can contract HIV/AIDS from mosquito bites, by sharing food with a person who has HIV/AIDS, or through supernatural means.

I conducted the current study to investigate how the education level of Nigerian adults aged 20–49 years old moderates the association between their place of residence, their wealth quantile, and their HIV/AIDS prevention knowledge. The study findings answered the question of whether the independent variables, place of residence and wealth, have a strong relationship to the HIV/AIDS prevention knowledge, which could contribute positively to the control of the disease. Understanding the level of HIV/AIDS prevention knowledge among people dwelling in rural areas versus those dwelling in urban areas and among the rich and the poor individuals can help to determine how to channel education resources and other preventive measures for HIV/AIDS control.

Summary of Key Findings

The findings showed that there was a significant relationship between place of residence and comprehensive knowledge of HIV/AIDS transmission and prevention. The odds ratio for place of residence (Exp(B) = 0.54) suggests that individuals living in rural areas were less likely to have comprehensive knowledge compared to those living in

urban areas after controlling for age and gender. I also found that there was a significant relationship between wealth and comprehensive knowledge of HIV/AIDS transmission and prevention. The odds ratio (Exp(B) = 2.01) for wealth as seen in the analysis for Research Question 2 suggests that rich individuals were more likely to have comprehensive knowledge compared to those who were poor after controlling for age and gender. In the analysis, the interaction between place of residence and education level was not significant, indicating that the relationship between place of residence and knowledge of HIV/AIDS transmission and prevention was not moderated by education level. However, the interaction between wealth and education level was significant, indicating that the relationship between wealth and knowledge of HIV/AIDS transmission and prevention was moderated by education level. In other words, the adjusted odds ratio (Exp (B) = 1.26) for the significant interaction suggested that the likelihood of having comprehensive knowledge increase was found among individuals who were both rich and educated.

Interpretation of the Findings

The results of the study provide several important insights into the factors influencing comprehensive knowledge of HIV transmission and prevention. Although 95% of the sample population had heard about HIV, there was a significant gap in comprehensive knowledge about its transmission and prevention, as evidenced by nearly half of the respondents (48.7%) lacking a full understanding. This finding suggests that while basic awareness campaigns have reached most of the population, they may not have translated into detailed knowledge that informs behavior change or preventive

actions. Therefore, simply being aware of HIV does not equate to possessing the critical understanding needed to mitigate risks effectively. In a related study to assess the HIV/AIDS knowledge, attitudes, and beliefs among Nepalese adolescents, Mahat and Scoloveno (2006) found that most of the adolescents had a moderate level of overall HIV/AIDS knowledge but lacked knowledge in the areas of mode of transmission and prevention of HIV/AIDS. The findings in the current study confirm findings in previous studies on the disparity between being aware of HIV and having knowledge of its mode of transmission and prevention (see Mahat & Scoloveno, 2006). Additionally, Bankole et al. (2017) assessed knowledge of HIV/AIDS among residents of three rural communities in Nigeria and found a high level of HIV/AIDS awareness among the participants. However, their findings revealed that the participants had insufficient knowledge of prevention and management of HIV, their HIV status, and readiness to utilize the free counseling and testing services.

The results from the binary logistic regression analysis in the current study indicated that place of residence plays a significant role in determining comprehensive knowledge of HIV transmission and prevention. Specifically, individuals living in rural areas were significantly less likely (0.54 times as likely) to have comprehensive knowledge compared to those in urban areas. This may reflect disparities in access to health education, infrastructure, and health care services between rural and urban communities. Rural populations may have less access to public health interventions, which tend to be more concentrated in urban centers, and face greater barriers to obtaining accurate information due to limited outreach efforts, lower literacy rates, and

fewer health facilities, which surprisingly corroborates the findings in similar previous research (see Haque et al., 2018) These findings underscore the need for targeted interventions in rural areas to bridge the knowledge gap.

The findings in the current study also confirm the findings of previous studies. For example, Yaya et al. (2019) conducted a cross-sectional study based on data from the 2013 NDHS that examined the socioeconomic and community factors associated with HIV/AIDS knowledge and attitudes among community dwelling women in Nigeria by using the linear regression with dummy variables model. Their study results showed that rural respondents displayed reduced HIV knowledge [Exp(B) = 0.8; 95% confidence interval (CI) = 0.83-0.89] and attitudes towards HIV/AIDS [Exp(B) = 0.91; 95% CI =0.89-0.93] compared with their urban dwelling counterparts, which means that knowledge of and attitudes towards HIV have a positive association with the respondents' age, geographical location, and place of residence.

The current study results also demonstrated that wealth significantly predicts comprehensive knowledge of HIV, with rich individuals being more than twice as likely to possess comprehensive knowledge compared to poorer individuals. This finding is not surprising and could be attributed to the fact that wealthier individuals may have better access to education, health care services, and information as well as more opportunities to engage with media and community programs that disseminate health information (see Haque et al., 2018). Economic empowerment is likely linked to better health literacy and access to preventive resources, making it a crucial factor in the fight against HIV. This finding also confirms Faust and Yaya's (2017) findings from a quantitative study using

the nationally representative 2013 NDHS to investigate how wealth inequality and other sociodemographic variables predict HIV-related knowledge among Nigerians as well as how those Nigerians who belong to special subgroups would benefit from specific HIV prevention interventions. The results of their analysis showed that Nigerians who belonged to the upper wealth quantile were less than half as prone than as those in the lower wealth quantile to have low HIV-related knowledge (AOR = 0.40, 95% CI = 0.35-0.46, $p < 0.001$) and that at each level of the wealth quantile, 2 times more women exhibited lesser HIV-knowledge than their male counterparts. The difference between Faust and Yaya's study and the current study was that I introduced education level as a moderator variable to determine how it affects the relationship between wealth and HIV prevention knowledge among the Nigerian adult population aged 20–49 years old.

The significant interaction between wealth and education observed in the current study further highlights the importance of socioeconomic status and educational attainment in understanding HIV transmission and prevention knowledge. The results revealed that individuals who are both rich and educated are 1.26 times more likely to have comprehensive knowledge of HIV transmission and prevention. This interaction suggests that education amplifies the positive effects of wealth on health knowledge. Educated individuals, particularly those from wealthier backgrounds, may have a broader understanding of health issues and may also be better equipped to interpret and act on the information they receive. In contrast, those with lower education levels may not fully benefit from the resources available to them, even if they are wealthier. This finding is confirmed by Iqbal et al.'s (2019) findings regarding the effects of socio-demographic

characteristics and autonomy on comprehensive knowledge and positive attitudes, which are considered the foundation for the prevention, control, and treatment of HIV/AIDS. The researchers assessed 13,558 married women aged 15–49 years old who were identified using the national representative data set of the 2012–2013 Pakistan Demographic and Health Survey to determine the respondents' knowledge on the modes of HIV/AIDS transmission and available preventive measures. Their results indicated that about 42% of the women have heard about HIV/AIDS and 68%, which is the majority, had a good overall knowledge of the disease as well as that Pakistani women who lived in urban areas, had at least a secondary-level education, had high autonomy, and belonged to the richest wealth quantile tended to have better knowledge of HIV/AIDS and positive attitudes towards people living with the disease (Iqbal et al., 2019). They found that the interaction between place of residence and education level was not significant, indicating that education does not moderate the relationship between living in a rural or urban area and HIV knowledge. This finding may suggest that regardless of educational attainment, living in a rural area still presents unique challenges in terms of access to comprehensive health information. Even educated individuals in rural areas may not have the same exposure to HIV education programs as their urban counterparts, possibly due to limitations in health care infrastructure and outreach in rural regions. This confirms the current study findings that place of residence influences a person's HIV/AIDS prevention knowledge level irrespective of their education level (see Yaya et al., 2019)

Interpretation of Findings in a Theoretical Context

I used Bandura's (2004) SCT to frame this study. SCT is one of the most widely used models in the study of disease transmission and prevention knowledge, which could transmit to positive behavioral change. In SCT, Bandura (1988) explained human behavior as a dynamic, mutual, and continuous interaction between the individual and the environment. I employed the model in this study to help understand how place of residence and wealth quantile of the study population related to their HIV/AIDS prevention knowledge level with education as the moderator variable. The study findings indicated that education level, residence, and wealth are important to promote the knowledge of HIV/AIDS prevention. When applied in the context of HIV/AIDS, the SCT presupposes that HIV/AIDS risks and prevention knowledge are dependent on a core set of determinants, including knowledge of health risks, perceived self-efficacy of the ability to control health habits, outcomes expectations, set health goals, perceived facilitators for the behavior change, and the impediments to the sought change (see Bandura, 2004). In other words, the SCT emphasizes that acquiring the disease knowledge, which includes what the disease is, how it is transmitted, and how it can be prevented, leads to behavioral change manifesting in the performance of desired preventive measures that ultimately leads to the attainment of the desired outcome, which is protection from diseases (see Bandura, 2004).

Previous studies carried out by other researchers underscored the importance of the SCT in promoting behavior change in relation to HIV/AIDS risks. The NIMH (2001) found that a causal relationship exists between self-efficacy and a variety of health risk-

reducing behaviors, such as the use of condom and contraception, which are strongest when the self-efficacy measures are tailored to specific risk behaviors and relevant situational factors. Calloway et al. (2014) suggested that peer education, which has its focus on severity, benefits, susceptibility, self-efficacy, peer influence, and skill building, serves as an effective strategy that could reduce HIV behaviors among certain Black populations. Kalichman et al. (2005) reported that a behavioral intervention rooted in SCT minimizes the incidence of unprotected sexual behaviors among men living with HIV infection with their female counterparts who are in a similar situation, whereby the highest reductions in the risk behaviors of HIV transmission occurring with sex partners who are not HIV positive. Olanrewaju (2020) found that parent-adolescent communication on HIV education was an educational strategy to reduce the attitudes and behaviors associated with increased HIV risks. On the other hand, Zakiel et al. (2022) opined that AIDS risk perception and controlling risky behavior associated with AIDS are positively related (i.e., higher risk perception will result in higher control over risky behavior). Therefore, the application of SCT in HIV/AIDS prevention efforts could narrow the gap between having knowledge of the disease and engaging in the behavioral change needed for the disease prevention (Safren et al., 2010).

Limitations of the Study

While providing valuable insights into the relationship between place of residence, wealth, education, and HIV/AIDS prevention knowledge, this study had several limitations that must be acknowledged.

Use of Secondary Data

The study relied on secondary data from the 2018 NDHS. Although these data are extensive, they limited the ability to control for all potential confounding variables or to include additional variables that could have provided further insights into HIV/AIDS prevention knowledge, such as access to health care services, cultural beliefs, or the influence of local community outreach programs. The predefined structure of the data set and how the data were collected constrained the current study to available variables, which may have omitted relevant factors. This limits the external validity of study because the original sampling strategy and findings may not apply to persons in other countries.

Cross-Sectional Design

The NDHS data set is cross-sectional, meaning that it captured information at one point in time. This design limits the ability to infer causality between place of residence, wealth, education, and HIV/AIDS prevention knowledge. The current study could not establish a causal relationship between residence, wealth, and HIV/AIDS prevention knowledge because of the use of a cross-sectional, correlational design. A longitudinal study would be necessary to track changes over time and establish stronger causal relationships between these variables.

Self-Reported Data

The data used in this study were self-reported by participants, which may introduce social desirability bias or recall bias. Respondents might have over- or underreported their knowledge of HIV/AIDS prevention due to perceived social pressures

or misunderstandings. This could affect the accuracy of the findings regarding the true level of knowledge within the population.

Simplification of Variables

The wealth variable was dichotomized into "poor" and "rich," and education was simplified into "educated" and "no education." These categorizations may have oversimplified complex socioeconomic and educational differences. For example, dividing wealth into two categories may not capture the nuances between different wealth quantiles, and the educational categories may not fully reflect the diverse levels of knowledge and literacy within the population.

Limited Scope of Moderation

Although education was examined as a moderating variable between place of residence, wealth, and HIV/AIDS prevention knowledge, other potential moderating or mediating factors were not considered. Variables such as access to media, community engagement, or the presence of local health campaigns could have influenced the relationships studied, and their exclusion may have resulted in an incomplete understanding of the moderating effects.

Geographical and Cultural Differences

Nigeria is a highly diverse country with significant variations in culture, language, religion, and local practices across its regions. These differences may influence HIV/AIDS knowledge and prevention practices. However, the study did not account for regional variations beyond urban and rural residence, which could have led to an oversimplification of the relationships between place of residence and HIV/AIDS

knowledge. Although the original 2018 NDHS sample was a stratified sample selected in two stages by separating each of the 36 states and the Federal Capital Territory into urban and rural areas but due to the nonproportional allocation of the sample to the different states and the possible differences in response rates, sampling weights were calculated, added to the data file, and applied so that the results would be representative at the national level as well as the domain level. However, cultural differences seen across the five geo-political zones of Nigeria could influence the level of HIV/AIDS prevention knowledge of the respondents irrespective of their place of residence (urban or rural), their education level and their wealth quantile. According to Vitsupakorn et al. (2024), culture is an important determinant of HIV risk and protective behaviors and should be integrated in interventions to improve uptake and HIV-related outcomes. It is pertinent to mention that the findings in this study may be generalized since the respondents' sample were randomly selected to represent the entire country and the effect of cultural influences were not considered or form part of the focus of the study.

Limited Age Range

The study focused on adults aged 20–49 years, which may not represent the knowledge and prevention behaviors of younger or older populations. HIV/AIDS prevention campaigns and education may target different age groups differently, so the findings cannot be generalized to the entire Nigerian population of other age groups.

Exclusion of Key Behavioral Variables

The study did not examine behavioral factors such as sexual practices, access to condoms, or the frequency of health care visits, which are critical to understanding

HIV/AIDS prevention. Comprehensive knowledge of HIV/AIDS transmission and prevention do not necessarily translate into preventive behavior, and this study did not explore whether participants acted on their knowledge. These limitations highlight areas where future research can focus on expanding the understanding of HIV/AIDS prevention knowledge and addressing the complexity of the factors that influence it in Nigeria.

Recommendations

Based on the findings of this study, I recommend that future research on HIV prevention knowledge with this population should explore other potential moderating factors that may influence the relationship between place of residence, wealth, and HIV/AIDS prevention knowledge. Variables such as cultural beliefs, access to health care services, and participation in community outreach programs should be studied to provide a more comprehensive understanding of the factors influencing HIV knowledge.

The study did not establish the casual relationship between residence, wealth, and HIV/AIDS prevention knowledge because it is a cross-sectional design study that utilized correlational methodology. Therefore, future researchers may want to consider adopting probit logistic model to establish cause and effect relationship existing between the variables of interest.

Implications for Professional Practice and Social Change

It is pertinent to mention that HIV/AIDS infection can occur irrespective of a person's socioeconomic and sociodemographic backgrounds when certain preventive measures such as the correct and consistent use of condoms, having one HIV uninfected

sex partner only and other preventive measures are not observed. The findings in this study have important implications for public health strategies. First, they emphasize the need for continued and targeted health education, particularly in rural areas and among poorer segments of the population. Interventions should be designed to not only raise awareness but also to ensure that populations receive accurate and comprehensive knowledge that translates into preventive behaviors. Second, the interaction between wealth and education underscores the necessity of integrating education into HIV awareness campaigns, especially for low-income populations. By addressing both economic and educational disparities, public health initiatives can be more effective in promoting comprehensive knowledge and reducing the risk of HIV transmission.

In this study it was observed that while there is widespread awareness about HIV among the adult population, significant gaps in comprehensive knowledge persist, particularly among rural and poorer individuals. Public health efforts should focus on narrowing these gaps, with targeted education and outreach programs to ensure that all segments of the population, regardless of their socioeconomic status or place of residence, are well-informed about HIV transmission and prevention.

Conclusion

This study explored the relationship between place of residence, wealth, and HIV/AIDS prevention knowledge among Nigerian adults aged 20–49 years, with education serving as a moderating factor. This is the age bracket when most individuals get married and are highly sexually active. The findings in this study indicate that both place of residence and wealth significantly influence comprehensive HIV/AIDS

prevention knowledge. Specifically, individuals residing in rural areas are less likely to possess comprehensive knowledge of HIV prevention methods compared to their urban counterparts, highlighting the challenges faced by rural communities in accessing health information. Wealth also plays a crucial role, with richer individuals being more likely to have comprehensive knowledge of HIV prevention than poorer individuals.

The moderating effect of education was significant in the relationship between wealth and knowledge, showing that educated individuals who are also wealthy are more likely to possess comprehensive knowledge of HIV prevention. However, education did not significantly moderate the relationship between place of residence and HIV/AIDS prevention knowledge, suggesting that the challenges rural dwellers face in acquiring comprehensive knowledge persist regardless of their educational background.

Overall, these findings emphasize the critical role that socioeconomic factors, particularly wealth and education, play in shaping HIV/AIDS prevention knowledge, while also highlighting disparities between rural and urban populations. A full understanding of these concepts by the Nigerian governmental and nongovernmental agencies involved in health care delivery would be essential in formulating policies that would ensure the equitable distribution of resources aimed at controlling the HIV/AIDS menace in the country especially among the adult population.

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Appendix: ICF/NDHS Data Set Use Approval Letter

Jun 10, 2024

Chinedu Nwaru
Walden University
United States
Request Date: 06/09/2024

Dear Chinedu Nwaru:

This is to confirm that you are approved to use the following Survey Datasets for your registered research paper titled: "Residence, Education, Wealth, and HIV/AIDS Prevention Knowledge Among Nigerian Adults":

Nigeria

To access the datasets, please login at: https://www.dhsprogram.com/data/dataset_admin/login_main.cfm. The user name is the registered email address, and the password is the one selected during registration.

The IRB-approved procedures for DHS public-use datasets do not in any way allow respondents, households, or sample communities to be identified. There are no names of individuals or household addresses in the data files. The geographic identifiers only go down to the regional level (where regions are typically very large geographical areas encompassing several states/provinces). Each enumeration area (Primary Sampling Unit) has a PSU number in the data file, but the PSU numbers do not have any labels to indicate their names or locations. In surveys that collect GIS coordinates in the field, the coordinates are only for the enumeration area (EA) as a whole, and not for individual households, and the measured coordinates are randomly displaced within a large geographic area so that specific enumeration areas cannot be identified.

The DHS Data may be used only for the purpose of statistical reporting and analysis, and only for your registered research. To use the data for another purpose, a new research project must be registered. All DHS data should be treated as confidential, and no effort should be made to identify any household or individual respondent interviewed in the survey. Also, be aware that re-distribution of any DHS micro-level data, either directly or within any tool/dashboard, is not permitted. Please reference the complete terms of use at: https://dhsprogram.com/Data/terms-of-use.cfm.

The data must not be passed on to other researchers without the written consent of DHS. However, if you have coresearchers registered in your account for this research paper, you are authorized to share the data with them. All data users are required to submit an electronic copy (pdf) of any reports/publications resulting from using the DHS data files to: references@dhsprogram.com.

Sincerely,

Bridgette Wellington

Bridgette Wellington
Data Archivist
The Demographic and Health Surveys (DHS) Program

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