

Socio-Demographic, Behavioural and Biomedical Factors Contributing to HIV Spread among Adults in Ghana - A Case-Control Study

Justice Thomas Sevugu¹, Justice Ofori-Amoah², Emmanuel K Nakua³

¹Atwima Nwabiagya Municipal Health Directorate, Nkawie, Ashanti Region, Ghana

²Sekyere East District Health Directorate, Effiduas, Ashanti Region, Ghana

³Kwame Nkrumah University of Science and Technology, School of Public Health, Department of Epidemiology and Biostatistics, PMB, Kumasi, Ghana

Abstract

HIV/AIDS prevalence remains a major global public health and development challenge despite key interventions to curb its spread. Ghana, in particular, for a decade now, has experienced a persistent increase in the number of HIV new infections among adults, with the new infection rates varying across the administrative regions. The study examines socio-demographic, health, social, behavioural, and biomedical factors contributing to the spread of HIV among adults in Ghana and how these factors vary across administrative regions. A case-control study was carried on involving 362 respondents made of 181 HIV cases and controls, each from the Ahafo and Northern regions of Ghana. Structured questionnaires were administered. Socio-demographic characteristics of respondents, their health status, social behavioural, and biomedical factors that have potential influence on the spread of HIV was collected. A logistic regression model was used to estimate the degree to which each of the risk factors collected were associated with the spread of HIV in Ghana and across regions. Out of 21 risk factors identified, 13 accounted for the spread of HIV in the Ahafo region compared to only 6 in the Northern region. The study concludes that factors for HIV spread in Ghana are many but vary across administrative regions in the country. It, therefore, suggests the need to create job opportunities, have HIV awareness campaign programmes, regulate the sale of alcoholic and other related drugs, discourage sex trade, promote condom use throughout the country for those who cannot abstain, and tailored to regions.

Keywords: Adults, Biomedical Factors, HIV Spread, Socio-Behavioural.

Introduction

The prevalence of HIV/AIDS and measures to curb its spread remained a major global public health and development challenges. For decades now, key global efforts have been galvanized to address the epidemic, and great strides have been made. For instance, the number of newly infected people with HIV and the number of AIDS-related deaths had progressively declined over the years, while the number of people with the infection receiving treatment increased to 23.3 million in 2018 [1]. In particular, coming down to developing countries and Sub-Saharan

Africa reveals rather a slow average progress rate in reducing the spread of HIV infections.

It is observed that globally, an estimated 37.9 million people were living with HIV, out of which about 1.7 million were new infections in 2018 alone, a decline of 40% in the number of new infections since the peak in 1997 [1]. An estimated 32.0 million (23.6 million–43.8 million) people have died from AIDS-related illnesses since the beginning of the epidemic. Sub-Saharan Africa in particular, accounts for the largest percentage of infections and people living with HIV/AIDS in the whole world. Approximately 25.6 million (67% of the global

*Corresponding Author: justicese1@yahoo.com

total) people live with the virus in sub-Saharan African countries [1]. The countries within this sub-region with the highest prevalence rate and the number of people living with HIV/AIDS include South Africa, Nigeria, Kenya, Uganda, Zimbabwe, Namibia, Tanzania, Swaziland, Lesotho, Botswana, Zambia, Mozambique, Ghana, Bahamas, Belize, Jamaica, Haiti, India, Thailand, Nepal, Myanmar, Indonesia, and Malaysia.

Despite recent reports of decreases in HIV infection prevalence in parts of Africa, Ghana recorded an increase in the number of new HIV infections in 2018 [2]. Though the country also experienced an increase in numerous prevention strategies and awareness campaigns, HIV transmission and prevalence rates remain high, thwarting the progress of the fight against the disease. The adult HIV/AIDS prevalence rate in the country has been estimated at 1.69 percent, according to 2018 national HIV estimates [2]. Also, based on regional variation in the prevalence and spread of HIV, the Ahafo region recorded one of the highest prevalence rates of 2.66 percent, while the lowest prevalence of 0.40 percent was recorded in the Northern region according to the 2018 national prevalence survey.

To understand why HIV/AIDS remains an epidemic in Ghana, we examined the factors that are contributing to the spread of the disease and the variations across administrative regions within Ghana. For the past decades, Ghana experienced a persistent increase in the number of HIV new infections [3] with wide regional variations of as high as 2.66% in the Ahafo region and as low as 0.40% in the Northern region. The purpose of the investigator was to identify the various risk factors associated with the new HIV infections and the regional variation in the prevalence rate for the Ahafo and the Northern regions. Particularly, little scientific research exists on the subject matter in Ghana. This study addresses the knowledge gap in the literature by investigating the determinants of HIV prevalence and the wide regional

variations in Ghana. Based on the findings, the appropriate intervention measures to curb the spread of the virus are proposed.

The current trends on HIV infections reveal that many people are either living with the condition or at high risk of being effected with the virus. Even though progress has been made at the global level on prevention, treatment, and care, there remains no cure for the disease [1]. Notwithstanding the challenges, significant progress has been made to address the epidemic. For instance, the Sustainable Development Goal 3 enjoins the global community to end the AIDS epidemic by 2030, and under the UNAIDS “90-90-90” targets, countries work toward achieving, by 2020, “90% of people living with HIV knowing their HIV status; 90% of people who know their HIV-positive status on treatment; and 90% of people on treatment with suppressed viral loads.” Despite Ghana’s weak performance in these targets as at December 2018, Ghana attained 63%, 42%, and 15% of the first, second and third 90-90-90 targets, respectively [4], new HIV infections remain high. To understand the various reasons accounting for high new infections and the regional variations in the spread of the virus, we first identified the socio-demographic, behavioural, and biomedical factors contributing to HIV spread among adults in Ghana; and then examined the variation in these factors in the Ahafo and Northern regions; and further established their associations with the spread of HIV in these regions of the country.

A review of literature shows that HIV/AIDS is a global burden that continues to threaten the world’s development efforts since 1981, when the first cases were reported. In almost 4 decades, the disease has infected over 70 million people, with 35 million related deaths [5]. The prevalence of HIV differs from country to country, though the majority of the cases come from low and middle-income countries, including Africa [5]. The number of HIV-infected people in 2017 in sub-Sahara Africa was 25.7 million as compared to 5.9 million in Asia and 2.2 million in Europe and America [5].

HIV/AIDS affects people of all ages and sex in all countries, but the impact varies. According to the world bank 2017 report on the proportion of adults living with HIV/AIDS, the following ten countries top the league table with the highest prevalence of HIV/AIDS in the world. Swaziland recorded the highest prevalence of 27.2%, followed by Lesotho with 25%, Botswana 21.9%, South Africa 18.9%, Namibia 13.8%, Zimbabwe 13.5%, Zambia 12.4%, Mozambique 12.3%, Malawi 9.2% and Uganda 6.5% [6].

Relevant literature has shown that the majority of factors such as demographic factors, alcohol use, smoking, late testing for HIV, previous history of STI, multiple sexual partners, infrequent condom use, and knowledge on HIV could contribute to the prevalence of HIV in the world. Though such studies could not conclude on the extent to which these factors influence different groups and populations, they provided associations. Nonetheless, the interplay of these factors has serious consequences on people at higher risk of infection, deaths, and the communities in which these people reside.

It is reported that heterosexual transmission is the leading factor of HIV spread in Sub-Saharan Africa [7] and that it is the only region where the women infection rate is high as compared to men. Coupled with the relative easiness of man-to-woman transmission than for woman-to-man transmission, [8] observed that poverty pushes many girls to accept relationships with older men who are ready to give money, gift items and/or favours in return for sex. Some researchers [9] reported that looking for money to attend school, buy goods, and food to live on have been some of the reasons why adolescent girls in sub-Saharan Africa indulge in sexual relationships.

Some studies put it that the high prevalence of HIV/AIDS in Africa is associated with concomitant multiple sexual partnerships among Africans, whether single or married [10]. While others [11] were more straight in underscoring the fact that there would be no AIDS pandemic

in the world if it were no multiple sexual partnerships. Stoneburner and Low-Beer reviewed the Ugandan HIV success story on sexual partner reduction and linked it to a study they conducted in Zambia, Malawi, and Kenya and reported that reduction in sexual partners and abstinence among unmarried youth are strong factors in reducing HIV spread. Similarly, others reported that those who engaged in multiple concomitant sexual relationships are considered as main movers of the HIV/AIDS epidemic [12, 13].

Nevertheless, [14], as cited in [15], contested the multiple and concurrent partners' notion and reported that some ecological studies of HIV/AIDS and concurrency have not found a statistically significant correlation between rates of self-reported concurrency and HIV/AIDS prevalence. In Sub-Saharan Africa, sexual activity seems not only to be mostly influenced by poverty but by cultural beliefs and practices [16]. Thus, [1] upheld the view that cultural beliefs and demands in most African countries embolden men to have multiple partners, while women are expected to abstain or remain faithful. According to [17], discussing sex is considered a taboo in many African countries, a situation that denies many young people the needed information to protect themselves. According to [18], other practices such as ritual cleansing and wife inheritance that report as prevalent in the Upper East Region of Ghana have also been identified as risk factors for the spread of HIV/AIDS. Certainly, the rates of HIV infection among young women are 300 to 400% more than those among young men in some countries in Sub-Saharan African [19].

Some studies have also shown a statistically significant association between having more than one sexual partner [20], having sex for benefits or money [21], medical history of injections, and HIV infection [22, 23]. Also, [24] indicated that many factors contribute to HIV infection, and these include older age, separated (marriage), women of lower social and

economic status, divorced, and lower education levels.

Biomedical factors, according to [25] have a significant association with HIV infection. They found men with a past 12-months history of genital ulcers (AOR), 1.91; 95% confidence interval (CI), 1.04–3.49), In women, 12-months previous history of unusual vaginal discharge to be associated with HIV infection. Similarly, the World Health Organization found the previous history of tuberculosis to be a major risk factor among People Living with HIV [5]. [26] suggests related illnesses as a major contributor to HIV morbidities and mortalities among PLWHA.

Methods

A case-control study design was used to determine the demographics, health, social behavior, and biomedical conditions associated with the spread of HIV in Ghana. Quantitative data were collected to determine the prevalence of risk factors of HIV amongst the adult population of 15 to 49 years in the Ahafo and Northern regions of Ghana. In a previous national prevalence study, the Ahafo region and the Northern region, out of the 16 regions in Ghana, recorded one of the highest (2.66%) and lowest (0.40%) HIV prevalence rates respectively in 2018 [27]. HIV new infections were estimated for all ages at 20, 000 (15,000-26,000) with close to a similar number of 14,000 (11,000-18,000) HIV related deaths in 2018 which formed the study population [27].

The design comprised comparable case (adult HIV positive persons) and control (adult HIV negative persons) groups determined by inclusion and exclusion criteria. A total of 362 participants from both the Ahafo region (155 cases, 155controls) and the Northern region (26 cases, controls 26) were randomly selected using a simple random selection approach given regional HIV difference in prevalence. The sample size of the study was determined using the following formula:

$$n = \left(\frac{r+1}{r} \right) \frac{(\bar{p})(1-\bar{p})(Z_{\beta} + Z_{\alpha/2})^2}{(p_1 - p_2)^2}$$

Where n is the sample size (362), $Z_{\beta} = 0.84$, 0.05 significance level ($Z_{\alpha} = 1.96$), an equal number of cases and controls ($r = 1$), odds of 2 or greater, and take the proportion of cases exposed in the control group at 20%. The average proportion exposed was taken at $(0.33 + 0.20)/2 = 0.265$.

A structured questionnaire covering socio-demographic, behavioural, and biomedical factors was the main tool for data collection. Some aspects of the questionnaire were adapted from the 2018 Ghana Demographic and Health Survey tool, while the remaining portion was designed by the researchers to suit the research objectives. Both closed and open-ended questions were used to provide qualitative and quantitative data for analysis. The questionnaires were administered by trained HIV counsellors as it was difficult for the researcher to directly obtain this confidential information from the targeted respondents. The questionnaire administration came after a four-step process was employed involving: 1. identification of sources of cases, 2. assigning a case definition, 3. deciding what type of control population is appropriate, and 4. matching of cases and controls.

The Regional and District Directors of Health Services and Management Teams of the study regions and ART centres were contacted to seek for their consent to conduct the study after ethical clearance has been given for the collection of data. The researcher was not in any way exposed to participants of the study to cause physical or psychological harm. Participation in the study was strictly participatory with the informed consent of participants that guarantees their right to privacy. Information obtained was treated with the strictest confidentiality and integrity by ensuring that responses are not linked to the names of respondents.

For analysis, data were entered, cleaned, and analyzed using Statistical Package for Social Science (SPSS, v.16). Descriptive statistical procedures such as tables and proportions were used to report and describe findings. For each variable, adjusted odds ratios (ORs) and population-attributable fractions (PAFs) for socio-demographic, biomedical, and behavioural factors were obtained using the logistic regression technique. Chi-square was used to identify factors associated with HIV prevalence and multiple logistics regression for identifying the contributing factors to the spread of HIV infection among adults in Ghana.

Results

Demographic Characteristics and Association with HIV Status

Table 1 presents the demographic characteristics of respondents interviewed

during the survey and how those characteristics relate to the HIV status of the respondents. Two districts, the Tano South (Bechem) district in the Ahafo region and the Karaga district in the Northern region of Ghana, formed the study site. A total of 155 HIV carriers and 155 controls were interviewed in Bechem, while 26 carriers and 26 controls were interviewed in the Karaga district, forming an overall total of 181 carriers and 181 non-carriers. The majority of HIV positives, 45.9%, were within the middle (25-39) year group, while the least, 11.1%, fell in the young (15-24) year group. Females formed the largest, 75.1% carriers of HIV. Of the 181 HIV positives, the majority, 66.3%, were unemployed, while 31% were unemployed in the control group. About 42.5% of HIV-positive respondents were still in marriage compared to 63% of non-carriers. Also, 60.2% of respondents with HIV carries lived in rural areas compared to 41.4% of the non-carriers.

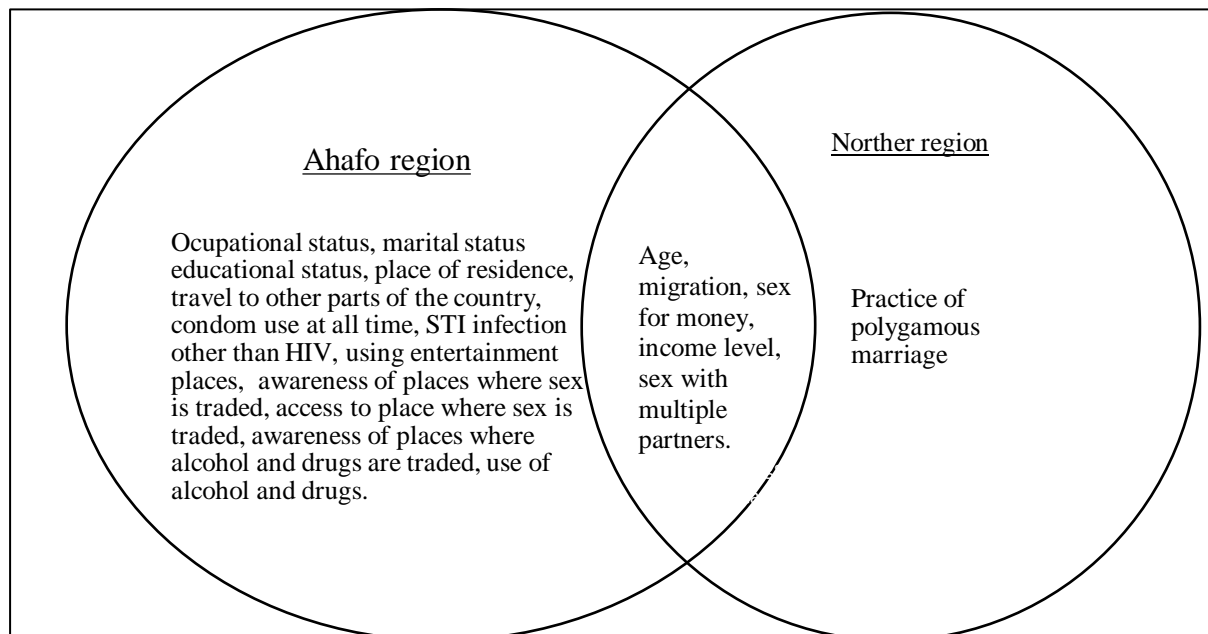


Figure 1. Factors Accounting for Spread of HIV Infections in Ahafo and Northern Regions of Ghana

Table 1. Relationship/Association Between Demographics and HIV Status

Respondents' Demographic Information	Responses	HIV Status				χ^2
		Negative		Positive		
		N	%	N	%	
Respondent's District	Bechem	155	85.60%	155	85.60%	0.00
	Karaga	26	14.40%	26	14.40%	
Age group of respondents (Years)	15 – 24 (Younger)	39	21.60%	20	11.10%	23.24**
	25 - 39 (Middle)	115	63.60%	83	45.90%	55.70***
	40 - 49 (Older)	27	14.80%	78	43.10%	49.10***
Sex of Respondent	Female	125	69.10%	136	75.10%	1.66
	Male	56	30.90%	45	24.90%	
Occupational Status of Respondent	Full – Time	122	67.40%	115	63.50%	23.75***
	Part – Time	2	1.10%	26	14.40%	
	Unemployed	57	31.50%	40	22.10%	
Educational Status of Respondent	University	30	16.60%	10	5.50%	45.93***
	Senior high school	44	24.30%	16	8.80%	
	Junior high school	56	30.90%	48	26.50%	
	Primary school	28	15.50%	47	26.00%	
	No formal Education	23	12.70%	60	33.10%	
Marital Status of Respondents	Cohabiting	2	1.10%	13	7.20%	51.21***
	Divorced	1	0.60%	19	10.50%	
	Married	114	63.00%	77	42.50%	
	Never married	12	6.60%	3	1.70%	
	Separated	1	0.60%	2	1.10%	
	Single	51	28.20%	53	29.30%	
	Widow	0	0.00%	14	7.70%	
Respondents' Place of Residence	Rural	75	41.40%	109	60.20%	12.78***
	Urban	106	58.60%	72	39.80%	

Source: Author's Field Survey, 2020), Significant level; 1% (***), 5% (**)

Factors influencing HIV Spread among Adults in Ghana

Table 2 reports on the demographics, health, social behaviour, and biomedical conditions such as; age groups, sex, occupational, educational, marital status, age group first time of sex, having sex with multiple partners, condom usage at all time, ever had sex with a partner 15 years older, sex for money, infected with sexually transmitted infections (STIs) among others included in the logistic regression model. Out of 21 independent variables, 13 variables (age group of respondents, sex of respondents, marital status of respondents, having sex with multiple partners, condom usage

at all times, sex for money, infected with sexually transmitted infection (STI) among others) were reported by the model to be statistically significant at 1% and 5% level that might influence HIV spread among adults in Ghana.

For each variable, adjusted odds ratios (AORs) were reported, and the overall significance of independent variables on the spread of HIV was tested using Chi-square. Also, the explanatory power of the independent variables on the dependent variable was estimated using Pseudo R². The model diagnostics (Table 2) demonstrate good model fitness to the data as indicated by the highly

significant Prob>chi2 value of 0.0000 and the explanatory power exhibited by the pseudo-R2 of 0.7094. The result of the Pseudo R2 showed

the independent variables in the model explain about 70.9% of the factors that might influence the spread of HIV among adults in Ghana.

Table 2. Factors Influencing HIV Spread Among Adults in Ghana

Variables	AOR	P>z	[95% Conf.Interval]
Age Group of Respondent	1.795	0.002***	1.24321 - 2.59137
Sex of Respondent	4.443	0.027**	1.189168 - 16.59735
Occupational Status of Respondent	0.410	0.207	0.1024159 - 1.639884
Educational Status of Respondent	0.515	0.203	0.1851685 - 1.430976
Marital Status of Respondents	0.210	0.003***	0.0753018 - 0.5871516
Respondents' Place of Residence	0.405	0.083	0.1459216 - 1.123671
Age group first time of sex	0.665	0.479	0.2140524 - 2.062923
Having sex with multiple partner	4.269	0.009**	1.448189 - 12.58322
Condom usage at all time	0.069	0.016**	0.007898 - 0.6095435
Ever had sex with a partner 15 years older	1.581	0.492	0.4272804 - 5.853243
Sex for money	21.404	0.000***	6.098537 - 75.12323
Infected with sexually transmitted infection	7.135	0.000***	2.491865 - 20.42966
Alcohol or Drug addiction	0.082	0.000***	0.0240381 - 0.2818849
Awareness of places where sex is traded	6.792	0.007**	1.68661 - 27.34769
Awareness of drugs/alcohol selling places	0.123	0.006**	0.0278064 - 0.544935
Income level	0.201	0.008**	0.0609327 - 0.6613691
Access to place of sex trade	12.708	0.011**	1.791786 - 90.13664
Used to traveling to other parts of the country	0.664	0.480	0.2127659 - 2.069773
Migration Status	10.616	0.000***	2.881842 - 39.10868
Practice polygamy marriage	1.157	0.867	0.2110345 - 6.34252
Entertainment	0.529	0.415	0.1145077 - 2.446815
Number of obs = 362		Prob > chi2 = 0.0000	
LR chi2(21) =356		Pseudo R2 = 0.7094	

Source: Author's Field Survey, 2020), Significant level; 1% (***) and 5% (**)

Difference in Factors influencing HIV Spread among Adults in Ghana

We analysed how factors influence the spread of HIV among adults across administrative regions of Ghana. Table 3 reports the variation of demographics, health, social behaviour, and biomedical conditions of respondents between Ahafo and the Northern region. Out of the 21 variables that were analyzed, 13 were found to be statistically significant (0.00001) for the Ahafo region, while only 6 variables were significant at 1% and 5% for the Northern region. The mean total scores of the factors that

were found to be statistically significant vary in the two regions. The Ahafo region recorded a mean total score of 1.52 while the Northern region recorded 0.52 (Table 3). This means that people living in the Ahafo region were 100 times more likely to get HIV infection than those living in the Northern region. This proved the null hypothesis wrong and favours the alternative hypothesis since there are significant differences in the presence and power of the factors across the regions. We, therefore, accept the alternative that there is a difference in factors accounting for the spread of HIV infection of persons across administrative regions in Ghana.

Table 3. Difference in Factors Influencing HIV Spread among Adults in Ghana

Variables	AOR	P>z	(95% Conf.Interval)	Ahafo region	Norther region
Age Group of Respondent	1.58	0.002***	1.24321 - 2.59137	***	***
Sex of Respondent	4.443	0.027**	1.189168 - 16.59735	**	
Occupational Status of Respondent	0.41	0.207	0.1024159 - 1.639884		
Educational Status of Respondent	0.515	0.203	0.1851685 - 1.430976		
Marital Status of Respondents	0.21	0.003***	0.0753018 - 0.5871516	***	
Respondents' Place of Residence	0.405	0.083	0.1459216 - 1.123671		
Age group first time of sex	0.665	0.479	0.2140524 - 2.062923		
Having sex with multiple partner	4.269	0.009**	1.448189 - 12.58322	**	**
Condom usage at all time	0.069	0.016**	0.007898 - 0.6095435	**	
Ever had sex with a partner 15 years older	1.581	0.492	0.4272804 - 5.853243		
Sex for money	21.404	0.000***	6.098537 - 75.12323	***	**
Infected with sexually transmitted infection (STI)	7.135	0.000***	2.491865 - 20.42966	***	
Alcohol or Drug addiction	0.082	0.000***	0.0240381 - 0.2818849	***	
Awareness of places where sex is traded	6.792	0.007**	1.68661 - 27.34769	**	
Awareness of drugs/alcohol selling places	0.123	0.006**	0.0278064 - 0.544935	**	
Income level	0.201	0.008**	0.0609327 - 0.6613691	**	**
Access to place of sex trade	12.708	0.011**	1.791786 - 90.13664	**	
Used to traveling to other parts of the country	0.664	0.48	0.2127659 - 2.069773		
Migration status	10.616	0.000***	2.881842 - 39.10868	***	***
Practice polygamy marriage	1.157	0.007	0.2110345 - 6.34252		***
Entertainment	0.529	0.415	0.1145077 - 2.446815		
Population Mean				1.52	0.52
Number of obs = 362		Prob > chi2 = 0.0000			
LR chi2(21) =356		Pseudo R2 = 0.7094			

Source: Author's Field Survey, 2020, Significant level; 1% (***) and 5% (**)

Demographics, Health, Social Behaviour and Biomedical Conditions influencing the Spread of HIV in Ahafo Region and Northern Region

To appraise the established variables influencing the spread of HIV in the two regions, Table 4a and Table 4b report these risk factors from the perspectives of both cases and control groups. The results showed that while marital status significantly affects HIV status in the

Ahafo region, 15% of HIV positives faced divorce as compared to 1% of HIV negative (Table 4a). For the Northern region, while 15.4% of HIV carriers faced divorce as compared to 0% of the non-carriers, marital status, in general, does not have a significant influence on HIV status (Table 4b). Also, 65.2% of HIV patients indicated they had sex for money as compared to only 9% of HIV negatives in the Ahafo region (Table 4a), while in the Northern region, 23.1%

of HIV patients affirmed that they had sex for money compared to 3.8% of the HIV negative. An inspection on the medical history of STIs other than HIV revealed that in the Northern region, 69.2% HIV positive respondents reported of ever suffering from other STIs as

compared to a relatively larger percentage (23.1%) in the HIV-negative cohorts (Table 4b). However, that of the Ahafo region showed that 94.8% of HIV patients reported of ever having other STIs compared to 38.1% of the non-carriers (Table 4a).

Table 4a. Relationships/Associations between Demographics, Health, social Behaviour and Biomedical Conditions with the Spread of HIV in Ahafo Region

Variables	Responses	HIV Status				χ^2	P-value
		Negative		Positive			
		N	%	N	%		
Age Group of Respondents (Years)	15 - 24 (Younger)	31	20.0%	16	10.3%	49.125	0.000***
	25 - 39 (Middle)	98	63.2%	68	43.8%		
	40 - 49 (Older)	26	16.8%	71	45.8%		
Sex of Respondent	Female	102	65.8%	115	74.2%	2.554	0.107
	Male	53	34.2%	40	25.8%		
Occupational Status of Respondent	Full – Time	119	76.8%	22	14.2%	20.565	0.000***
	Part – Time	2	1.3%	23	14.8%		
	Unemployed	34	21.9%	110	71.0%		
Educational Status of Respondent	University	26	16.7%	9	5.8%	65.107	0.000***
	Senior high school	44	28.4%	15	9.7%		
	Junior high school	56	36.1%	46	29.7%		
	Primary school Education	25	16.1%	44	28.4%		
	No formal Education	4	2.6%	41	26.4%		
Marital Status of Respondents	Cohabiting	2	1.3%	12	7.7%	48.458	0.000***
	Divorced	1	.6%	15	9.7%		
	Married	92	59.4%	64	41.3%		
	Never married	10	6.5%	0	0.0%		
	Separated	1	.6%	0	0.0%		
	Single	49	31.6%	51	32.9%		
	Widow	0	0.0%	13	8.4%		
Respondents' Place of Residence	Rural	49	31.6%	87	56.1%	18.916	0.000***
	Urban	106	68.4%	68	43.9%		
Any knowledge on HIV	No	5	3.2%	1	.6%	2.719	0.099
	Yes	150	96.8%	154	99.4%		
Age group first sex	Above 18	118	76.1%	117	75.5%	0.017	0.894
	Below 18 years	37	23.9%	38	24.5%		
Sex with multiple partners	No	79	51.0%	51	32.9%	10.386	0.001***
	Yes	76	49.0%	104	67.1%		
Condom Usage at all times	No	116	74.8%	151	97.4%	31.076	0.000***
	Yes	39	25.2%	4	2.6%		
Sex for money	No	141	91.0%	54	34.8%	104.632	0.000***
	Yes	14	9.0%	101	65.2%		

STI Infection other than HIV	No	96	61.9%	8	5.2%	112.053	0.000***
	Yes	59	38.1%	147	94.8%		
Alcohol and drugs status	No	63	40.6%	118	76.1%	40.162	0.000***
	Yes	92	59.4%	37	23.9%		
Awareness of places where sex is traded	No	141	91.0%	128	82.6%	4.75	0.029**
	Yes	14	9.0%	27	17.4%		
Access to place where sex is traded	No	153	98.7%	130	83.9%	21.461	0.000***
	Yes	2	1.3%	25	16.1%		
Awareness of places where alcohol and drugs are traded	No	136	87.7%	147	94.8%	4.909	0.027**
	Yes	19	12.3%	8	5.2%		
Access to place where alcohol/drugs traded	No	152	98.1%	146	94.2%	3.12	0.077
	Yes	3	1.9%	9	5.8%		
Traveling to other parts of the country	No	71	45.8%	105	67.7%	15.195	0.000***
	Yes	84	54.2%	50	32.3%		
Migration status	No	141	91.0%	126	81.3%	6.075	0.014**
	Yes	14	9.0%	29	18.7%		
Practice of polygamy marriage	No	153	98.7%	150	96.8%	4.501	0.051
	Yes	2	1.3%	5	3.2%		
Entertainment Status	No	98	63.2%	142	91.6%	35.723	0.000***
	Yes	57	36.8%	13	8.4%		

Source: Author's Field Survey, 2020, Significant level; 1% (***) and 5% (**)

Table 4b. Relationships/Associations between Demographics, Health, Social Behaviour and Biomedical Conditions with the Spread of HIV in Northern Region

Variables	Responses	HIV Status				χ^2	P-value
		Negative		Positive			
		N	%	N	%		
Age Group of Respondents (Years)	15 - 19 (Younger)	8	30.8%	4	15.4%	10.488	0.015***
	20 - 24 (Middle)	17	65.4%	15	57.7%		
	25 - 29 (Older)	1	3.8%	7	26.9%		
Sex of Respondent	Female	23	88.5%	21	80.8%	0.59	0.442
	Male	3	11.5%	5	19.2%		
Occupational Status of Respondent	Full – Time	3	11.5%	5	19.2%	4.109	0.128
	Part – Time	0	0.0%	3	11.5%		
	Unemployed	23	88.5%	18	69.2%		
Educational Status of Respondent	University	4	15.4%	1	3.8%	5.827	0.323
	Senior high school	0	0.0%	1	3.8%		
	Junior high school	0	0.0%	2	7.7%		
	Primary school Education	3	11.5%	3	11.5%		
	No formal Education	19	73.1%	19	73.0%		
Marital Status of Respondents	Cohabiting	0	0.0%	1	3.8%	10.514	0.105
	Divorced	0	0.0%	4	15.4%		
	Married	22	84.6%	13	50.0%		
	Never married	2	7.7%	3	11.5%		

	Separated	0	0.0%	2	7.7%		
	Single	2	7.7%	2	7.7%		
	Widow	0	0.0%	1	3.8%		
Respondents' Place of Residence	Rural	26	100.0%	22	84.6%	4.333	0.037**
	Urban	0	0.0%	4	15.4%		
Any knowledge on HIV	No	1	3.8%	0	0.0%	1.019	0.313
	Yes	25	96.2%	26	100.0%		
Age group first sex	Above 18	22	84.6%	19	73.1%	1.037	0.308
	below 18 years	4	15.4%	7	26.9%		
Sex with multiple partners	No	6	23.1%	2	7.7%	2.363	0.124
	Yes	20	76.9%	24	92.3%		
Condom Usage at all times	No	25	96.2%	25	96.2%	0.000	1.000
	Yes	1	3.8%	1	3.8%		
Sex for money	No	25	96.2%	20	76.9%	4.127	0.042**
	Yes	1	3.8%	6	23.1%		
STI Infection other than HIV	No	7	76.9%	8	30.8%	0.093	0.760
	Yes	19	23.1%	18	69.2%		
Alcohol and drugs status	No	25	96.2%	19	73.1%	5.318	0.021**
	Yes	1	3.8%	7	26.9%		
Awareness of places where sex is traded	No	24	92.3%	21	80.8%	3.143	0.092
	Yes	2	7.7%	5	19.2%		
Access to place where sex is traded	No	25	96.2%	24	92.3%	2.835	0.231
	Yes	1	3.8%	2	7.7%		
Awareness of places where alcohol and drugs are traded	No	0	0.0%	2	7.7%	2.080	0.149
	Yes	26	100.0%	24	92.3%		
Access to place where alcohol/drugs traded	No	5	19.2%	1	3.8%	3.014	0.083
	Yes	21	80.8%	25	96.2%		
Traveling to other parts of the country	No	12	46.2%	3	11.5%	7.589	0.006**
	Yes	14	53.8%	23	88.5%		
Practice of polygamy marriage	No	15	57.7%	8	30.7%	15.437	0.001***
	Yes	11	42.3%	18	69.3%		
Entertainment Status	No	26	100.0%	24	92.3%	6.088	0.054

Source: Author's Field Survey, 2020, Significant level; 1% (***) and 5% (**)

Discussion

Factors Influencing HIV Spread Among Adults in Ghana

Out of 21 independent variables, 13 were reported by the logistic regression model to be statistically significant at 1% and 5% level, thus influencing HIV spread among adults in Ghana. These include age, sex, marital status, having sex with multiple partners, condom usage at all times, sex for money, infected with sexually

transmitted infection (STI), alcohol or drug addiction, awareness of places where sex is traded, awareness of drugs selling places, income level, access to places where sex is traded and migration status of respondents.

For instance, growing older increases the likelihood of HIV infection by 1.795 times the immediate young age group at 1% significance level, as also found by [28]. Education (both formal and informal), though was insignificant, reduces the likelihood of getting HIV by about

54.5% (AOR=0.515). This finding was in contrast to [29], who found a significant positive relationship between education and HIV status. Also, females were found to be about 4.443 times more likely to be affected by HIV than their male counterpart at the 5% significance level. This finding was almost the same as [19], who found females in Africa were about 3 to 4 times more likely to get HIV compared to males. Married respondents were about 79% (AOR=0.21) less likely to be effected with HIV at the 1% level of significance.

In terms of sexual practice among respondents, respondents who indicated they ever had sex with multiple partners were about 4.269 times more likely to be effected/spread HIV compared to those who indicated they were never involved in multiple sex partners. This difference was statistically significant at 5% and confirms the findings of [20, 30]. [11] were more straight in underscoring the fact that there would be no AIDS pandemic in the world if it were no multiple sexual partnerships. Respondents who indicated that they use condoms at all the time were found to be about 93.1% (AOR=0.069) less likely to be effected with HIV compared to those who do not practice frequent condom use. Respondents who engage in sex for money were found to be about 21.4 times (AOR=21.404) more likely to be infected with HIV than those who do not trade sex for money. This finding implies that, as one pursues money by offering themselves for sex, they are likely to have multiple sex partners, and therefore the likelihood of them being infected is high. This confirms the finding of [21].

Comparing the medical history of other STIs infections, respondents who reported of being previously effected with STIs were more likely, 7.135 times to be effected with HIV than those without STIs. The finding supported those of [22] who noted that HIV prevalence is reported to be higher among people with previous sexual transmitted infections. Non-alcohol users were also predicted at the 5% significant level to be 91.2% (AOR=0.082) less likely to have HIV as

compared to alcohol addicts. This was consistent with [11] and means that drunkards are mostly exposed to unsolicited sex or sometimes turn to be indifferent on sexual demands under the influence of alcohol.

The level of income was found to be negatively related with the probability of one acquiring HIV. From the results, high-income earners were about 79.9% (AOR=0.201) less likely to acquire HIV as compared to low-income earners, this was consistent to [21, 23]. On the other hand, [9] reported that girls from low-income families in Africa are the most vulnerable to HIV infections as they turn to offer themselves for sex to raise money to attend school, buy goods and food to live on. Also, high-income earners could afford HIV preventive measures or afford a decent life without trading themselves for money. The results further revealed that migrants are about 10.6 (AOR=10.616) times more likely to spread HIV than those who do not travel. This finding was not surprising as travelers are often the reasons why viruses that are transmitted by human contacts gets to other places; confirming the statement that has been made by Ghanaian Health Authorities during the COVID 19 pandemic that “virus does not have legs; it is human beings that carry them”. This statement was used to restrict human movement in order to contain the virus and break the transmission of the Covid-19. This strategy, in essence, can be applied in reducing slams in the cities and ensure the safety of migrants and travelers and that they are not displaced and get into poor and risky behavioural practices that could spread HIV.

Difference in factors influencing HIV Spread among Adults in Ghana

We analysed how factors influence the spread of HIV in Ghana among adults and vary across the administrative regions. The results indicated that demographics, health, social behaviour, and biomedical conditions of respondents have varied effects on HIV status between Ahafo and the Northern region. Out of the 21 variables that

were analyzed, 11 were found to be statistically significant at 1% level for the Ahafo region, while only 6 variables were significant at 1% and 5% for the Northern region. For instance, while marital status was found to be associated with HIV spread in the Ahafo region, that was not so in the Northern region. Non-usage of condom was also a significant factor influencing the spread of HIV in the Ahafo region but insignificant for the northern region. Also, factors such as sexually transmitted infection (STI), alcohol or drug addiction, awareness of places where sex is traded, awareness of drugs/alcohol selling places, and access to a place of sex trade were all found to be significant in HIV spread in the Ahafo region but insignificant for the Northern region.

Factors that have the same influence on HIV spread for the two regions were the age of the respondents, having sex with multiple partners, income level of respondents, and their migration status. The practice of polygamy was the only factor the influence the spread of HIV in the Northern region but was found to be insignificant for the Ahafo region.

The mean total scores of the factors that were found to be statistically significant vary for the two regions. The Ahafo region recorded a mean total score of 1.52, while the Northern region recorded 0.52. This means that people living in Ahafo region were 100 times more likely to get HIV infection than those living in the Northern region. This proved the null hypothesis that stated that there was no significant difference in factors influencing the spread of HIV in the two regions wrong. We, therefore, accept the alternative that there is a difference in factors accounting for the spread of HIV infection of persons across administrative regions in Ghana.

In summary, the study found that the majority of HIV carriers had had sex with multiple partners and that the majority of HIV carriers had had sex for money before in the Ahafo region compared to Northern region. It was found that the majority of HIV carriers especially in the Northern region, are not

alcoholic/drug addicts, aren't aware of any place where sex, alcohol, and drugs are traded in the Northern region, contrary to earlier reports by [31].

Demographics, Health, Social Behaviour and Biomedical Conditions influencing the Spread of HIV in Ahafo Region and Northern Region

To appraise the established factors influencing the spread of HIV in the two regions, these risk factors were analyzed from the perspectives of both cases and control groups. The results showed that while marital status significantly affects HIV status in the Ahafo region, 15% of HIV positives faced divorce as compared to 1% of HIV negative. For the Northern region, while 15.4% of HIV carriers faced divorce as compared to 0% of the non-carriers, marital status, in general, does not have a significant influence on HIV status. The findings indicated that previously married couples prior to HIV acquisition are more likely to be divorced compared to the same cohorts in the control group.

Also, 65.2% of HIV patients indicated they had sex for money as compared to only 9% of HIV negatives in the Ahafo region, while in the Northern region, 23.1% of HIV patients affirmed that they had sex for money compared to 3.8% of the control group. Generally, offering sex for money implies having with multiple partners and, therefore a high likelihood of contracting the virus. An inspection on the medical history of STIs other than HIV revealed that 69.2% of HIV carriers reported suffering from other STIs in the Northern region compared to a relatively larger percentage (73.1%) in the HIV negative cohorts. That of the Ahafo region showed that 94.8% of HIV patients reported of having other STIs compared to 38.1% of the non-carriers. Based on the exposure to STIs, the Ahafo region was seen to have a high risk of HIV infections and spread.

Recommendations to Address the Findings

From the analysis of the demographics, health, social behaviour and biomedical conditions associated with the spread of HIV and their variations across administrative regions, key risk factors such as sex with multiple partners, sex for money, attitude towards condom use, alcohol and drugs addiction, availability of places for commercial sex, income levels among others were the main drivers for the spread of HIV among adults in Ghana. As a result, measures should be tailored in addressing this social, behavioural characteristic exhibited by HIV carriers. This will lead to a reduction of the spread of HIV.

The study, therefore, recommends that the Ministry of Health should fill HIV programme implementation gaps and provide adequate information regarding HIV spread in the country. The Government of Ghana should create enough job opportunities so that people can get employed to satisfy their basic needs. Employment will reduce the tendency of engaging in sex for money which means having multiple sex partners, thus reducing the chance of spreading HIV. The display of alcoholic and other drug substances to the public should be regulated by the government to curb the number of people who consume alcohol and other drugs. Health workers should use the media (radio, TV, and other social media channels) to discourage the society from sex trade which is one key source of the spread of HIV infections in the country.

Conclusion

This study determined the demographics, health, social behaviour, and biomedical conditions associated with the spread of HIV and their variations across administrative regions

among adults in Ghana. Two regions, Ahafo and Northern regions, were selected since they form the regions with the highest and lowest prevalence rates, respectively. The study Adopted a case-control study on 362 respondents (181 cases and 181 controls) where questionnaires were administered by HIV/AIDS trained counsellors.

The findings from the logistic regression model showed that age group of respondents, occupation, education, marital status, respondents' place of residence, sex with multiple partners, condom usage at all times, sex for money, alcohol, and drugs addiction status and awareness of places where sex is traded among other risk factors, significantly influence the spread of HIV in Ghana. These factors, however, were found to vary between the two regions used in the study. For instance, the Ahafo region recorded a total mean score of 1.52 while the Northern region recorded 0.52. This means that people living in the Ahafo region were 100 times more likely to get HIV infection than those living in the Northern region. Therefore, HIV programmes implementations should be pursued appropriately to address the spread of the virus in Ghana.

Conflict of Interests

The authors declare that they have no competing interests.

Acknowledgement

The author reserves many thanks to the Almighty God for the gift of strength and wisdom to finish this article. The effort of the PhD supervisor is well acknowledged for his guidance through this PhD program. Finally, the author remains grateful to those who helped to shape the discourse of this work and to his family for the emotional and financial support.

References

- [1] UNAIDS. 2019 Global AIDS Update: Communities at the Centre; July 2019. UNAIDS. AIDS info website; accessed September 2019, available at: <http://aidsinfo.unaids.org/>. UNAIDS. Fact sheet; September 2019.
- [2] Ghana AIDS Commission (2019). Status of the National HIV and AIDS Response Report. Accra: Ghana AIDS Commission. 212. <https://www.ghanais.gov.gh/>.
- [3] Ghana National AIDS Commission, Annual report, 2018, p.1-5, accessed September 2019, available at: <https://ghanais.gov.gh/mcadmin/Uploads/nationalHIVandAIDSPolicy.pdf>.
- [4] Ghana National AIDS Control Programme Annual Report, 2019 accessed December 2020, available at: https://ghanais.gov.gh/mcadmin/Uploads/NACP%20Annual%20Report%2019_Final.pdf.
- [5] Chan, M., Sidibe, M., Lake, A., 2007. Towards Universal Access: Scaling up priority HIV/AIDS interventions in the health sector. April. Geneva, WHO/UNAIDS/UNICEF 201706. https://www.afro.who.int/sites/default/files/2017-06/Towards-universal-access-en_0.pdf.
- [6] World Bank report, 2017. Annual Report 2017: worldbank.org/annual_report. Accessed at: <https://thedocs.worldbank.org/en/doc/908481507403754670-0330212017/original/AnnualReport2017WBG.pdf>.
- [7] Manyahi J., Jullu B. S., Abuya M. I., Juma J., Ndayongeje J., Kilama B., Sambu V., Nondi J., Rabel B., Somi G., Matee M. I. (2015). Prevalence of HIV and syphilis infections among pregnant women attending antenatal clinics in Tanzania, 2011. *BMC Public Health*. 2015 May 22; 15:501. doi: 10.1186/s12889-015-1848-5.
- [8] Ankomah, A., Ganle, J. K., Lartey, M. Y., Kwara, A., Nortey, P. A., Okyerefo, M. P. K., & Laar, A. K. (2016). ART access-related barriers faced by HIV-positive persons linked to care in southern Ghana: a mixed method study. *BMC Infectious Diseases*, 16(1), 738. Retrieved from <https://doi.org/10.1186/s12879-016-2075-0>.
- [9] Audet C.M, Burlison J., Troy D Moon T. D., Sidat M., Vergara A.E., & Vermund S. H. (2010). Sociocultural and epidemiological aspects of HIV/AIDS in Mozambique. *BMC International Health and Human Rights* 2010, 10:15. Retrieved from <http://www.biomedcentral.com/1472-698X/10/15>.
- [10] Park, L., S., Siraprapasiri, T., Peerapatanapokin, W., Manne, J., Niccolai, L., and Kuanusont, C. (2010). HIV transmission rates in Thailand: evidence of HIV prevention and transmission decline. *Journal of Acquired Immune Deficiency Syndromes*, 54(4): 430-436.
- [11] Shelton, J., D., Halperin, D., T., Nantulya, V., Potts, M., Gayle, H., D., Holmes, K., K. (2004). Partner reduction is crucial for balanced —ABC approach to HIV prevention: Behaviour change programmes to prevent HIV have mainly promoted condom use or abstinence, while partner reduction remains the neglected component of ABC. *BMJ*, 328: 891-4.
- [12] Stoneburner, R., L., and Low-Beer, D. (2004). Population-Level HIV Declines and Behavioral Risk Avoidance in Uganda. *SCIENCE* 304, 714.
- [13] Jewkes, R., Dunkle, K., Koss, M., P., Levin, J., B., Nduna, M., Jama, N., and Sikweyiya (2006). Rape perpetration by young, rural South African men: Prevalence, patterns and risk factors. *Social Science and Medicine*, 63(11): 2949-2961.
- [14] Lurie, M., Rosenthal, S., Williams, B. (2009). Concurrency driving the African HIV epidemics: where is the evidence? *Lancet*, 374:1420-1421.
- [15] Sawer, L., and Stillwaggon, E. (2010). Concurrent sexual partnerships do not explain the HIV epidemics in Africa: a systematic review of the evidence. *Journal of the International AIDS Society* 13:34.
- [16] Agyemang, S., (2009). Addressing HIV/AIDS pandemic in the Ejura Sekyedumase District: a study of knowledge, attitudes and sexual behavior among unmarried 15–24-year-olds. *KNUST Space*. [handle/123456789/609](http://dSPACE.knust.edu.gh/handle/123456789/609). <http://dSPACE.knust.edu.gh/handle/123456789/609>.
- [17] Buor, D., (2000b). Help Break Taboos on Sexuality. Ghana News Agency. General News of Monday, 18 September.

- <https://www.ghanaweb.com/GhanaHomePage/NewsArchive/Help-break-taboo-on-sexuality-Lecturer-11252>.
- [18] Odoi-Agyarko, K. (2004). Socio-cultural Factors and Determinants Affecting Sexual Behaviour Among the Youth in the Upper East Region of Ghana. Paper Presented at the National HIV/AIDS Research Conference (NHARCON) held at La Palm Royal Beach Hotel, Accra, Ghana, February 11-13.
- [19] Auerbach, J. (2009). Transforming Social Structures and Environments to help in HIV Prevention. *Health Affairs*, 28 (6): 1655-1665.
- [20] Choudhry, V., Ambresin, A-E., Nyakato, V. N., & Agardh, A. (2015). Transactional sex and HIV risks-evidence from a cross-sectional national survey among young people in Uganda. *Global Health Action*, 8, 1-11. Retrieved from <https://doi.org/10.3402/gha.v8.27249>.
- [21] Ghanem A., Little S. J., Drumright L., Liu L., Morris S., and Garfein R. S. (2015) PMC High-Risk Behaviors Associated with Injection Drug Use Among Recently HIV-Infected Men Who Have Sex with Men in San Diego, CA doi: 10.1007/s10461-011-9970-6.
- [22] Clínicas, H., Medicina, F. De, & Paulo, D. S. (2012). Prior history of sexually transmitted diseases in women living with AIDS in São Paulo, Brazil, 16(3), 226–231.
- [23] Wilson C. N., and Sathiyasuman A (2015). Associated Risk Factors of STIs and Multiple Sexual Relationships among Youths in Malawi. *Plos One Journal*. Retrieved from <https://doi.org/10.1371/journal.pone.0134286>.
- [24] Omoria R., and Laith J. A (2017). Sexual network drivers of HIV and herpes simplex virus type 2 transmission. *AIDS (London, England)*. May 2017 DOI:10.1097/QAD.0000000000001542.
- [25] Pettifor, A., Rees, H., Kleinschmidt, I., Steffenson, A., MacPhail, C., Hlongwa-Madikizela L., Vermaak K., Padian N. S. (2005). Young people's sexual health in South Africa: HIV prevalence and sexual behaviors from a nationally representative household survey. PMID: 16135907 DOI: 10.1097/01.AIDS.0000183129.16830.06.
- [26] Rahmanian, S., Wewers, M. E., Koletar, S., Reynolds, N., Ferketich, A., & Diaz, P. (2011). Cigarette Smoking in the HIV-Infected Population. *Proceedings of the American Thoracic Society*, 8(3), 313–319. Retrieved from <https://doi.org/10.1513/pats.201009-058WR>.
- [27] Ghana Health Service, 2019. Ghana National Sentinel Surveillance Report, 2019. Ghana Health Service. Accessed at <https://ghanais.gov.gh/mcadmin/Uploads/HSS%202019%20Report%2027-08-2020.pdf>.
- [28] Beauclair, R., Helleringer, S., Hens, N., & Delva, W. (2016). Age differences between sexual partners, behavioural and demographic correlates, and HIV infection on Likoma Island, Malawi. *Scientific Reports*, 6(1), 36121. <https://doi.org/10.1038/srep36121>.
- [29] Fortson J.G. the gradient in sub-saharan Africa: Socioeconomic status and HIV/AIDS. *Demography* 45, 303 – 322 (2008). <https://doi.org/10.1353/dem.0.0006>.
- [30] Kolawole, I. E., 2010. Awareness and Perceptions of HIV/AIDS Preventive Strategies among students of Universities of Zululand and Ado-Ekiti. Unizulu Institutional Repository, 10530(633), <http://hdl.handle.net/10530/633>.
- [31] Achappa, B., Madi, D., Bhaskaran, U., Ramapuram, J. T., Rao, S., & Mahalingam, S. (2013). Adherence to antiretroviral therapy among people living with HIV. *North American Journal of Medical Sciences*, 5(3), 220–223. <https://doi.org/10.4103/19472714.109196>.