*International Research Journal of Social Sciences*_____ ISSN 2319–3565
Vol. **7(3),** 22-38, March **(2018)** *Int. Res. J. Social Sci.*

An exploratory study of the factors of HIV infection risk in Botswana

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Available online at: www.isca.in, www.isca.me
Received 14th December 2017, revised 25th February 2018, accepted 10th March 2018

Abstract

Data from the 2008 Botswana AIDS Impact Survey III (2008 BAIS III) were used to explore the determinants of HIV infection risk in Botswana. It was found that place of residence, age, gender, education, marital status, type of relationship with a sexual partner, male circumcision, religion and sexual behaviour might be significant determinants of HIV infection risk in Botswana. Education seems to be a major determinant. The policy implication is that education should be emphasized in order to fight the HIV/AIDS epidemic. Rural development is also essential.

Keywords: HIV risk, sample design, households' survey, condom, male circumcision, sexually transmitted infections (STAs).

Introduction

The purpose of this study was to explore the demographic, socio-economic and behavioural determinants of HIV infection risk, as well as the relationships between these determinants in Botswana[1-5]. Literature indicates that place of residence is a major determinant of HIV infection risk – causing geographical differences in HIV prevalence levels[1,6]. Sexually Transmitted Diseases (STDs) increase the risk of HIV transmission especially among women[1,7-9]. Women are more likely to delay or avoid treatment, and this might partially explain why HIV prevalence levels in South Africa, on average, are higher among women than among men[1]. For biological and socio-economic reasons, women in general are at a higher risk of HIV infection than men[1]. Prevalence patterns differ according to age; women tend to become infected in their teens and early twenties and because men, in general, attract more sexual partners as they enter employment and acquire socio-economic status they tend to get infected at older ages[1].

It is proclaimed that marital status does not appear to be a significant factor of HIV risk[1]. Religion is a factor, though according to Johnson and Budlender (2002) it is not clear whether church members in general are less likely to be HIV positive than non-church members[1,10]. The authors found that members of Pentecostal and independent churches are less likely to engage in extra- and pre-marital sex and so, they are less likely to be HIV positive than members of other churches. Knowledge (for eg, that HIV/AIDs is transmitted sexually) and beliefs about HIV/AIDS are other risk factors[1,11]. It was found that these risk factors are most common in rural areas and among unemployed people, though evidence suggests that knowledge by itself does not provide much protection against HIV infection[1].

HIV infection through sexual contact with an infected partner depends on type of sexual intercourse, the duration of infection of the infected partner, presence of other sexually transmitted diseases (STDs) and lack of circumcision[12-18]. It is revealed that sex without a condom is the most common form of high risk sexual intercourse[1]. This is most common at older ages, among less educated individuals, and less common in rural areas than in urban areas this might be due to the fact that accessing condoms in rural areas is more difficult[1].

Socio-economic factors (eg, income, education and employment status) are significant factors of HIV infection risk[13,19]. There are two types of HIV infection risk, namely, individual risk and group risk of HIV infection; the former being determined by individual's ability to attract sexual partners (particularly in the case of men), his or her access to STD treatment as well as ability to protect himself or herself from HIV infection, while the latter is determined by the socio-economic status of the community in which an individual lives, which is closely related to its extent of urbanization and the level of migration it experiences[1,20]. HIV prevalence varies with economic status, occupation and type of industry[1]. For example, it is high among teachers, agriculture workers, mine workers, track drivers and other occupations involving long separations from regular partners, and is low among white-collar workers[1,21]. HIV prevalence was found to be at a higher level among blacks than among whites in South Africa[1]. This study might help to inform the relevant policies and programmes for HIV/AIDS in Botswana and other countries with similar characteristics[22,23].

Methodology

The data used in this study were generated by the Botswana AIDS Impact Survey III (BAIS III), which was designed to study the trend of HIV prevalence rate, behavior, knowledge,

attitude, and other factors that are associated with the epidemic. With the consideration of statistical determinants (margin of error, design effect, household size etc.), the overall sample size for the 2008 BAIS-III survey was 8,275 households. The target population covered all individuals aged 18 months and above – including all usual members of the selected private households aged 10 to 64 years, excluding the iinstitutional dwellings (prisons, hospitals, army barracks, hotels, etc) and places with completely industrial area. This was a nation-wide survey using administrative district and sub-districts that are used by the Central Statistics Office. The Sampling frame was defined and constituted by all Enumeration Areas (EAs) found in the three geographical regions viz. i. Cities and Towns, ii. Urban Villages and iii. Rural Districts as defined by the 2001 Population and Housing Census. A list of occupied households in a selected EA served as sampling frame for that EA so the secondary sampling units (SSUs) were occupied households.

Stratification was done such that all districts and major urban centres became their own strata. With regard to increasing precision, consideration was also given to group EAs according to income categories in cities/towns and ecological zones in rural districts (implicit stratification) in such a way that homogeneity of the variables was relatively high.

Sample Design: A stratified two-stage probability sample design was used for the selection of the sample. The first stage was the selection of EAs as primary sampling units (PSU) selected with probability proportional to size (PPS), where measures of size were the number of households in the EA as defined by the census. A total of 459 EAs were selected with probability proportional to size. At the second stage of sampling, the households were systematically selected from a fresh list of occupied households prepared at the beginning of the survey's fieldwork (i.e. listing of households for the selected EAs). Consent for participation in the BAIS III was requested for all the survey's components including blood specimen for HIV testing. The respondents were explained the nature of the research and its benefits to the community and the country such that the interviewer only proceeded with the research undertaking once he or she was confident that the participant had fully consented to be interviewed - in accordance with internationally agreed upon standards, such as the International Ethical Guidelines for Biomedical Research Involving Human Subjects. Taking a blood sample required that the participant gave a further verbal (informed) consent, after being given further detailed description of how samples would be collected, labeled, stored and analyzed. The respondents were assured of the anonymity of the HIV test results and were also assured utmost confidentiality in accordance with provisions made under the laws of Botswana[24].

Results and Discussion

Population: Figure-1 indicates a large proportion of children and young adults up to age group 25-29. The triangular shape implies a typical developing country with larger cohorts at young ages and smaller ones at higher ages - indicating prevailing high fertility levels in the past. The population below age 15 is 34.2 percent. The population aged 15 to 64 is 59.7 percent and that aged 65 years and over is 6.1 percent. The corresponding percentages for males and females are: 36.2 percent and 32.4 percent; 57.7 percent and 60.8 percent; and 6.1 percent and 6.8 percent respectively. These statistics indicate that females have a higher life expectancy than males.

Table-1 shows the distribution of population enumerated by gender cross-classified by residence. It is indicated that the percentage distribution of population according to place of residence is more or less the same for both genders. A large percentage of males (54.2%) and females (56.1%) are situated in urban areas. On average, 55.2 percent of the population resides in urban areas.

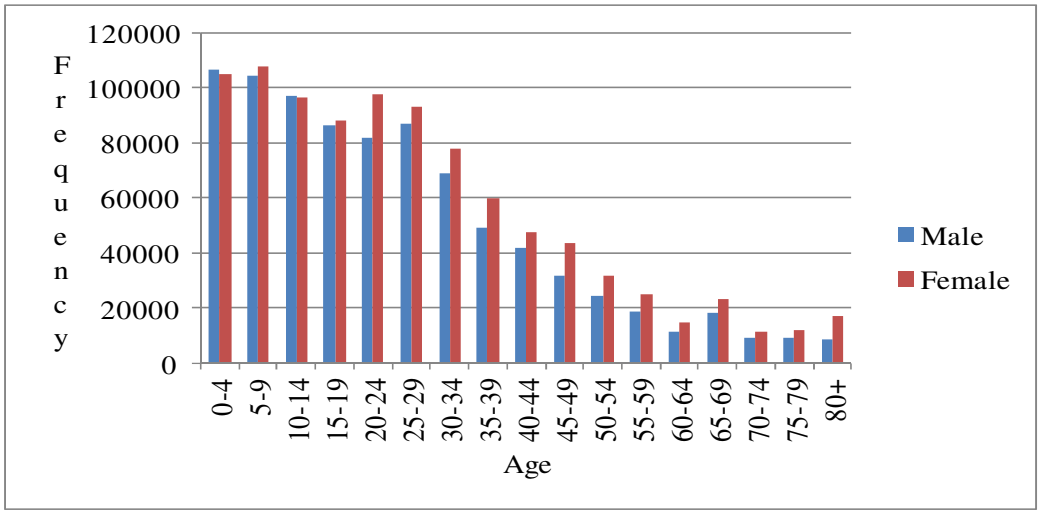

Figure-1: Distribution of population enumerated by gender and 5-year age group.

This might be due to employment opportunities being more in urban areas than in rural areas. For example, in general, 30.8 percent of persons aged less than or equal to 14 years of age, and 10.3 percent aged 50+ years of age reside in urban areas compared to respectively 38.5 percent and 16.1 percent of persons who reside in rural areas. So, for both genders, the young and old people are more concentrated in rural areas while the middle aged mostly resides in urban areas. Proportionally, more males (45.8%) live in rural areas than females (43.9%) and more females (56.1%) live in urban areas than males (54.2%).

The sex ratio for the country was 86.1 in 2008; in urban areas it was 84.2 whereas it was 88.7 in rural areas. This indicates that there are more women than men, and that the difference is experienced more in urban areas than in rural areas. The difference in sex ratio between urban and rural areas might be caused by net in-migration of males or net out-migration of females in rural areas or both.

The majority of people (57.7%) have never been married, and seemingly, this phenomenon is worse in urban areas. About 40 percent are either married (15.7%) or living together (21.9%).

Education: Ten (10) percent of the respondents never attended school, about 30 percent had primary education, and 44.6 and 13.8 percent had secondary and higher education respectively. According to the results, although the total number of respondents who never went to school comprise more males (51%) than females (49%), seemingly, on average, males are more educated than females. For example, according to Figure-2, 16.8 percent of the males have higher education compared to 13.9 percent of the females.

Table-1: Distribution of Population by place of residence and gender.

Residence	Place	Male		Female		Both genders	
		Frequency	Percent	Frequency	Percent	Frequency	Percent
Residence	Cities/Towns	193169	22.7	204654	21.5	397824	22.1
	Urban Villages	268344	31.5	329084	34.6	597428	33.1
	Rural	390718	45.8	416989	43.9	807706	44.8
	Total	852231	100	950727	100	1802958	100
Residence	Urban	461513	54.2	533739	56.1	995252	55.2
	Rural	390718	45.8	416989	43.9	807706	44.8
	Total	852231	100	950727	100	1802958	100

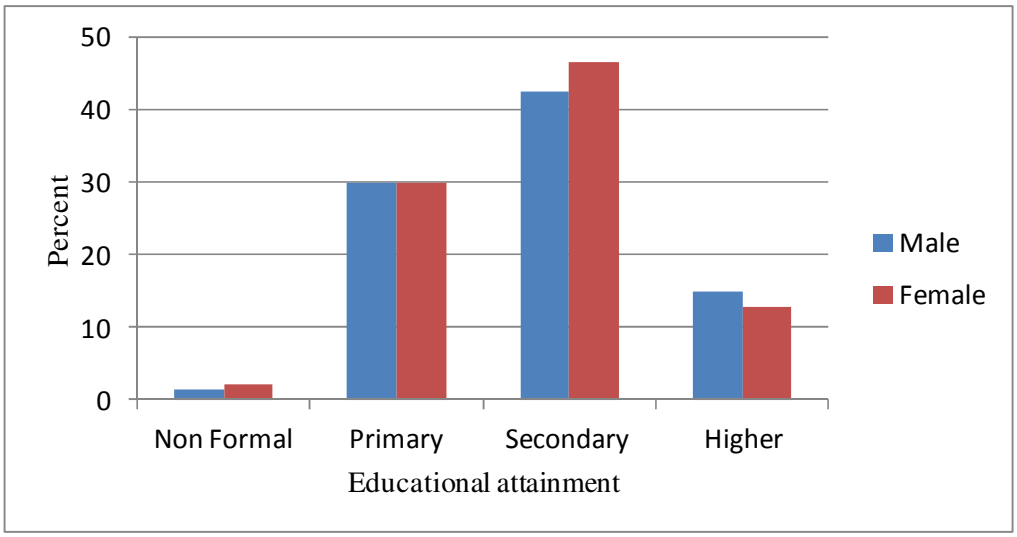

Figure-2: Percentage distribution of population by education and gender.

Figure-3 indicates that most people who never attended school reside in rural areas (68.4%) and the educated mostly reside in urban areas as expected. For example, the percentage points of people residing in urban areas with secondary and higher education are respectively 65.1 and 70.4.

Economic activity: In Botswana, the unemployment rate for the people, aged 12 years and over is 26.2; it is 22.4 in urban areas and 32.6 in rural areas. The corresponding participation rates are 59.8 and 50.0 respectively. Of the total number of people employed, 13.1 percent are self-employed. Figure-4 indicates that most employed people reside in urban areas and that, a larger number of people who work at own land or cattle-post reside in rural areas, as expected. In the case of males, unemployment rate ranges from 1.2 ('75-79' age group) to 58.6 ('12-14' age group, averaging at 21.9. Participation rate ranges from 2.3 ('12-14' age group) to 95.0 ('30-34' age group), with an average of 64.3. For females, unemployment rate ranges from 0 percent ('75-79' age group) to 80.1 ('12-14' age group). On average, it is 31.2. Participation rate ranges from 2.0 ('12-14' age group) to 75.6 ('30-34' age group), with an average of 48.3.

Young people (aged 10-24 years) have the highest unemployment rate ranging from 45.2 (20-24) to 68.8 (10-14). The trend is that the older one grows the more chances of being employed. This is expected because naturally, the older one grows the more educated and/or experienced for a particular job he or she becomes.

Figure-4 indicates that employees and self-employed people are predominantly between 20 and 55 years of age, as expected; whereas working at own lands/cattle-post are mostly associated with later ages. The distribution is more or less the same for both genders.

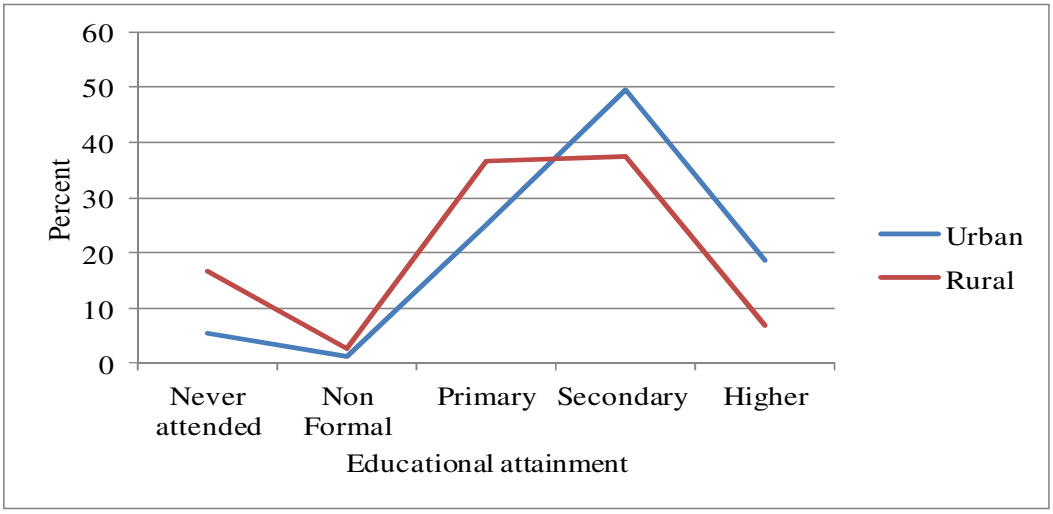

Figure-3: Percentage distribution of population aged 10-64 years by educational attainment and place of residence.

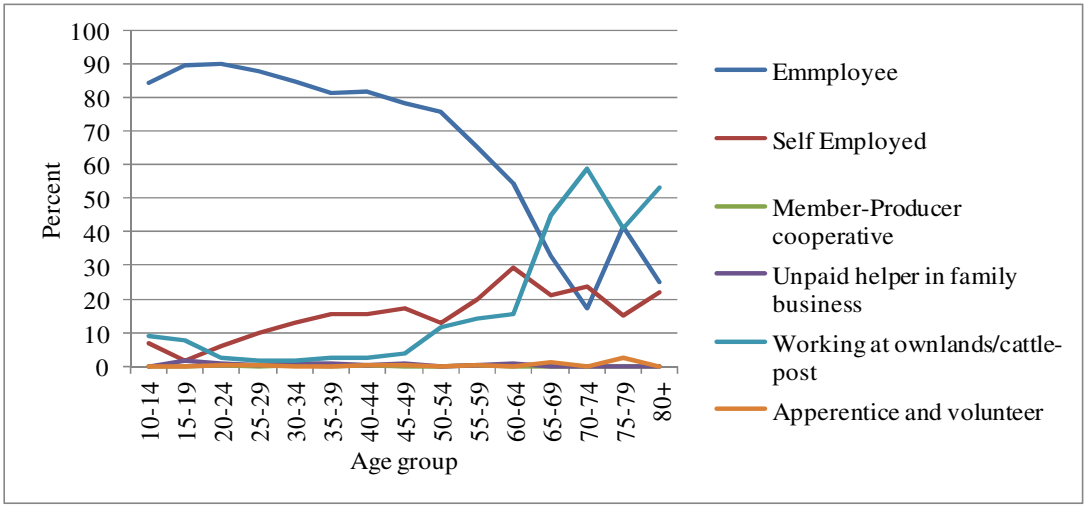

Figure-4: Percentage distribution of population by type of economic activity and age.

Industry: According to Figure-5, a large number of people are in agriculture, hunting, forestry and fishing (12.5% for males and 6.5% for females), public administration (15.7% for males and 15.1% for females), construction (9% for males and 2.8% for females) and wholesale and retail trade (10.1% for males and 13.3% for females). So, males predominantly work in Agriculture, hunting, forestry and fishing; public administration and construction industries, whereas females predominantly work in wholesale and retail trade, and education, health and social work (14.5%) industries. The percentage for males working in the education, health and social work industry is 6.8.

Occupation: According to Table-2 and Figure-6, a large proportion of people (about 25%), aged 12 years and over, do elementary occupations. The table indicates that there are more males (64.6%) working as legislators, administrators and managers than females (35.4%); slightly more male professionals (53.8%) than female professionals (46.2%); and more males (76.2%) working as craft and related trade workers than females (23.8%). On the other hand, there are more females (55.9%) working as technicians and associate professionals and as clerks (74.3%) than males (44.1%) and (25.7%) respectively; more females (52.5%) working as service workers, and shop and market sales workers than males (47.5%); and slightly more females (50.9%) doing elementary occupations than males (49.1%). Figure 6 illustrates this more clearly. Like in the case of industry, these findings indicate that males and females predominantly do different jobs. For example, whereas legislators, administrators and managers are mostly males (64.6%), clerks are predominantly females (74.3%).

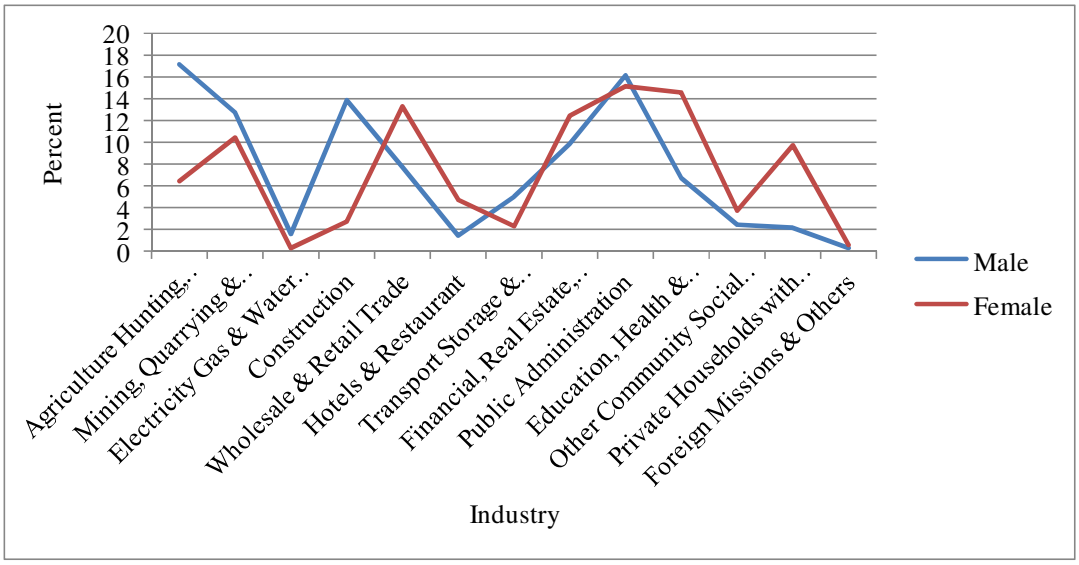

Figure-5: Percentage distribution of population by type of industry and gender.

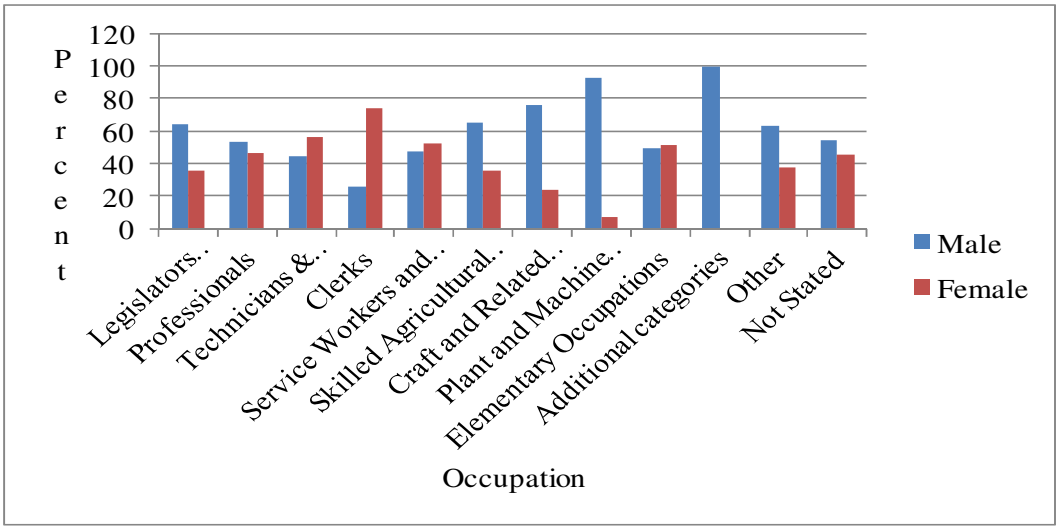

Figure-6: Percentage employed population by occupation and gender.

According to the results, 6 percent of the employed males are legislators, administrators and managers compared to 4 percent of females; for technicians and associate professionals, the respective percentages are 9.7 percent (males) and 15.2 percent (females); for service workers and shop and market sales workers, they are 15.3 and 19.8; for craft and related trade workers, they are 19.9 and 8.0, whereas for elementary occupations they are 21.7 and 29.4.

The scale of the Pandemic: HIV Incidence and Prevalence: Figure-7 shows the distribution of population aged 18 months and over according to new HIV infection test result (incidence) (for the 180 Days Window Period), cross-classified by place of residence and gender. The results indicate that more females are infected with HIV than males regardless of place of residence. For example, the HIV incidence is 3.51 and 2.18 in urban areas and 2.27 and 1.65 in rural areas for females and males respectively. It is also indicated that the incidence is concentrated between ages 25 and 49. The infection is mostly occurring in towns and cities.

Table-2: Employed population by occupation and gender.

Occupation Group	Gender				Total
	Male	Percent	Female	Percent	
Legislators Administrators and Managers	18129	64.6	9947	35.4	28076
Professionals	23036	53.8	19812	46.2	42848
Technicians and Associate Professionals	26969	44.1	34200	55.9	61170
Clerks	7261	25.7	21011	74.3	28272
Service Workers and Shop and Market Sales Workers	41149	47.5	45543	52.5	86692
Skilled Agricultural and Related Workers	19937	64.7	10900	35.3	30838
Craft and Related Trade Workers	57104	76.2	17818	23.8	74923
Plant and Machine Operators and Assemblers	31000	93.1	2290	6.9	33290
Elementary Occupations	63765	49.1	66229	50.9	129994
Additional categories	4956	100	0	0	4956
Other	312	62.9	184	37.1	496
Not Stated	3898	54.1	3311	45.9	7209
Total	297516	56.3	231246	43.7	528762

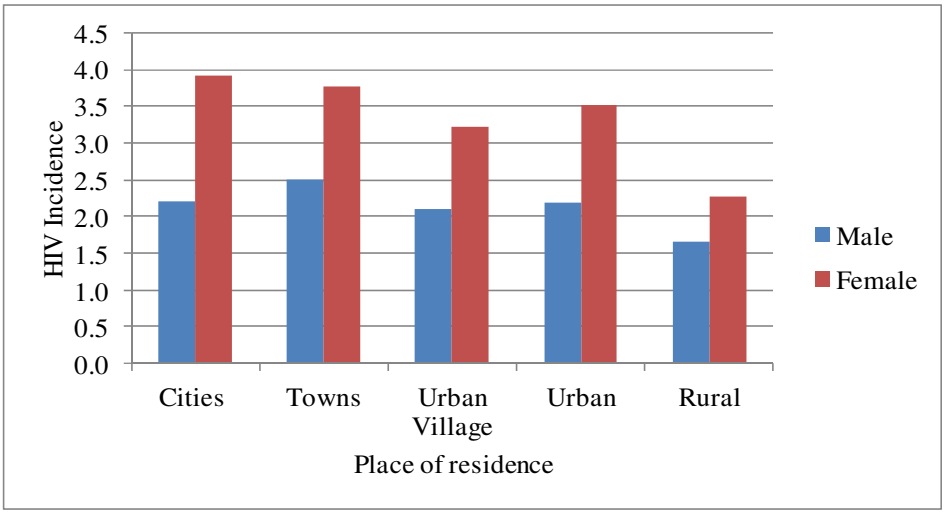

Figure-7: Distribution of population by HIV Incedence, cross-classified by place of residence and gender.

In general, HIV incidence decreases with education, such that the non-educated are the most affected (Figure-8). For example, the incidence is 5.99 and 4.03 for no education and about 4.5 and less than 2 for secondary education for females and males respectively.

Figure-9 indicates that while females who are never married (3.82) and living together (3.99) are mostly affected, for males, it is the married people (4.0). The HIV incidence is 3.82 and 1.64 for never married, 3.99 and 3.18 for living together and 3.15 and 4.0 for married couples for females and males respectively.

HIV Prevalence: According to Figure-10, HIV prevalence is concentrated roughly between ages 20 and 65, and mostly in age groups 30-34 (39.7), 35-39 (40.5) and 40-44 (40.6). It was found that it is worst in towns (22.1) compared to 16.6 for urban villages and 17.1 for rural areas.

Figure-11 shows the relationship between HIV prevalence and education; the higher the education the better. It goes down with education from 28.6 for non-formal education to 16.3 for higher education.

Figure-12 indicates that the Bahai faith (68.7) is most affected and Hinduism (5.0) is least affected.

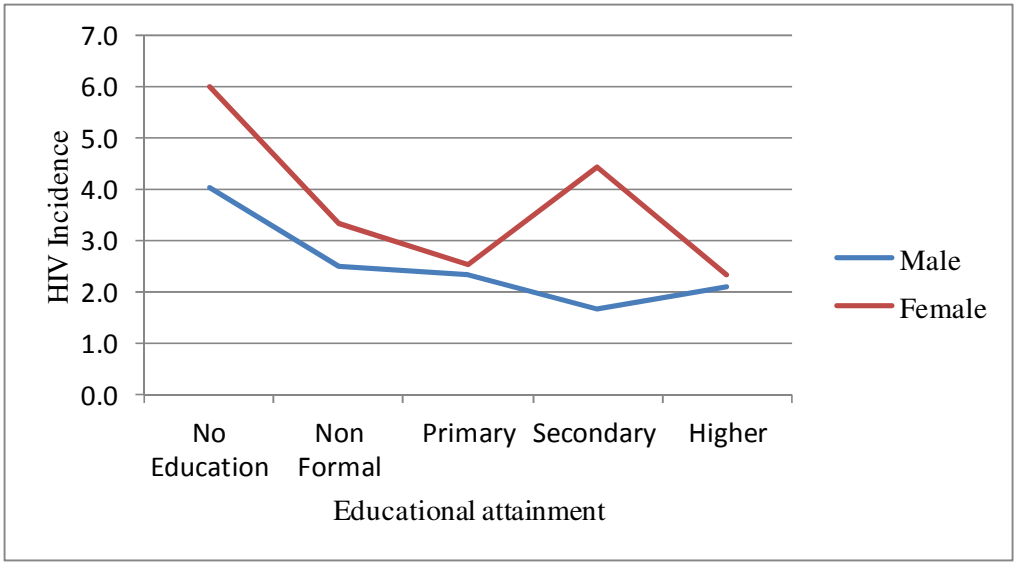

Figure-8: Distribution of population by HIV Incedence, cross-classified by education and gender.

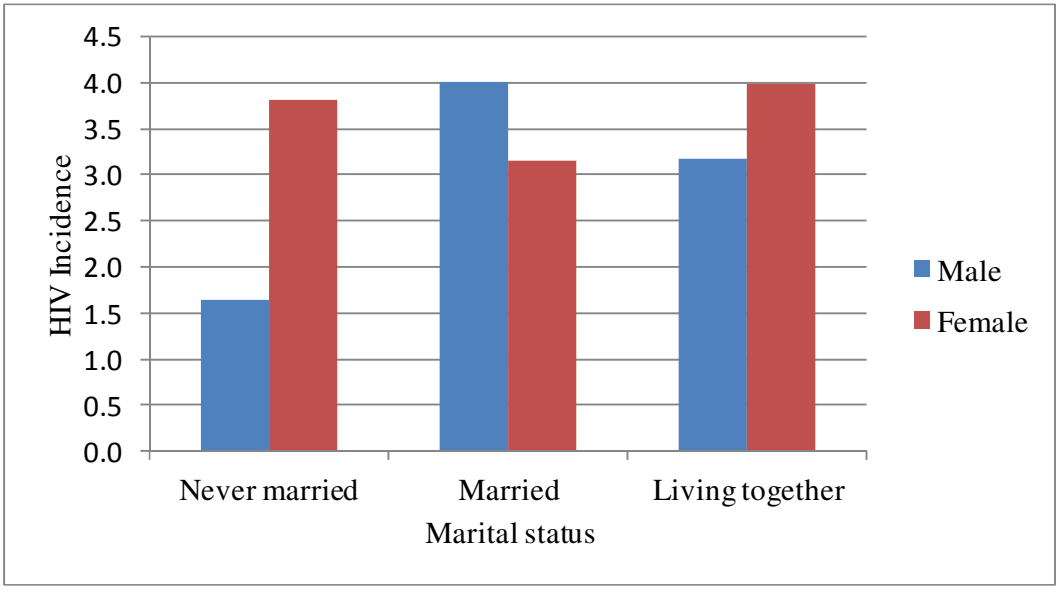

Figure-9: Distribution of population by HIV Incedence, cross-classified by marital status and gender.

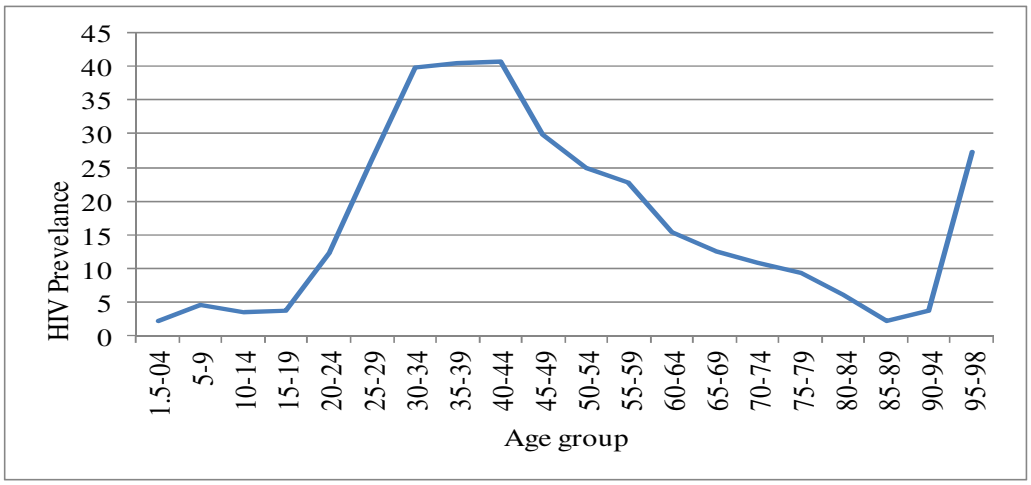

Figure-10: Distribution of population by HIV Prevalence, cross-classified by age.

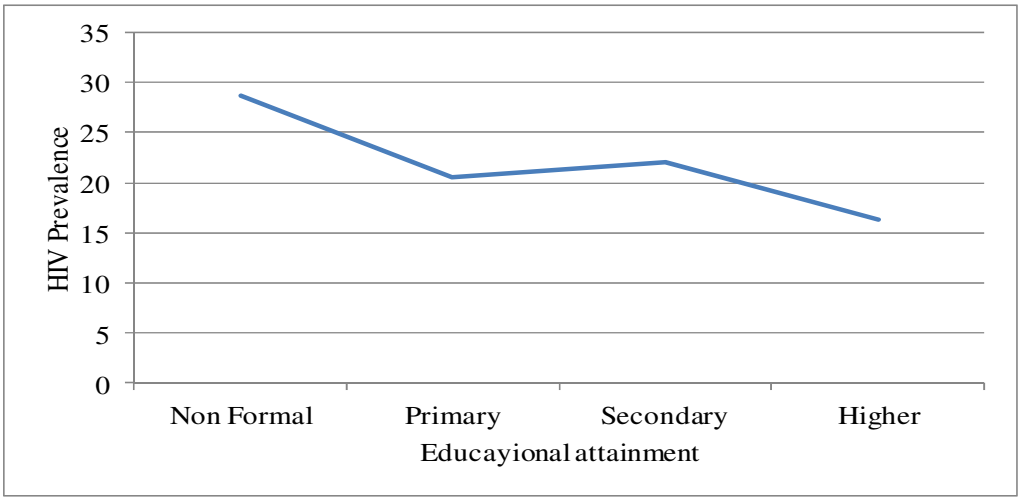

Figure-11: Distribution of population by HIV Prevalence, cross-classified by education.

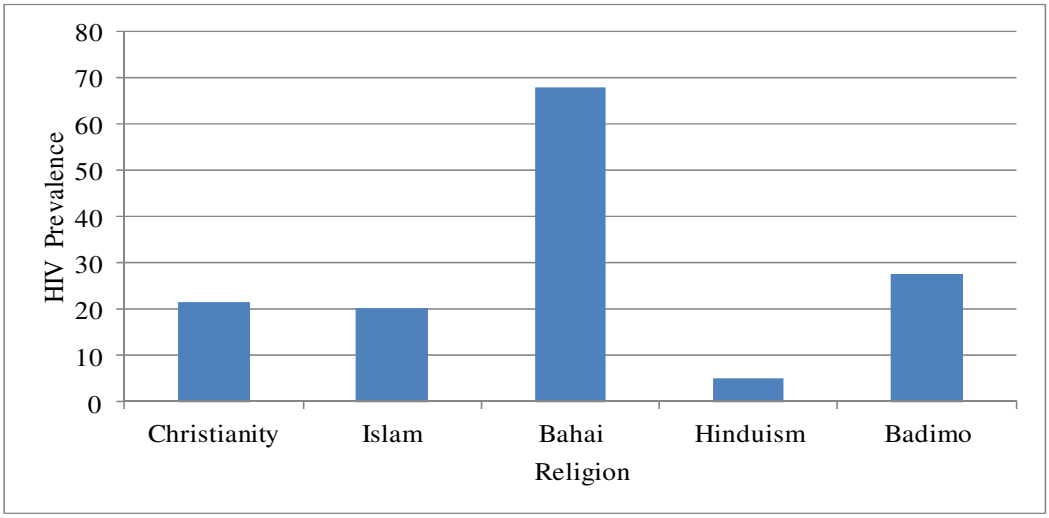

Figure-12: Distribution of population by HIV Prevalence, cross-classified by religion.

Figure-13 indicates that HIV prevalence increases with age from the age group 1.5-04 years (2.3 for males and 2.1 for females), reaches the maximum at age group 30-34 years for females (48.9) and at age group 40-44 years for males (43.6), and then goes down with age (for both genders) to 0 at age group 85-89 and 90-94 for females and males respectively. The figure also indicates that in general, females are more affected than males, and they reach their maximum and minimum HIV prevalence earlier than males. This supports Johnson and Budlender (2002)'s finding.

Sexual history and Behaviour among the Reproductive age-group 15-49 years: Condom use: Figure-14 indicates that condoms are mostly used in towns (48.8 – 63.2%). Their usage is worst in rural areas (38.4-48.8%). This finding is supported by the literature.

In general, the use of a condom increases with education. Non-formal education is associated with the minimum usage of 35.6 percent (first time), 41.4 percent (last time) and 36.2 percent (always), whereas higher education is associated with the maximum usage of 70.4 percent (first time), 62.9 percent (last time) and 51.9 percent (always) (Figure-15). This implies that education helps people to become more knowledgeable about the importance of the use of a condom.

Figure-13: Distribution of population by HIV Prevalence, cross-classified by age and gender.

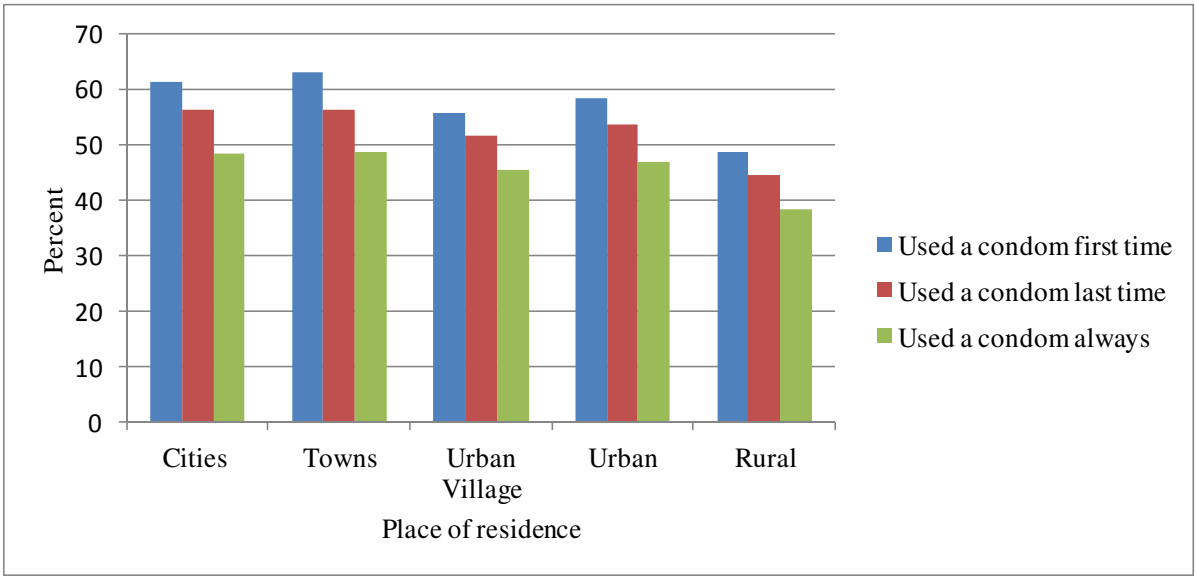

Figure-14: Percentage distribution of population by condom use, cross-classified by place of residence.

Figure-16 indicates that condom is mostly used by people aged between 20-24 years (55.9-72.6%) and 40-44 years (42.0-43.4%), reaching a maximum at age group 25-29 (55.7-76.0%). The reason for this might be because people of these ages are the most sexually active.

According to Figure-17, those living together (54.2% (always) and 72.1% (first time)) use the comdom the most and the widowed (30.8% (always) and 32.7% (first time)) use it the least. The results also indicate that people use the condom mostly at the first time they have sexual intercourse with someone.

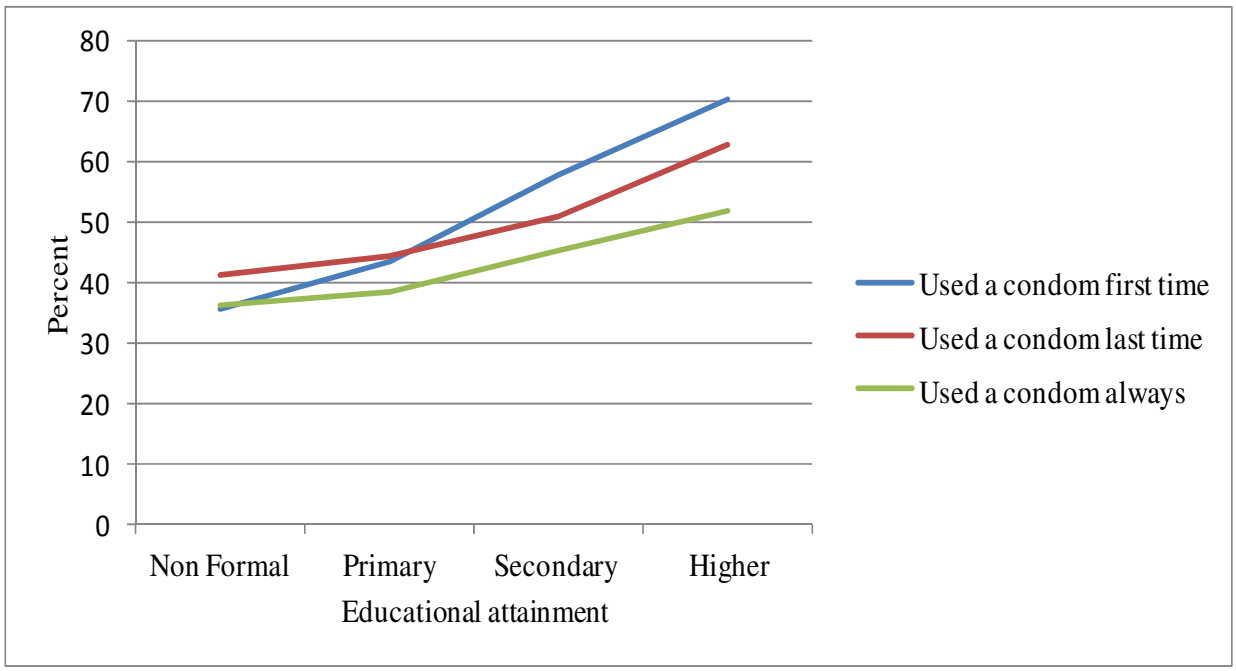

Figure-15: Percentage distribution of population by condom cross-classified by education.

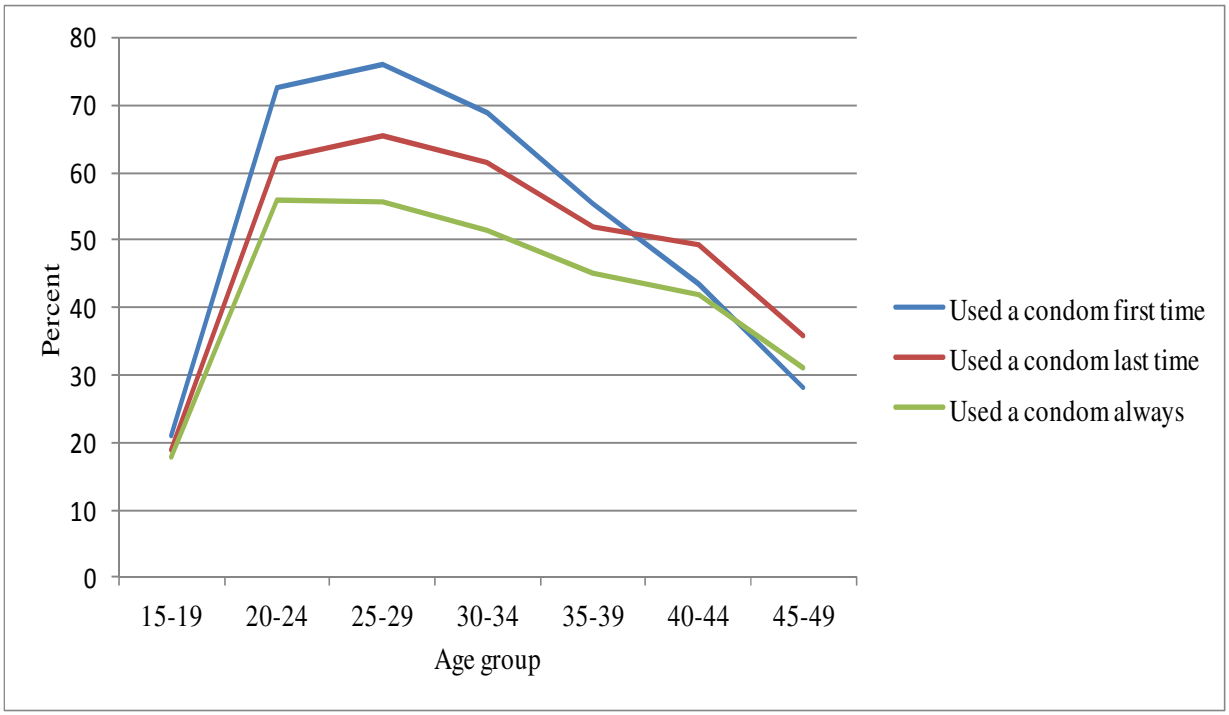

Figure-16: Percentage distribution of population by condom use, cross-classified by age.

Figure-18 shows the distribution of population aged 15-49 who had sexual intercourse during the last 12 months whether ALWAYS used a condom with the most recent sexual partner. The figure indicates that a condom is always used mostly with someone whom was paid or who paid you for sex (100% for both genders) and with a casual acquaintance (86.7% for males and 81.7% for females). It is least used by husband and wife (38.8% for males and 90% for females) as expected. The results also indicated that a condom is used mostly with non-regular partners (however, this decreases with age but increases with education). These findings imply that sexual behaviour particularly in terms of condom usage varies with educational attainment, marital status as well as type of relationship (ie, whether someone is a regular or non-regular partner, which most likely has to do with trustworthiness about HIV/AIDS).

People of the Badimo affiliation (31.8%) and Christians (29.4%) use a condom the most with regular partners, whereas people belonging to the other religions (55.2%) and those without a religion (45.0%) are associated with the least condom usage. For non-regular partners, other religions (55%) and people with no religion (45%) use a condom the most but Hunduis and Bahai (20%) use it the least (Figure-18).

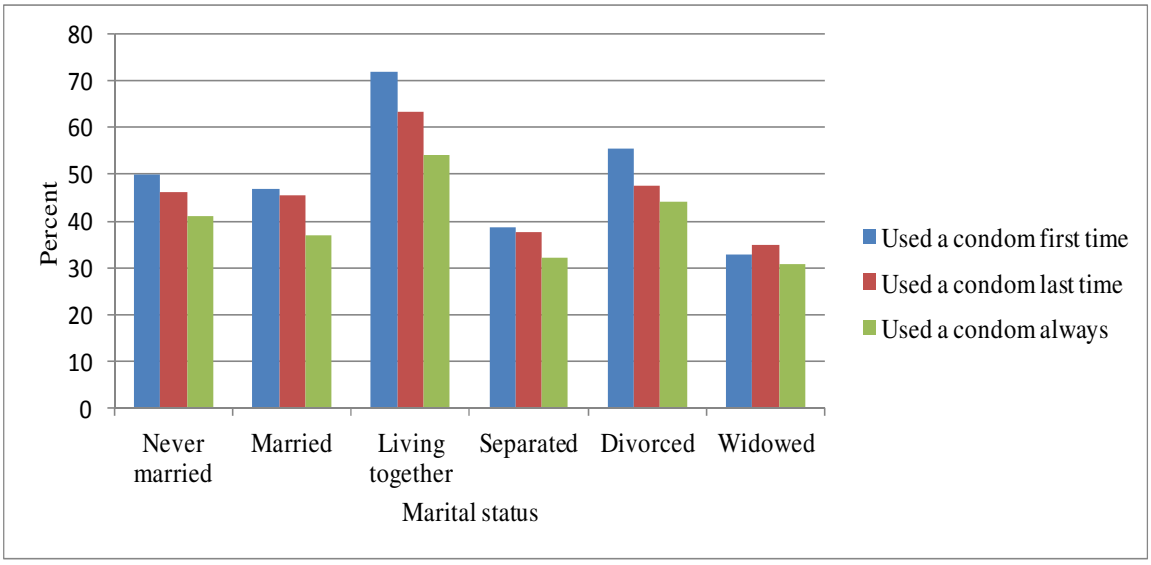

Figure-17: Percentage distribution of population by condom use, cross-classified by marital status.

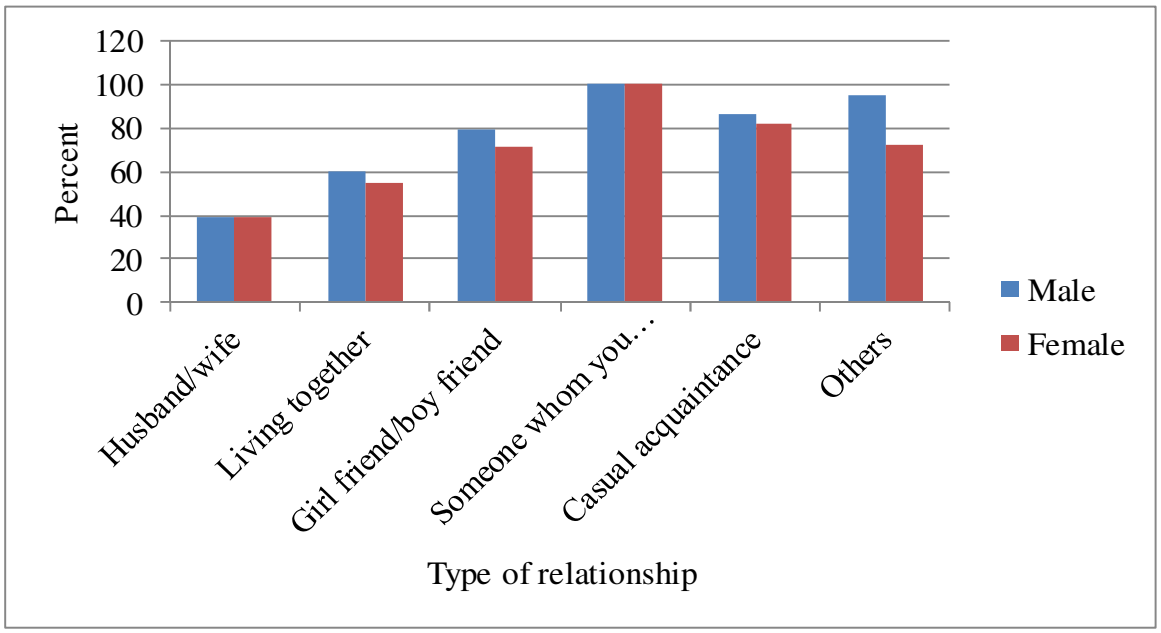

Figure-18: Percentage distribution of population who always used a condom with sexual partner by type of relationship.

Figures-20 and 21 indicate that the use of a condom by persons aged 15-49 years who were drunk before the last sexual intercourse decreases with age but increases with education. For males it decreases from 85.9 percent (15-19 years) to 44.6 percent (45-49 years), whereas for females it decreases from 72.1 percent (20-24 years) to 36.6 percent (45-49 years). In the case of education, it increases from 28.8 percent and 41.1 percent (never attended school) for males and females respectively to 76.4 percent (secondary education) for males and 77.8 percent (higher education) for females.

The figures also indicate that the percentages of people who always use a condom after becoming drunk and the way this is affected by education might differ significantly between males and females.

These findings imply that age, gender and education are important factors of sexual behaviour in terms of using a condom after someone has become drunk.

Male circumcision: Education: Figure-22 indicates that male circumcision varies with education attainment. On average the more or better educated are more circumcised than the less educated. Circumcision ranges from 8.6 percent (primary) to 20.5 percent (higher education). The reason for this might be because education tends to make people more knowledgeable about the whole issue of HIV/AIDS including the protection that might be brought about against HIV/AIDS by circumcision.

Marital status: For some reason, the most circumcised individuals are separated (33.9%) and divorced (28.6%) according to Figure-23. The reason for this might be because "separated" people and divorcees tend to engage in sexual intercourse with non-regular sexual partners more, and they then use circumcision for protection against HIV infection more than others. Those who have never married (8.9%) are circumcised the least. Circumcised people mostly tend to be Muslims as expected.

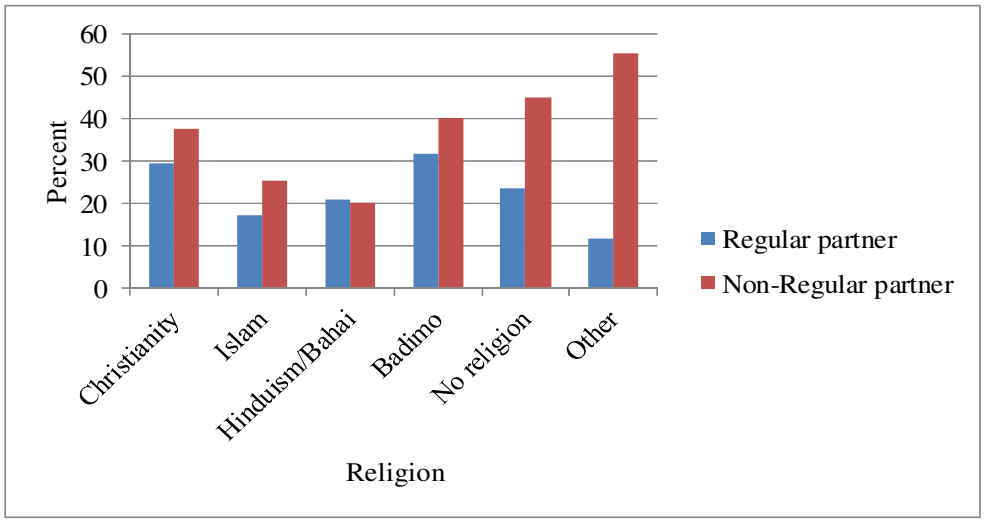

Figure-19: Percentage distribution of population who always used a condom with sexual partner by religion affiliation.

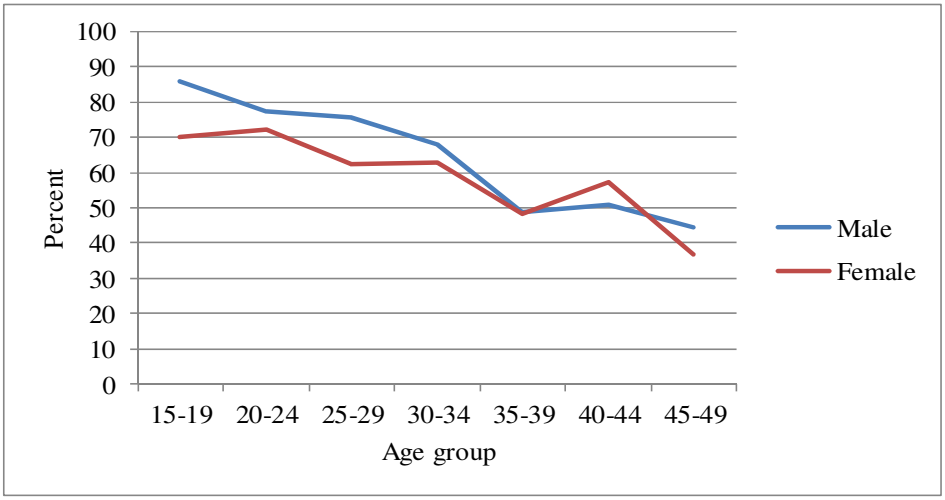

Figure-20: Percentage distribution of population who always used a condom after becoming drunk by gender.

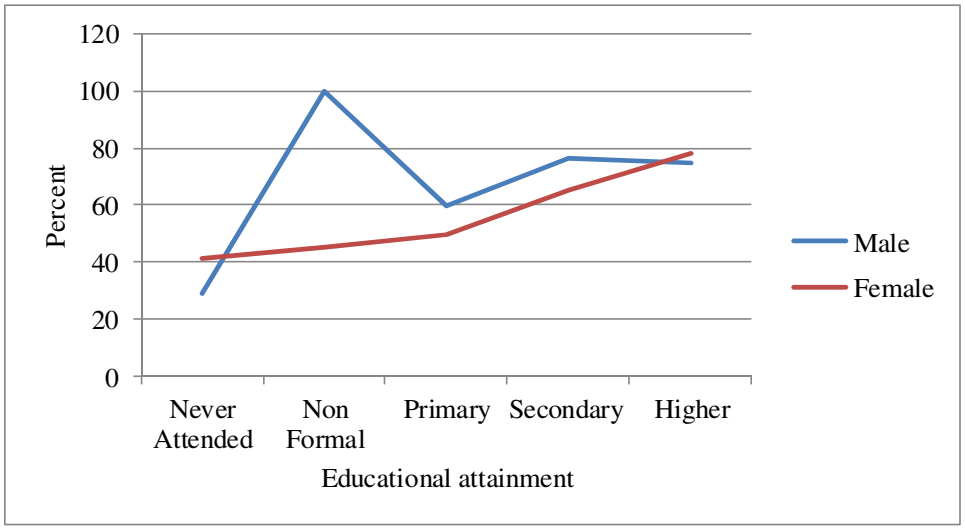

Figure-21: Percentage distribution of population who always used a condom after becoming drunk by education.

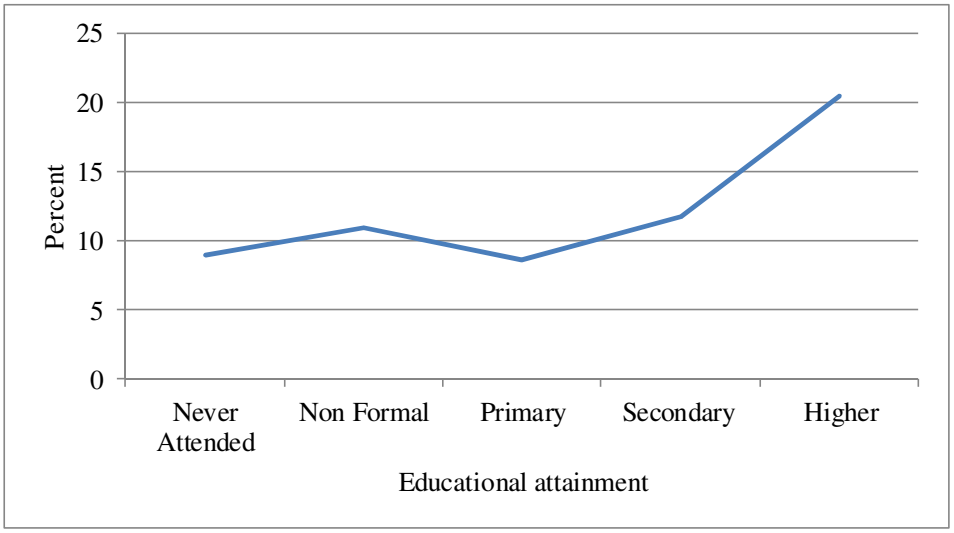

Figure-22: Percentage distribution of male population who were circumcised by education.

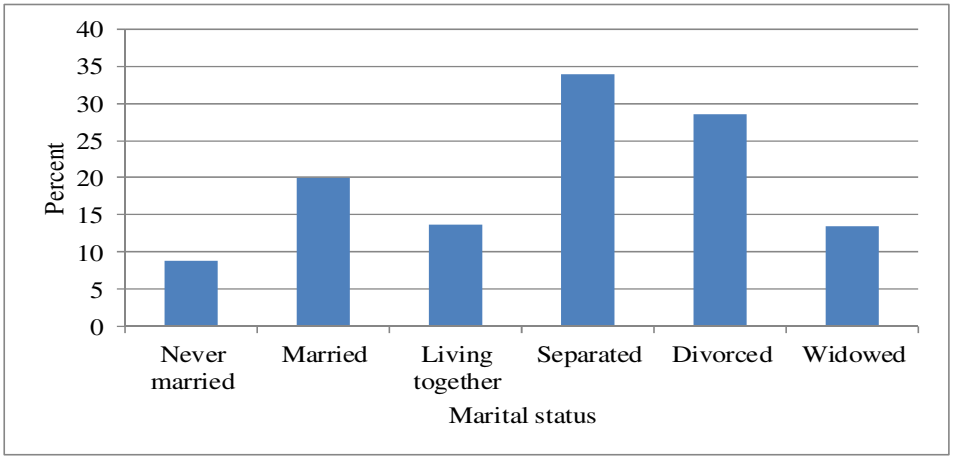

Figure-23: Percentage distribution of male population who were circumcised by marital status.

Sexually transmitted infections (STIs): Figure-24 shows the percentage distribution of persons 10-64 years who had ever heard of STI's by signs/symptoms in a *WOMAN* that would lead them to think that she has an STI, cross-classified by residence.

The figure indicates that genital ulcers or open sores (45.9% and 41.7%), offensive discharge from vagina (41.6% and 34.6%) as well as burning pain on urination (24.4% and 24.2%) in urban areas and rural areas respectively are the most common signs or simptoms in a woman that would lead people to think that she has an STI. The results indicated that education plays a big role in this regard such that the more educated people are the better, simply because, on average, more or better educated people tend to be more knowldgeable about STIs than the less educated. Similar results were obtained for signs or simptoms in a man such as discharge from the penis, pain during intercourse, and genital ulcers or open sores.

Where someone can go to get treatment for STIs?: It was found that people mostly go to clinic or hospital (96%) and private doctor (17.8% (urban) and 9.2% (rural) for treatment for STIs). The second most common place where people go for treatment in rural areas is traditional or spiritual healer (10.2%).

Knowledge about HIV and AIDS and Level of Access to Intervention: Figure-25 indicates that the use of a condom (86.6% and 83.0%) and no sex at all (59.9% and 47.4%) for urban areas and rural areas respectively are mostly used as ways of avoiding getting HIV AIDS, regardless of education level and for both genders. The results indicated that education plays a big role in this regard.

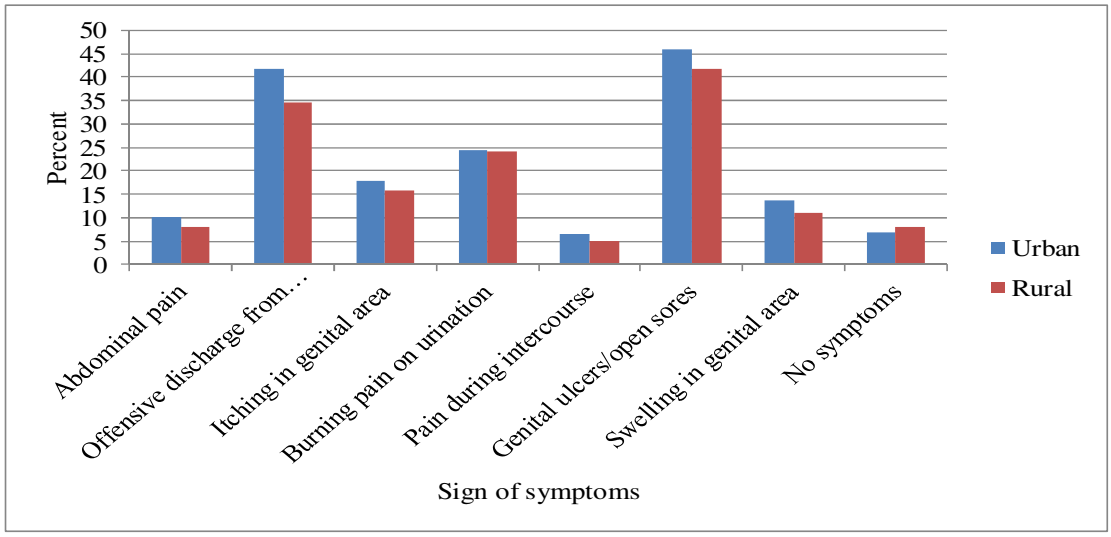

Figure-24: Percentage distribution of persons who had ever heard of STI's by signs or symptoms that would lead them to think that she has STI.

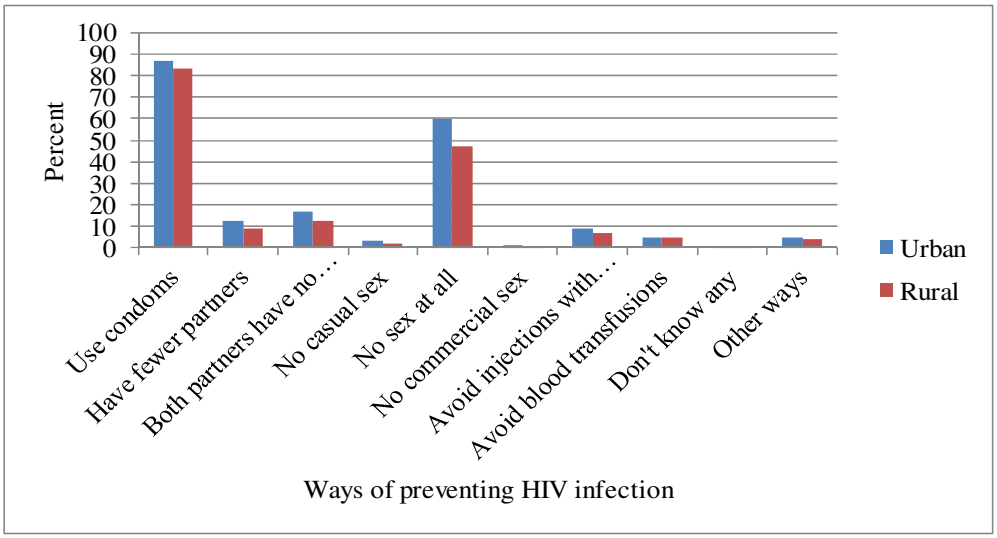

Figure-25: Percentage distribution of population with ways of preventing HIV Infection by place of residence.

Figure-26 shows the percentage distribution of persons aged 10-64 years by access to social and medical services, cross-classified by residence. It is indicated that most people have access to the IPT Programme (25.6% and 21.3% in urban areas and rural areas respectively). It is also indicated that this access is affected by education such that the more educated access it more than the less educated (Figure 27).

According to Figure-28, AIDS (25.2% and 16.2%) is one of the major causes of death in Botswana, followed by TB (7.5% and 8.8%) and Heart disease (5% and 8.6%) in urban areas and rural areas respectively. Seemingly, heart disease and TB proportionally kill more people in rural areas than in urban areas.

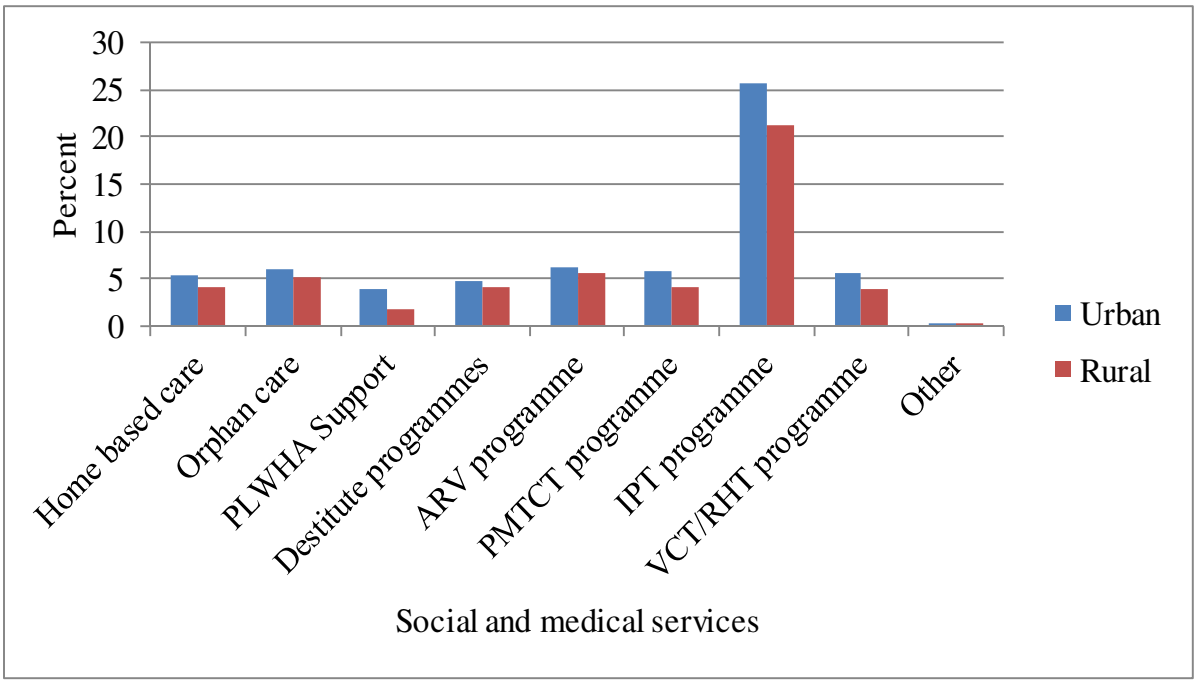

Figure-26: Percentage distribution of population with access to social and medical services by place of residence.

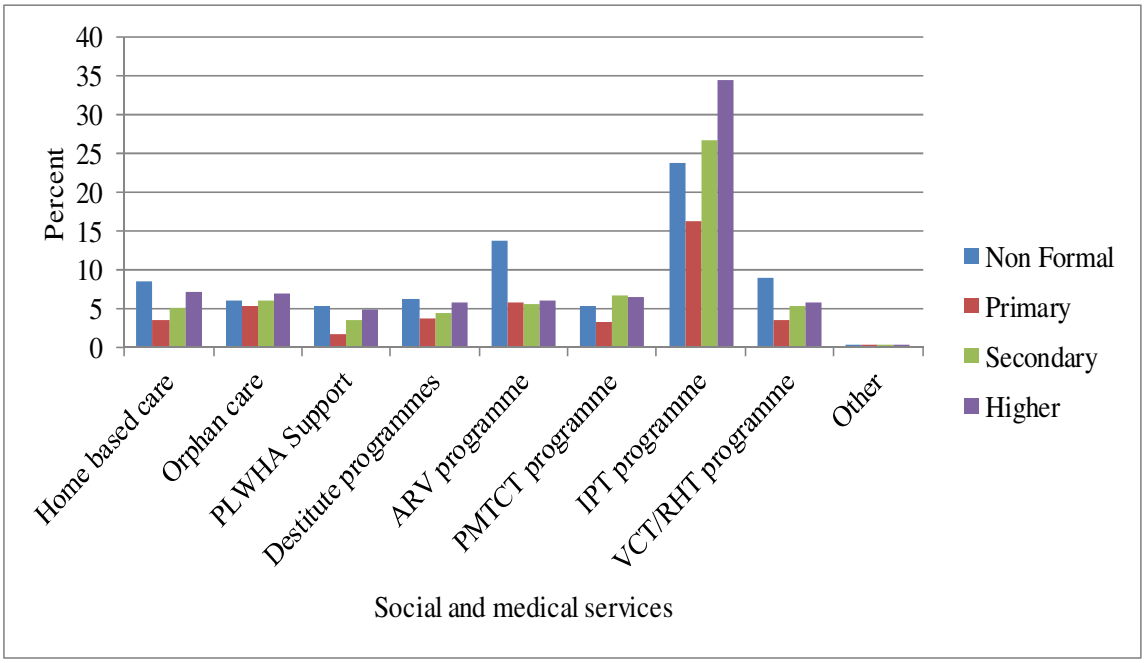

Figure-27: Percentage distribution of population with access to social and medical services by educational attainment.

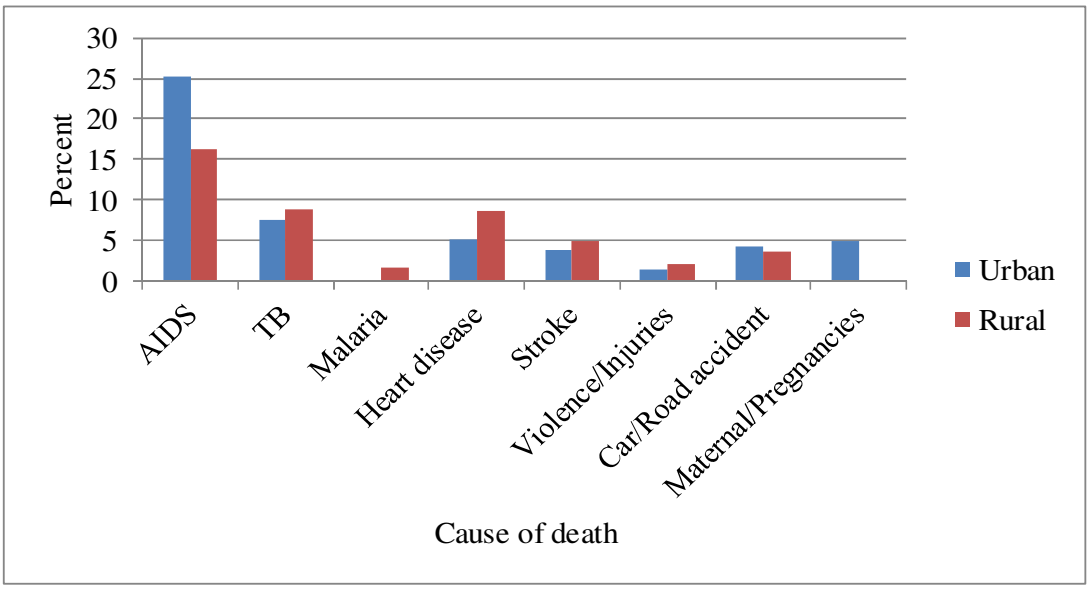

Figure-28: Percentage distribution of population with the causes of death by place of residence.

Conclusion

It has been found that place of residence, age, gender, education, marital status, type of relationship with a sexual partner, male circumcision, religion and sexual behaviour (ie, usage of a condom) - which might also be influenced by drinking liquor might be affecting HIV infection risk in Botswana. Education seems to be the most important determinant. Because many of these factors are related with each other, especially with gender and education, it might not be easy for a researcher to identify their partial effects on HIV infection risk very clearly.

The policy implication is that education should be emphasized in order to fight the HIV/AIDS epidemic. Rural development is also essential.

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