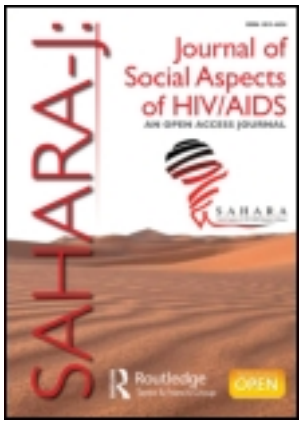

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Risk factors associated with HIV infection among young persons aged 15–24 years: Evidence from an in-depth analysis of the 2005–06 Zimbabwe Demographic and Health Survey

Joshua Kembo

Abstract

This study focuses on factors that predispose young persons aged 15–24 years in Zimbabwe to infection from HIV. Using the Mosley and Chen framework, multivariate modelling was used to assess the effect of demographic, socio-economic and behavioural factors on the risk of HIV infection among this target group. The study utilised data from the Zimbabwe Demographic and Health Survey (ZDHS) conducted in 2005–06. Only the variables that were significant in the bivariate analysis were included in the multivariate binary logistic regression. Young females aged 15–24 years are associated with a significant two-fold elevated risk of HIV infection relative to their male peers ($p < 0.000$). Young persons aged 15–24 years who were divorced, widowed or not living together have significantly elevated risk compared with their never-married counterparts, OR = 5.267 ($p = 0.000$); OR = 4.323 ($p = 0.000$) and OR = 3.272 ($p = 0.000$), respectively. Young persons whose age at first sexual intercourse was less than 14 years are significantly associated with 2.696 times more risk of HIV infection relative to their peers whose age at first sexual intercourse was 20–24 years ($p = 0.000$). Young persons aged 15–24 years with two or more sex partners in the past 12 months preceding the 2005–06 ZDHS survey had a significantly elevated risk of HIV infection of 1.568 times relative to their counterparts with no sex partners in the same period of time. Great challenges still exist for the control of HIV and AIDS among young persons in Zimbabwe. HIV prevention programmes targeted at young persons aged 15–24 years should provide invigorated focus on marital status, age at sexual debut, number of sexual partners, sexually transmitted infections and condom use so as to mitigate these predisposing factors for HIV infection.

Keywords: *HIV and AIDS, HIV sero-status, young persons aged 15–24, Zimbabwe, sub-Saharan Africa, multivariate binary logistic regression*

Résumé

Cette étude s'est focalisée sur les facteurs qui prédisposent les jeunes âgés de 15–24 ans au Zimbabwe à l'infection du VIH. La méthode de Mosley et Chen, la modélisation multi variée a été utilisée pour évaluer l'effet des facteurs démographiques, socio-économiques et comportementaux sur le risque d'infection au VIH dans ce groupe cible. L'étude a utilisé des données de l'enquête démographique et de santé au Zimbabwe (EDSZ) réalisée entre 2005–06. Seules les variables qui étaient significatives dans l'analyse bi variée ont été incluses dans la régression logistique binaire multi variée. Les jeunes femmes âgées de 15–24 ans sont exposées à un risque plus élevé de l'infection du VIH par rapport à leurs congénères masculins ($p < 0.000$). Les jeunes âgés de 15–24 ans qui ont été divorcés, veufs ou ne vivant pas ensemble ont un risque significativement élevé par rapport à leurs semblables qui n'ont jamais été mariés, OU = 5.267 ($p = 0.000$); OR = 4.323 ($p = 0.000$) et OR = 3.272 ($p = 0.000$), respectivement. Les jeunes dont l'âge au premier rapport sexuel était de moins de 14 ans sont significativement exposés au risque de contracter l'infection du VIH, soit 2696 fois plus élevé par rapport à leurs homologues dont l'âge au premier rapport sexuel était de 20–24 ans ($p = 0{,}00$). Les jeunes âgés de 15–24 ans ayant un ou plusieurs partenaires sexuels durant les derniers mois précédant l'enquête de l'année 2005–6 EDSW encouraient un risque très important de l'infection du VIH, soit 1568 fois de plus comparé à leurs analogues sans partenaires sexuels durant la même période. De grands défis subsistent encore pour pouvoir contrôler l'infection du VIH / SIDA parmi les jeunes au Zimbabwe. Les programmes de préventions relatives au VIH ciblant les jeunes âgés de 15–24 ans devraient aussi donner une orientation vigoureuse sur l'état matrimoniale, l'âge au premier rapport sexuel, le nombre de partenaires sexuels, les maladies sexuellement transmissibles et l'utilisation du préservatif en vue d'atténuer ces facteurs prédisposant au VIH.

Mots clés: *VIH/SIDA, le statut sérologique VIH, les jeunes âgés de 15–24 ans, Zimbabwe, Afrique Sub-saharienne, la régression logistique binaire multi-varié*

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Introduction

HIV infection remains a major problem among young persons aged 15–24 years in Zimbabwe. The Joint United Nations Programme on HIV/AIDS (2010a) stipulates that the reduction of the prevalence of HIV and AIDS among persons aged 15–24 years is important for monitoring the reduction of the epidemic among the general population. HIV infection among young persons aged 15–24 years facilitates the detection of the course of new infections in the general population.

It is for these reasons that the objective of the United Nations General Assembly Special Session on HIV/AIDS is to reduce HIV infection among persons aged 15–24 years. The World Health Organisation (2010) noted that the countries that have achieved the least progress with regard to health-related Millennium Development Goals (MDGs) are the ones worst hit by HIV and AIDS, economic hardships or conflicts. The Joint United Nations Programme on HIV/AIDS/World Health Organisation (2008) report observed that since 2000/2001 HIV prevalence among pregnant women aged 15–24 years attending antenatal clinics in Kenya, Cote d'Ivoire, Malawi and Botswana declined by close to 25%.

HIV prevalence among persons aged 15–24 years is one of the indicators for monitoring the progress of MDG 6 which is to 'Have halted by 2015 and begun to reverse the spread of HIV/AIDS'. The other related indicator for monitoring progress towards the achievement of MDG 6 is the proportion of the population aged 15–24 years with comprehensive correct knowledge of HIV/AIDS (Statistics South Africa, 2010). It is against this background that this paper focuses on describing the determinants of HIV infection among young persons aged 15–24 years in Zimbabwe.

The specific objective of this paper is to determine the demographic, socio-economic and behavioural factors that predispose persons aged 15–24 years to HIV infection in Zimbabwe. This paper also offers an extended in-depth analysis of the aspects of the HIV and AIDS module in the 2005–06 Zimbabwe Demographic and Health Survey (ZDHS) (Zimbabwe Central Statistical Office/Macro International Incorporated 2007). The findings from this paper are expected to inform the design of appropriate prevention programmes to combat the spread of HIV and AIDS among persons aged 15–24 years.

According to the 2005–06 ZDHS, 7.8% of men and women in Zimbabwe aged 15–24 years were HIV positive. The prevalence of infection was higher among female persons aged 15–24 years (11.0%) than among male persons aged 15–24 years (4.2%) (Zimbabwe Central Statistical Office/Macro International Incorporated, 2007). Using antenatal surveillance data, the 2010 Zimbabwe MDG Report states that Zimbabwe is likely to attain the MDG 6 target of a 9% reduction in HIV prevalence among pregnant women aged 15–24 years by 2015. This is attributable to the reduction in HIV prevalence among this group over the recent years (Zimbabwe Ministry of Labour and Social Welfare 2010).

The HIV prevalence among persons aged 15–24 years in Zimbabwe was estimated to be 20.8% in 2002, declining to 17.4% in 2004, 12.5% in 2006 and 11.6% in 2009 (Zimbabwe Ministry of Labour and Social Welfare 2010). This observed trend indicates that major achievements have been made in reducing the prevalence of HIV and AIDS among persons aged 15–24 years in Zimbabwe. Similar declines have been observed in the HIV prevalence estimates among the adult population (aged 15–49 years) in Zimbabwe. In 2001, the HIV prevalence among adults aged 15–49 years was 23.7% but this declined to 18.1% in 2005–06 (United Nations General Assembly Special Session 2008–2009; Zimbabwe Central Statistical Office/Macro International Incorporated 2007). By 2009, the adult HIV prevalence in Zimbabwe had dropped to 14.3% (Zimbabwe Ministry of Labour and Social Welfare 2010).

Various reasons have been forwarded as explanations for the observed decline in HIV prevalence in Zimbabwe, and these include: the impact of prevention programmes, changes in sexual behaviour and the availability of prevention of mother-to-child transmission HIV services as well as mortality among the cases diagnosed during the peak of the epidemic (Zimbabwe Ministry of Labour and Social Welfare 2010). The Joint United Nations Programme on HIV/AIDS (2010b) report also noted that HIV prevalence among young people was falling in 16 of the 25 countries studied. The report further noted that the main drivers of the reductions were changes in sexual behaviour among the young people (The Joint United Nations Programme on HIV/AIDS 2010b). Despite these declines, morbidity and mortality due to HIV among persons aged 15–24 years in Zimbabwe still remains a major concern, hence the focus of this paper to determine the determinants of HIV infection among this target group. Decosas (2009) noted that despite the increased donor support, national health programmes on HIV and AIDS and other sexually transmitted infections that are targeted at young people are still lacking in West Africa and other African countries.

Laski and Wong (2010) have also argued that adolescents form a significant proportion of most developing countries' populations and hence their health status is of paramount importance to poorly resourced countries. They further noted that adolescent girls living in rural areas were particularly vulnerable to HIV infection, sexual violence and abuse (Laski & Wong 2010). Hindin and Fatusi (2009) noted that 70% of adolescents live in developing countries and that the environment in which they are growing up, and having to make sexual and reproductive health decisions, is rapidly evolving due to technological advancement in the media, internet and telecommunications. The present study is therefore well situated to interrogate the factors that are associated with HIV infection among persons aged 15–24 years.

In a recent study conducted among young persons aged 10–18 years, Ferrand, Bandason, Musvaire, Larke, Nathoo, Mujuru, et al. (2010) indicated that morbidity due to HIV was the leading cause of hospitalisation of persons in this age group in Harare, Zimbabwe. Nearly 50% of the persons aged 10–18 years admitted to hospital were HIV positive. All the persons aged 10–18 years studied exhibited severe immunosuppression and had a median CD4 cell count of 51 cells/mm^3. The mortality

risk of HIV-infected persons aged 10–18 years was almost four times more than that of those who were uninfected. HIV-related diseases among the persons aged 10–18 years were mainly caused by adult-spectrum opportunistic infections and chronic complications of paediatric HIV and AIDS (Ferrand et al. 2010). These results were consistent with those from similar studies involving African adults before the availability of antiretroviral therapy.

In a study in which they projected the time course of the HIV/AIDS epidemic in Southern Africa, Ferrand, Corbett, Wood, Hargrove, Ndhlovu, Cowan, et al. (2009) argue that there is an emerging HIV and AIDS epidemic among older survivors of mother-to-child transmission in Southern Africa. They recommended improvement of diagnostic and health care services targeted at this target group. The review of literature has shown that HIV and AIDS morbidity and mortality among persons aged 15–24 years, though on the decline in Zimbabwe, and in some other countries, is still a major problem. There is therefore a need for research in order to improve our understanding of the factors that are driving the epidemic.

The conceptual framework that is used in the research design, analysis and interpretation of results in this paper is that proposed by Mosley and Chen (1984) for research on child survival. The basic characteristic of the Mosley and Chen framework is that socio-economic variables must operate through proximate factors in order to influence child morbidity and mortality. Studies on HIV and AIDS morbidity and mortality are increasingly utilising the Mosley and Chen framework in order to research the determinants of HIV infection. Fig. 1 provides a diagrammatic representation of the adapted framework underlying this study:

The adapted framework depicted in Fig. 1 shows that the underlying determinants, that is, the demographic and socio-economic factors (age, sex, marital status, religion, education, type of place of residence, province and wealth status), operate through the proximate factors, which are behavioural and biological in nature (age at first sex, number of sexual partners, sexually transmitted infections and condom use), in order to influence the health outcome, that is, risk of HIV infection. It should be noted that the conceptual framework could be expanded with the addition of other variables depending on the availability of data. The 2005–06 ZDHS, from which data for this paper were sourced, permits the analysis of all the variables as shown in the conceptual framework provided in Fig. 1.

The following section provides a detailed exposition of the data and methods utilised in this paper.

Data and methods

Nationally representative data from the 2005–06 ZDHS were used to study the risk factors associated with HIV infection among young persons aged 15–24 years in Zimbabwe. The 2005–06 ZDHS was a follow-up on to the 1988, 1994 and 1999 rounds of a similar survey. The 2005–06 ZDHS used a probability sample that involved clustering and stratification. The sample in the 2005–06 ZDHS is stratified by province, ward, enumeration area, cluster and household (Zimbabwe Central Statistical Office/Macro International Incorporated 2007). The 2005–06 ZDHS collected a wide range of data on maternal and child health, fertility and reproductive health, HIV knowledge, practice, behaviour and HIV sero-status of the respondents who agreed to have samples of blood drawn and tested for HIV. The determination of HIV sero-status from the survey allowed the computation of HIV prevalence estimates.

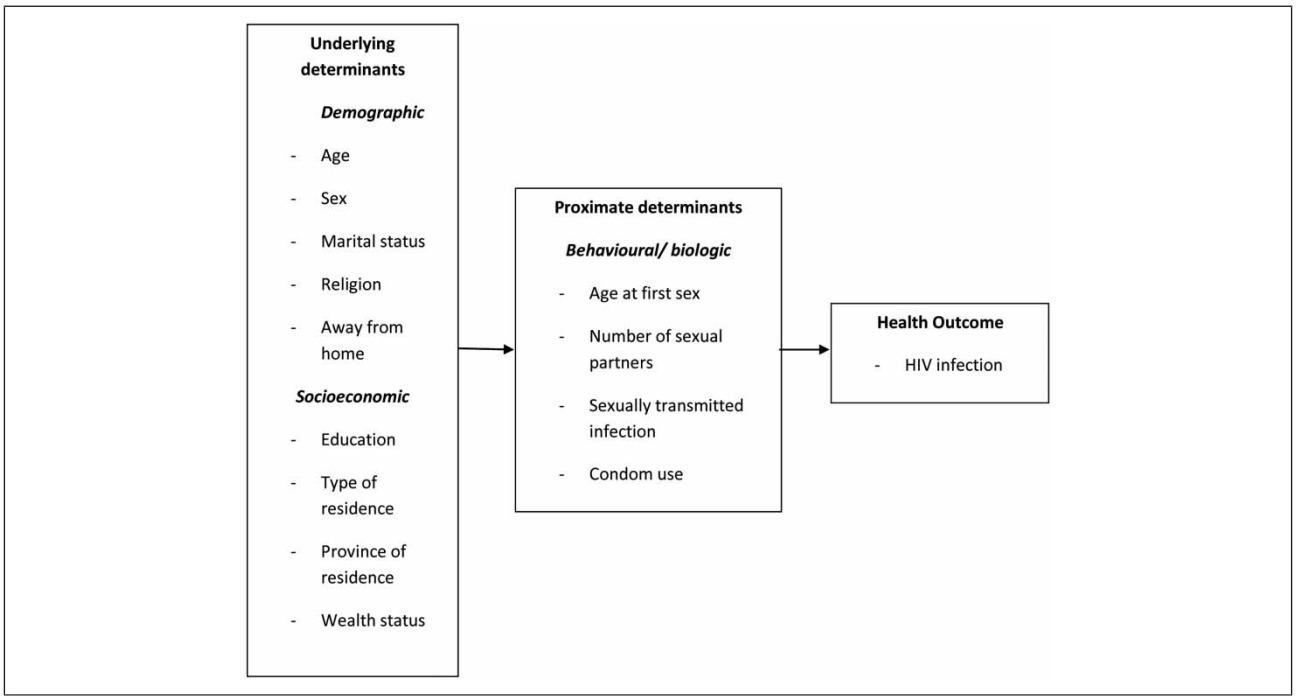

Fig. 1. Conceptual framework for factors affecting the risk of HIV infection among young persons aged 15–24 years, Zimbabwe. Source: Adapted from Mosley and Chen (1984).

The 2005–06 ZDHS interviewed a representative sample of 9870 women aged 15–49 years and 8761 men aged 15–54 years. The 15–24 year age group constituted 3409 and 4017 females and males, respectively. A total of 6139 persons aged 15–24 years agreed to take the dried blood sample (DBS) HIV sero-status test.

The analysis in this paper is based on this sub-sample of persons aged 15–24 years (6139) who took the DBS HIV test. Multivariate logistic regression modelling was used to determine hierarchical factors associated with being HIV positive among young persons aged 15–24 years. The independent variables are the demographic, socio-economic and behavioural factors and the dependent variable is HIV-positive sero-status. Significance tests to test for association between the independent variables and the dependent variable were performed for both the entire construct and the individual dummies. The justification for the distinction between the entire construct and the individual dummies is to be able to test for the significance of both the entire construct and the individual dummies on the dependent variable. It is possible for one or more of the individual dummies to be significant while the entire construct is not. The entire construct can also be significant with nonsignificant dummies (Polissar & Diehr 1982).

The Statistical Package for the Social Sciences 18.0 was used for tabulating the variables in the bivariate analysis and for constructing the multivariate binary logistic regression models (SPSS Incorporated 2011). The statistical significance of the variables in the bivariate and multivariate modelling was tested at levels of $p = 0.05$, $p = 0.01$ and $p = 0.001$. Pearson chi-square tests were performed in the bivariate models to test for association between the dependent variable and independent variables. A chi-square probability of 0.05 or less indicates that the independent variable is related to the dependent variable (Agresti 1996; Levin 1999). Only those variables that were significantly associated with the dependent variable were included in the multivariate binary logistic regression. In addition, statistical tests of difference between two proportions, namely *t*-tests, were performed to test for the significance of difference between the prevalence rates in the independent dummy variables. STATA 10.0 software was used to compute the *p*-values for those *t*-tests (Stata Corporation 2003).

Ethical considerations are well addressed in DHS surveys around the world. In the 2005–06 ZDHS, a general health interview was conducted before collecting blood samples. The selected respondents were required to provide written informed consent before testing. A written statement describing the benefits and potential risks was also read to the participant. The interviewer was required to record on the questionnaire the respondent's decision and to further endorse that the decision was indeed as given by the respondent. In order to safeguard anonymity of the blood samples, the cluster and household numbers associated with any participants were scrambled to render it impossible to link any individual data with a specific household or place. The respondents were also provided with information on the nearest facilities around Zimbabwe offering voluntary counselling and testing services. In addition, the DHS programme has developed procedures for the safety of the survey teams and for the correct disposal of biological specimens and biohazards (Mishra, Vaessen, Boerma, Arnold, Way, Barrere, et al. 2006).

Results

This section presents the results from the study. The distribution of the explanatory covariates (bivariate analysis) are first presented and then the multivariate analysis. The former shows the percentage distribution of the covariates used in the statistical models, thereby providing a detailed description of the sample. The multivariate analysis determines the associations between the various independent (demographic, socio-economic and behavioural) factors and the dependent variable (HIV sero-status). Only the variables that were significant in the bivariate analysis were selected for the multivariate binary logistic regression.

Distribution of explanatory covariates

The distribution of the covariates, which is shown in Table 1, forms the basis of the multivariate logistic regression models depicting the association between the demographic, socio-economic and sexual behaviour variables and the risk of HIV infection.

The data in Table 1 indicate that the variable 'age group' is significantly associated with the blood test result ($\chi^2 = 137.072$; $p = 0.000$). The data further show that HIV prevalence among persons aged 15–24 years in Zimbabwe during 2005–06 was 7.8%. The total number of young persons aged 15–24 years who agreed to take the DBS HIV test was 6139. This number represented 75.6% of the persons aged 15–24 years who were interviewed in the 2005–06 ZDHS. The distribution of persons aged 15–24 years by age group further indicates that HIV prevalence was highest for the 21–24-year age group (12.7%) and lowest for the 15–17-year age group (3.1%) ($p = 0.000$). The sex of the persons aged 15–24 years is also significantly related to the blood test result ($\chi^2 = 97.311$; $p = 0.000$). The prevalence of HIV infection was also significantly higher for females (11.0%) than for males (4.2%) ($p = 0.000$).

Marital status was significantly associated with HIV sero-status for the young persons surveyed ($\chi^2 = 309.112$; $p = 0.000$). The analysis of prevalence rates by marital status indicates that persons aged 15–24 years who were divorced (30.8%) had the highest infection rates while those who were never married had the lowest prevalence (4.3%) ($p = 0.000$). A highly statistically significant difference was observed. The variable 'religion' (as a construct) was significantly associated with the blood test result ($\chi^2 = 16.352$; $p = 0.000$). It should be noted that the association between the socio-economic covariates and HIV sero-status presented in Table 1 for young persons aged 15–24 years was nonsignificant. As a result, the socio-economic variables are not included in the multivariate binary logistic regression.

The results in Table 1 further indicate that there are highly significant associations between sexual behaviour-related variables and HIV sero-status. A closer examination of these results indicates that there was a highly significant association between age at first sex and HIV sero-status for the persons aged 15–24 years ($\chi^2 = 117.810$; $p = 0.000$). Persons aged 15–24 years whose age at first sexual intercourse was between 15 and 19 years had a prevalence of 12.0%, the highest in this category, while those

Table 1. Distribution of young persons aged 15–24 years who took the dry blood test (DBT) for HIV during the 2005–06 ZDHS.

	Blood test result							
	HIV negative		HIV positive		Total			
	Number	%	Number	%	Number	%	χ^2	*p*-value
Age group							137.072	0.000
15–17	1941	96.9	63	3.1	2004	100.0		
18–20	1810	93.0	135	7.0	1945	100.0		
21–24	1912	87.3	279	12.7	2190	100.0		
Sex							97.311	0.000
Male	2814	95.8	125	4.2	2939	100.0		
Female	2848	89.0	352	11.0	3200	100.0		
Marital status							309.112	0.000
Never married	4151	95.7	185	4.3	4336	100.0		
Married	1262	85.7	211	14.3	1474	100.0		
Living together	54	84.3	10	15.7	64	100.0		
Widowed	24	71.0	10	29.0	33	100.0		
Divorced	85	69.2	38	30.8	123	100.0		
Not living together	86	78.8	23	21.2	109	100.0		
Religion							16.352	0.000
Traditional	178	94.0	11	6.0	189	100.0		
Christian	2160	93.7	145	6.3	2305	100.0		
Pentecostal	2476	91.4	233	8.6	2708	100.0		
Muslim	41	86.2	7	13.8	48	100.0		
Other/none	807	90.8	82	9.2	889	100.0		
Away for more than one month							0.003	0.956
No	1582	91.8	142	8.2	1724	100.0		
Yes	1268	91.8	113	8.2	1382	100.0		
Province							7.120	0.625
Mashonaland Central	550	90.6	57	9.4	607	100.0		
Mashonaland East	437	93.5	30	6.5	468	100.0		
Mashonaland West	517	92.0	45	8.0	563	100.0		
Matabeleland North	338	91.4	32	8.6	370	100.0		
Matabeleland South	285	92.4	23	7.6	308	100.0		
Midlands	777	92.9	59	7.1	836	100.0		
Masvingo	733	93.4	52	6.6	785	100.0		
Harare	988	91.5	92	8.5	1081	100.0		
Bulawayo	382	92.9	29	7.1	411	100.0		
Type of place of residence							0.400	0.527
Urban	2243	92.0	196	8.0	2439	100.0		
Rural	3419	92.4	281	7.6	3700	100.0		
Highest educational level							2.824	0.420
No education	19	94.0	1	6.0	21	100.0		
Primary	1444	91.5	134	8.5	1578	100.0		
Secondary	4085	92.4	336	7.6	4421	100.0		
Higher	114	95.3	6	4.7	119	100.0		
Wealth index							5.319	0.256
Poorest	873	92.7	68	7.3	941	100.0		

(*Continued*)

Table 1. Continued.

	Blood test result							
	HIV negative		HIV positive		Total			
	Number	%	Number	%	Number	%	χ^2	*p*-value
Poorer	926	91.4	87	8.6	1013	100.0		
Middle	1115	93.0	84	7.0	1199	100.0		
Richer	1321	91.2	127	8.8	1448	100.0		
Richest	1427	92.9	109	7.1	1537	100.0		
Age at first sex							117.81	0.000
Less than 14	3041	95.8	134	4.2	3175	100.0		
15–19	2066	88.0	281	12.0	2347	100.0		
20–24	478	90.0	53	10.0	531	100.0		
Number of sex partners in past 12 months							139.366	0.000
0	3339	95.7	151	4.3	3490	100.0		
1	2090	87.3	303	12.7	2393	100.0		
2	189	90.6	20	9.4	209	100.0		
3+	41	95.0	2	5.0	43	100.0		
Sexually transmitted infection in past 12 months							43.877	0.000
No	5576	92.5	450	7.5	6026	100.0		
Yes	78	74.8	26	25.2	104	100.0		
First intercourse used condom							7.866	0.000
No	1981	87.2	291	12.8	2272	100.0		
Yes	832	90.7	85	9.3	917	100.0		
Last intercourse used condom							16.907	0.000
No	1670	86.2	268	13.8	1939	100.0		
Yes	652	92.1	56	7.9	708	100.0		
	5662	*92.2*	*477*	*7.8*	*6139*	*100.0*		

*$p < 0.05$.

whose age at first sex was less than 14 years had the lowest (4.2%) ($p = 0.000$).

There was a significant association between the number of sexual partners and the blood test result among young persons aged 15–24 years ($\chi^2 = 139.366$; $p = 0.000$). In addition, significant variations in the prevalence by number of sexual partners in the past 12 months before the survey were found. As expected, persons aged 15–24 years with no reported sex partners in the past 12 months preceding the survey had the lowest prevalence (4.3%) while those with one sex partner had the highest prevalence rate (12.7%) ($p = 0.000$). The low prevalence of 5.0% for those reporting three or more sexual partners could be due to the relatively low sub-sample of persons aged 15–24 years in this category.

The occurrence of a sexually transmitted infection in the past 12 months before the survey was significantly associated with the blood test result among persons aged 15–24 years ($\chi^2 = 43.877$; $p = 0.000$). Young persons aged 15–24 years who reported that they had had a sexually transmitted infection in the past 12 months preceding the survey had an almost three times higher HIV prevalence (25.2%) than their counterparts who reported no such illness in the same period of time (7.5%) ($p = 0.000$).

Persons aged 15–24 years were also asked whether they had used a condom during the first time that they had had sexual intercourse. Use of a condom during the first sexual intercourse was significantly associated with the blood test result ($\chi^2 = 7.866$; $p = 0.000$). Those who reported no condom use had a significantly higher prevalence (12.8%) than those who used a condom (9.3%) ($p = 0.006$).

A related question was on whether young persons aged 15–24 years had used a condom during the last time they had had sexual intercourse. It can be observed from Table 1 that the use of a condom during the last time that a person aged 15–24 years had had sex was significantly associated with the blood test result ($\chi^2 = 16.907$; $p = 0.000$). Young persons aged 15–24 years who reported condom use during the last time they had had sexual intercourse had a significantly higher prevalence rate of 13.8% than their counterparts who had not used a condom (prevalence rate of 9.3%, $p = 0.000$).

Multivariate analysis of the factors associated with HIV infection among young persons aged 15–24 years

The results presented in this section in Table 2 provide the multivariate relationships between the demographic and behavioural factors and HIV infection. These results are interpreted and analysed using the adapted construct from the Mosley and Chen (1984) conceptual framework presented in Fig. 1. The multivariate analysis presents only the variables that were found to be significantly associated with the blood test result in the bivariate analysis presented earlier in this paper.

Model I presented in Table 2 provides the factors that deal with the demographic variables. These variables include age group, sex, marital status and religion. The first observation is that all the constructs are significant. With regard to religion, the construct is significant but the individual dummies are nonsignificant.

It is evident that persons aged 15–24 years in the younger age group, that is 15–17-year age group, are associated with a significant 0.379 times lower risk of HIV infection relative to their counterparts aged 21–24 years ($p = 0.000$). Persons aged 18–20 years have a significant reduced risk of 22% compared with those aged 21–24 years ($p = 0.001$). Female persons aged 15–24 years are associated with a significant 2.024 times greater risk of HIV infection relative to their male counterparts ($p < 0.000$).

The analysis by marital status indicates that young persons aged 15–24 years who were either married, living together, widowed, divorced or not living together have higher risks of HIV infection relative to those who were never married, odds ratio (OR) = 1.987, $p = 0.014$; OR = 2.428, $p = 0.000$; OR = 4.323, $p = 0.000$; OR = 5.267, $p = 0.000$ and OR = 3.272, $p = 0.000$, respectively. It appears that, whereas as a construct variable religion is significantly associated with risk of HIV infection, the individual dummies, that is types of religious affiliation, have a nonsignificant association with HIV infection.

Model II shown in Table 2 is an extension of model I and adds controls for the behavioural variables, namely age at first sexual intercourse, number of sexual partners in the past 12 months, sexually transmitted infections and condom use. It was found that the effect of behavioural variables on the risk of HIV infection in the multivariate binary logistic regression models is attenuated after controlling for the demographic factors.

The variables included in model II are controlling for the intermediaries. The results in this model indicate that initiating sexual intercourse at younger ages, that is below 14 years, significantly predisposes young persons aged 15–24 years to HIV infection ($p = 0.000$). The data in model II indicate that young persons whose age at sexual debut was below 14 years experience a 2.696 times greater risk of HIV infection compared with their counterparts whose age at first sexual intercourse was 20–24 years ($p < 0.000$).

As expected, having more than one sexual partner significantly increases the risk of HIV infection. Persons aged 15–24 years who had two or more sexual partners in the past 12 months preceding the 2005–06 ZDHS have a significantly enlarged risk of HIV infection of 1.568 times greater than their counterparts with no sexual partners in the same period of time ($p = 0.023$).

Sexually transmitted infections are a risk factor for HIV infection. Our results indicate that young persons aged 15–24 years, who reported that they had not had a sexually transmitted infection in the past 12 months before the survey, are significantly associated with a 0.437 times lower risk of HIV infection compared with their counterparts who had had a sexually transmitted infection during that same period of time ($p = 0.003$).

Condom use is critical for the prevention of HIV and AIDS and other sexually transmitted infections. The odds representing the risk of HIV infection for young persons aged 15–24 years who had not used a condom during their first sexual intercourse is 1.313 times greater relative to those who had used a condom ($p = 0.050$). Similarly, not having used a condom during the last sexual intercourse preceding the 2005–06 ZDHS significantly predisposes young persons aged 15–24 years to a 1.264 times greater risk of HIV infection compared with their counterparts who had used a condom during last sexual intercourse ($p = 0.031$).

This section presented the results from the bivariate and multivariate analysis of the factors predisposing young persons to HIV infection in Zimbabwe. The multivariate analysis presented only the variables that were significantly associated with HIV infection in the bivariate analysis. The next section discusses these results.

Discussion

It was found that the association between the constructs representing demographic and behavioural variables was significant in the bivariate analysis, with the exception of the construct for the variable 'away from home more than one month in the past 12 months' which was found to be nonsignificant. The association between HIV infection and all the socio-economic constructs was found to be nonsignificant in the bivariate analysis. Consequently, the multivariate analysis included only the variables that were significantly associated with HIV infection in the bivariate analysis.

The results indicated that young female persons aged 15–24 years are twice as likely to contract HIV than their male counterparts. This finding is consistent with observations from the Centers for Disease Control and Prevention (2004), which noted that young women residing in developing countries are increasingly becoming more susceptible to HIV infection. In a recent study, Abdool, Humphries and Stein (in press) noted that reducing HIV infection in women is central in controlling the HIV and AIDS epidemic, particularly in generalised hyperendemic settings.

The HIV prevalence and risk profiles for young persons aged 15–24 years who were married and those who were living together were 14.3% and 15.7% and OR = 1.987 ($p = 0.014$) and OR = 2.428 ($p = 0.000$), respectively. Clark, Bruce and Dude (2006) in a study in Africa and Latin America also observed that married young persons aged 15–24 years had a higher risk of

Table 2. Multivariate binary logistic regression models of the factors associated with HIV infection among young persons aged 15–24 years, 2005–06 ZDHS, Zimbabwe.

Variable	Model I			Model II		
	Odds ratio	*p*-value	Confidence interval	Odds ratio	*p*-value	Confidence interval
Age group (years)		0.000		0.000	0.000	
15–17	0.379***	0.000	0.276–0.519	0.177***	0.000	0.087–0.360
18–20	0.683**	0.001	0.543–0.860	0.788	0.102	0.592–1.049
21–24	1.000	–	–	1.000	–	–
Sex		0.000		0.000		
Male	1.000	–	–	1.000	–	–
Female	2.024***	0.000	1.576–2.599	2.762	0.000	1.875–4.069
Marital status		0.000		0.000		
Never married	1.000	–	–	1.000	–	–
Married	1.987***	0.014	1.541–2.564	1.119	0.591	0.742–1.689
Living together	2.428*	0.000	1.198–4.918	1.698	0.183	0.779–3.704
Widowed	4.323***	0.000	1.971–9.484	3.489*	0.021	1.210–10.062
Divorced	5.267***	0.000	3.395–8.171	3.619***	0.000	1.964–6.670
Not living together	3.272***	0.000	1.975–5.420	2.049*	0.033	1.059–3.958
Religion		0.002			0.011	
Traditional	1.000	–	–	1.000	–	–
Christian	1.006	0.985	0.529–1.914	1.035	0.929	0.491–2.178
Pentecostal	1.254	0.483	0.666–2.362	1.342	0.428	0.649–2.775
Muslim	2.587	0.079	0.896–7.466	1.861	0.398	0.441–7.858
Other/none	1.790	0.083	0.927–3.457	2.041	0.065	0.958–4.348
Age at first sexual intercourse					0.001	
Less than 14				2.696***	0.000	1.578–4.605
15–19				1.467	0.051	0.998–2.155
20–24				1.000	–	–
Number of sex partners in past 12 months					0.031	
None				1.000	–	–
1				1.050	0.727	0.644–1.879
2+				1.568*	0.023	1.016–2.315
Sexually transmitted infection in past 12 months					0.003	
No				0.437**	0.003	0.252–0.760
Yes				1.000	–	–
First sexual intercourse used condom					0.050	
No				1.313*	0.050	1.065–2.154
Yes				1.000	–	–
Last sexual intercourse used condom					0.031	
No				1.264*	0.031	1.0587–1.553
Yes				1.000	–	–

Source: Author computations based on raw data from the 2005–06 ZDHS (Zimbabwe Central Statistical Office/Macro International Incorporated 2007).

*$p < 0.05$.

**$p < 0.01$.

***$p < 0.001$.

HIV infection as compared with their sexually active unmarried peers.

Young persons aged 15–24 years who were divorced, separated and widowed have significantly higher risks of HIV infection than their unmarried peers. The comparatively significant high infection prevalence associated with young persons aged 15–24 years who are widowed could be explained by the fact that their partners could most probably have died of HIV and AIDS. Divorced young persons aged 15–24 years have the highest risk, amounting to five times greater than their unmarried counterparts. These young persons could most probably have entered marriage at younger ages, and endured the transition from virginity to frequent unprotected sex, which they would likely continue to engage in after the termination of marriage. It may also be true that some of these young persons could have been infected while in marriage and could have been separated or divorced at the recognition that they were infected with HIV. For females, their sex partners are likely to be older males who may be HIV positive (Clark et al., 2006). This may explain the comparative significantly high risks associated with young persons aged 15–24 years who were divorced and widowed. Programmes and interventions for the control of HIV and AIDS should also focus on widowed and divorced young persons aged 15–24 years and promote appropriate prevention strategies such as condom use and abstaining from sexual activities in order to prevent them from contracting HIV or other sexually transmitted infections.

The results confirmed that early sexual debut is significantly associated with increased likelihood of being infected with HIV. One reason that could account for this observation is that young persons aged 15–24 years who engage in early sexual relationships are likely to have more sex partners than their counterparts whose sexual debut occurs later, which predisposes them to contraction of HIV and other sexually transmitted diseases. This observation is consistent with findings by Hallet, Lewis and Lopman (2007) in their study on age at first sex and HIV infection in rural Zimbabwe, which observed that women who started sex at earlier ages were more prone to HIV infection than their peers who had their sexual debut at later ages. Pettifor, van de Straten, Dunbar, Shiboski and Padian (2004) also made similar observations. They found that women who had their sexual debut at ages below 15 years had significantly higher risk of HIV infection. The number of sexual partners, sexually transmitted infections and condom use are well documented predictors of HIV infection (Green & Conde 2000; LeBeau & Yoder 2008).

It is further interesting to note that the effect of behavioural variables on the risk of HIV infection in the multivariate logistic models is attenuated after controlling for the demographic factors. It is pertinent to re-state that these behavioural factors are important predictors of HIV infection. Efforts to control the spread of HIV and AIDS among young persons aged 15–24 years should focus on eradicating this factor (behavioural) as this has long been identified as the chief driver of the epidemic in communities where the epidemic is either homosexually or heterosexually driven.

Conclusion

The 2010 Zimbabwe Millennium Development Progress Report (Zimbabwe Ministry of Labour and Social Welfare 2010) notes that the country is witnessing some declines in the prevalence of HIV among young persons aged 15–24 years. However, there are still great challenges for the control of HIV and AIDS among these young persons. If the recently observed reductions in HIV prevalence among persons aged 15–24 years in Zimbabwe, and indeed in other countries such as Kenya, Cote d'Ivoire, Malawi, Botswana, Namibia and Swaziland, are to be sustained, efforts towards the prevention of new HIV infections among this target group have to be supported and strengthened.

The findings in this study indicated that age group, sex, marital status, age at sexual debut, number of sexual partners, sexually transmitted infections and condom use are important predictors of HIV infection among persons aged 15–24 years in Zimbabwe. The entire constructs of these variables are significant in both the bivariate and multivariate analysis. HIV prevention programmes in Zimbabwe and indeed in other developing neighbouring countries should focus on these predisposing factors in order to mitigate the spread of HIV and AIDS among young persons aged 15–24 years.

It has been long thought that marriage could be a safe haven from HIV and AIDS. Our results indicated that the HIV prevalence rate for young persons aged 15–24 years in marriage is 14.7%, almost twice that of all persons aged 15–24 years combined (7.8%). However, these results are not surprising given that young persons aged 15–24 years who are married and those that are living together are most likely to be engaging in unprotected sex, thereby increasing their risk of being infected with HIV and other sexually transmitted infections. HIV and AIDS prevention programmes should promote condom use among married young persons aged 15–24 years as a protection strategy for the prevention of HIV and other sexually transmitted infections. The formulation of relevant and effective policy changes that would centre on married young persons, particularly female persons aged 15–24 years, is also advisable.

It is important for HIV and AIDS prevention programmes targeted at young persons aged 15–24 years to include promoting the delay of sexual debut as this predisposes them, especially young females, to multiple sexual partnerships, which in turn puts them at risk of HIV infection. It is important to design bold and effective interventions that address the needs of all young persons aged 15–24 years in Zimbabwe and in other sub-Saharan countries such as South Africa, Botswana and Malawi, which are still characterised by a high burden of HIV-induced morbidity and mortality.

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