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Factors Associated with Ever Having Tested for HIV among Adolescent Girls and Young
Women in Zambia: 2016 Zambia Population-based HIV Impact Assessment

By

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Master of Public Health

Global Epidemiology

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Factors Associated with Ever Having Tested for HIV among Adolescent Girls and Young Women in Zambia: 2016 Zambia Population-based HIV Impact Assessment

By

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B.S., University of Georgia, 2017

B.A., University of Georgia, 2017

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An abstract of
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Abstract

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By Ha Truong

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the outcome of ever having tested for HIV among AGYW using socio-demographic data and data
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The ZAMPHIA survey was a nationally representative, cross-sectional, population-based survey
used to measure Zambia's national HIV burden and HIV services uptake. Our study population
includes HIV-negative AGYW age 15-24 years who had been sexually active within 12 months
before interview (n=2,112). We determined weighted descriptive frequencies, crude and adjusted
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Manuscript

Factors Associated with Ever Having Tested for HIV among Adolescent Girls and Young Women in Zambia: 2016 Zambia Population-based HIV Impact Assessment

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Abstract

Adolescent girls and young women (AGYW) age 15-24 years are an important population to focus on in HIV testing efforts because AGYW accounted for a disproportionate number of new HIV infections compared to males of the same age. We aimed to identify factors associated with the outcome of ever having tested for HIV among AGYW using socio-demographic data and data from the reproduction, sexual activity, and gender norms modules of the 2016 ZAMPHIA survey. The ZAMPHIA survey was a nationally representative, cross-sectional, population-based survey used to measure Zambia's national HIV burden and HIV services uptake. Our study population included HIV-negative AGYW age 15-24 years who had been sexually active within 12 months before interview (n=2,112). We determined weighted descriptive frequencies, crude and adjusted weighted prevalence ratios (aPR) and 95% confidence intervals for exposures of interest using multivariable log-binomial regression models and jackknife replicate weights to account for the complex survey design. Having ever tested for HIV was associated with age 20-24 years versus age 15-19 years (aPR=1.18 (1.12, 1.24)), being married or living with a partner versus never being married (aPR=1.21 (1.15, 1.27)), urban residence versus rural residence (aPR=1.05 (1.02, 1.09)), experiencing pregnancy versus never experiencing pregnancy (aPR=1.49 (1.33, 1.67)), using a modern contraceptive method versus not using a modern contraceptive method (aPR=1.12 (1.07, 1.16)), and having one sexual partner in the last 12 months versus having two or more sexual partners (aPR=1.12 (1.01, 1.24)). Having ever tested for HIV was less common in AGYW in age-similar relationships versus those in an age-disparate relationships, defined as an age difference of 5 or more years (aPR=0.92 (0.89, 0.96)). Our results are consistent with the socio-behavioral risk factors associated with lower rates of HIV testing in adolescent populations in other Sub-Saharan African countries and encourages further research into the linkage of HIV testing services with family planning services to increase HIV testing among AGYW and relationship between age-disparate relationships, perceived HIV risk, and motivation to obtain HIV testing among AGYW.

Introduction

In 2017, there were an estimated 36.9 million people worldwide living with the human immunodeficiency virus (HIV)/acquired immunodeficiency syndrome (AIDS); an additional 1.8 million individuals worldwide became infected with HIV [1]. Sub-Saharan Africa accounts for more than 70% of the global HIV burden, with 19.6 million people living with HIV in Eastern and Southern Africa in 2017 [1]. Adolescent girls and young women (AGYW) age 15-24 years are an important population to focus on in HIV prevention efforts because young women and adolescent girls account for a disproportionate number of new HIV infections compared to males of the same age groups. In 2016, AGYW made up 26% of new HIV infections despite only accounting for 10% of the population in Eastern and Southern Africa [2]; new HIV infections were 44% higher among AGYW compared to males of the same age group [2]; and young women were at risk of acquiring HIV five to seven years earlier than their male peers [2]. Several socio-behavioral, socio-economic, and structural factors underlie the gender disparity in HIV infection, including gender inequality, poverty, gender-based violence, lack of education, engaging in age-disparate relationships, multiple partnerships, stigmatization in accessing HIV preventative measures, and lack of access to health and reproductive resources [3-7].

Several programs have worked to quantify and address the socio-economic and structural factors underlying the gender disparity in HIV infection rates. To measure the reach and impact of HIV programs in countries supported by the United States President's Emergency Plan for AIDS Relief (PEPFAR) Program, Population-based HIV Impact Assessments (PHIA) were conducted in multiple countries from 2015-2019 [8]. The PHIA surveys are national household-based surveys that include home-based HIV counseling and testing and collect information about access to HIV preventive care and treatment services for adults and children. The results measure national and regional progress toward the Joint United Nations Program on HIV/AIDS's (UNAIDS) 90-90-90 goals and guide policy and funding priorities. The UNAIDS 90-90-90 goals

are that by 2020: 1) 90% of all people living with HIV will know their HIV status; 2) 90% of people diagnosed with HIV will receive anti-retroviral therapy (ART); and 3) 90% of people on ART will have viral load suppression (VLS) [9]. With support from the US PEPFAR Program and other donors, the DREAMS Partnership specifically focuses on helping AGYW develop into **D**etermined, **R**esilient, **E**mpowered, **A**IDS-free, **M**entored, and **S**afe women. The DREAMS Partnership targets poverty, sexual violence, gender inequality, and the lack of education in AGYW to reduce HIV incidence in ten Sub-Saharan African countries where AGYW make up more than half of new HIV infections [10].

The Zambia Population-based HIV Impact Assessment (ZAMPHIA) was a nationally representative cross-sectional household survey with HIV testing conducted in 2016. In 2016, annual HIV incidence was 0.67% among ZAMPHIA participants aged 15-59; was 1.02% among females; and was 0.32% among males [11]. HIV prevalence among people aged 15-59 in Zambia was 12.0%; among females was 14.6%, and among males was 9.3% [11]. ZAMPHIA findings indicated that AGYW were disproportionately infected with HIV compared to males of the same age group: HIV prevalence among AGYW (5.7%) was more than three times as great as the prevalence among their male peers (1.8%) [12]. In particular, HIV prevalence among females ages 20-24 (8.3%) was four times greater than the prevalence among males of the same age group (2.0%) [11]. Among AGYW who tested HIV-positive, only 40.1% reported being aware of their status, 31.2% of those aware reported receiving ART, and 33.6% of those receiving ART achieved VLS [14]. In comparison, among HIV-positive women age 15-59 years, 68.4% reported being aware of their status, 57.7% of those aware reported receiving ART, and 60.4% of those receiving ART achieved VLS [14].

HIV testing is the first critical step in the process of obtaining ART, reaching viral suppression, and preventing HIV transmission. Because of the gender disparity in HIV infection between females and males age 15-24 and the clear gap between HIV-positive AGYW aware of their status and HIV-positive AGYW reaching viral suppression, it is necessary to identify

opportunities for increasing awareness and opportunities for HIV testing among AGYW in Zambia. We aimed to identify factors associated with the outcome of ever having tested for HIV among AGYW using socio-demographic data and data from the 2016 ZAMPHIA dataset. Our study population included HIV-negative AGYW aged 15-24 years who had been sexually active in the year before taking the ZAMPHIA survey. Current literature on factors associated with HIV infection in AGYW has focused on socio-behavioral factors such as age at first sexual debut, gender-based violence, age-disparate relationships, multiple partnerships, and transactional sex [5]. These factors offered areas of opportunity for targeting HIV testing uptake among subgroups of AGYW at high-risk for HIV infection. We aimed to provide further data building upon the evidence of socio-behavioral risk factors associated with HIV infection in AGYW in Zambia and to identify areas of opportunity for increasing knowledge of HIV status in this population.

Methods

Study design and setting

The ZAMPHIA survey was a nationally representative, cross-sectional, population-based survey of households across Zambia conducted from March to August 2016 and was used to measure Zambia's national HIV burden and HIV services and treatment uptake [13]. The ZAMPHIA survey used a two-stage stratified cluster sample design, where in the first stage researchers randomly selected 511 enumeration areas (EAs) from Zambia's 2010 Census using a probability proportional to size method [13]. In the second stage, researchers randomly selected a sample of households in each EA (cluster) using an equal probability method, where the average number of households selected per cluster ranged from 11 to 48 [13]. The head of consenting households were administered a household questionnaire, which informed the ZAMPHIA household questionnaire dataset [13]. Eligible and consenting adults, aged 15 years or older, and

adolescents in each selected household were administered individual adult and adolescent

questionnaires, which contributed to the ZAMPHIA adult and adolescent questionnaire datasets,

respectively [13]. Individuals who completed the individual adult and adolescent questionnaires

were eligible to participate in the biomarker testing, which were included in the ZAMPHIA

biomarkers dataset [13].

Survey participants and study population

We used data from the ZAMPHIA adult questionnaire dataset for our analyses. Adults,

defined as age 15 years or older, were eligible if their household was selected for a household

interview; if they lived in the household or were visitors who slept in the household the night

before they survey; if they were literate in one of the eight survey languages or provided a literate

witness; and if they provided consent (or assent in the case of individuals aged 15 to 17 years old)

[14]. Of the 13,441 randomly selected households, 12,193 were occupied, and 89.4% of the

occupied households completed a household interview [14]. Of the 13,317 eligible women and

11,346 eligible men aged 15-59 years, 90.8% of women and 80.4% of men were interviewed

[14]. The entire ZAMPHIA adult questionnaire dataset includes 29,884 individuals aged 15 to 80

years and was used for our weighted analyses. Our study population of interest included AGYW

age 15-24 years who were HIV negative, have been sexually active within a year of taking the

ZAMPHIA survey, and were not missing data on history of HIV testing.

Variables

The primary research question is to identify factors associated with ever having tested for

HIV. We selected our factors of interest from the socio-demographic data and the reproduction,

sexual activity, and gender norms responses to identify areas of opportunity for AGYW to receive

HIV testing. From the socio-demographic data, we used five variables: age (categorized as 15-19

and 20-24 years), highest level of education ever attended (categorized as none, primary,

secondary, and more than secondary), current marital status (categorized as never married, married/living together, and separated/divorced/widowed), and whether the individual lived in an urban area (categorized as urban or rural). From the reproduction responses, we used five variables: if the individual has ever been pregnant (categorized as yes or no), number of pregnancies (categorized as 0, 1, or 2 or more), whether the individual received antenatal care (ANC) at a health facility during her last pregnancy among women who have delivered in the last three years (categorized as yes, no, or not applicable), where the individual delivered her last child (categorized as at home, at a health facility, in transit or other, or not applicable), and use of a modern contraceptive method to delay or avoid pregnancy (categorized as yes or no), defined as using female sterilization, oral contraceptive pills, intra-uterine devices (IUD)/coils, injections, implants, male condoms, and female condoms. From the sexual activity responses, we used four variables: age at first vaginal sex (categorized as less than 15, 16-17, 18-19, or 20 or more years), number of sexual partners in the last 12 months (categorized as 1 or 2 or more), participating in an age-disparate relationship, defined as having a partner 5 years or more older or younger, and participating in transactional sex, (categorized as yes or no), defined as entering a sexual relationship with the intent of receiving something and having received something in return. We were interested in seeing how gender norms influenced having ever tested for HIV. From the gender norms responses, we used the survey question of who makes the decision about healthcare for the interviewed AGYW (categorized as I do, partner/spouse, and we both do) as a proxy for gender norms. Six covariates were selected via the *a priori* criteria in consideration with prior literature on factors associated with HIV testing in pregnant women and adolescent populations in Kenya and South Africa respectively [15, 16, 17]. We controlled for known socio-demographic covariates associated with HIV testing (categorical age, highest level of education attended, marital status, and urban or rural residence) [16, 17]. We controlled for ever being pregnant because pregnancy is strongly associated with the outcome of having ever tested for HIV [15, 17]. Lastly, we controlled for the number of sexual partners in the last 12 months as a proxy for

lifetime number of sexual partners, a known covariate for HIV testing [15, 16, 17].

Statistical methods

All data analyses were conducted using SAS Version 9.4 where the adjusted weighted analyses were conducted with SAS-callable SUDAAN procedures. We conducted bivariate analyses for the association between all exposures of interest and the dichotomous outcome of having ever tested for HIV and all covariates of interest and the outcome to decide how to categorize the factors of interest. We obtained p-values for the association between two categorical variables using chi-square tests and Fisher's Exact Test when expected cell counts were less than five, as seen for the variables for receiving ANC and location of last birth among women who delivered in the last three years. We determined weighted, country-level percentages for each category of the population characteristic of interest for HIV-negative women age 15 to 24 years who have been sexually active within the last year.

For all regression models, we set the reference group as the group expected to have lower risk of having ever tested for HIV. For the crude weighted estimates, we obtained prevalence ratios and their 95% confidence intervals by using the SAS command PROC SURVEYFREQ for the ZAMPHIA adult questionnaire dataset and jackknife replicate weights for variance estimation to account for the complex survey design. We conducted a domain analysis for our population of interest by including age 15-24 years, having HIV negative status, being sexually active in the last 12 months, and female gender in the TABLES statement of the PROC SURVEYFREQ command. For the adjusted weighted estimates, we obtained prevalence ratios and their 95% confidence intervals by using the SUDAAN command PROC RLOGIST with the PREDMARG statement for the ZAMPHIA adult questionnaire dataset and jackknife replicate weights for variance estimation to account for the complex survey design. We controlled for 6 covariates: categorical age, highest level of education ever attended, current marital status, urban or rural residence, ever pregnant or not, and number of sexual partners in the last 12 months.

The ZAMPHIA survey was administered using mobile survey on electronic tablets, which enabled forced responses [1]. Therefore, bias due to missing data for survey variables was minimal, unless participants purposely responded, "don't know" or "refused to answer". For illogical answers, such as when a woman who has been pregnant said she has never had sex, or for non-applicable participants, such as when men cannot answer the question on number of prior pregnancies, the answer were coded as "out of range". Sampling weights were based on sampling probabilities and are adjusted for bias due to non-response and post-stratification according to 2016 national census based on age and sex [13].

Results

Sample characteristics

The sample for the crude and adjusted weighted analyses was comprised of all individuals who completed the ZAMPHIA adult interview questionnaire (n=29,884). The weighted analyses specified that the population of interest was HIV negative women age 15-24 years who were sexually active within the last 12 months. The final sample for the crude and adjusted unweighted estimates included only women, age 15-24 years, who had sexual intercourse in the last 12 months, and were HIV negative from the original ZAMPHIA adult interview questionnaire dataset (n= 2,112).

Table 1 shows the weighted frequencies for factors of interest collected in the socio-demographic data and reproductive, sexual activity, and gender norm modules of the ZAMPHIA adult interview questionnaire. Overall, most of our study population were 20-24 years of age, had attended at least secondary school or higher, were married or lived with a partner, resided in rural areas, had been pregnant, and had one sexual partner in the last 12 months. The weighted country-level estimate for having ever tested for HIV among our study population of interest is

84.7%. Among AGYW who had ever tested for HIV in comparison with AGYW who had never tested for HIV, a greater proportion were age 20-24 years compared to age 15-19 years, attended secondary education or higher, lived in urban areas, have ever been pregnant, used modern contraceptive methods, and participated in age-similar relationships. Chi-square tests were conducted for the bivariate analyses of the factors of interest in comparison with the outcome. All factors were significantly associated with having ever tested for HIV (significance level of α= 0.05) except for transactional sex.

Multivariable analyses

Table 2 presents the crude weighted and adjusted weighted prevalence ratios and their 95% confidence intervals for the association between the population characteristics and outcome of having ever tested for HIV. The reference level was set to the exposure category that was expected to have a lower prevalence of having ever tested for HIV based on prior literature on HIV testing [15, 16, 17].

Among socio-demographic exposures, having ever tested for HIV was more prevalent among AGYW who were aged 20-24 years, compared to those aged 15-19 years; AGYW who were married or living together and AGYW who were separated, divorced, or widowed compared to those unmarried; and AGYW who lived in urban areas compared to those who lived in rural areas. The increasing prevalence ratios suggest that having ever tested for HIV is more common as highest category of education attended increases compared to having no formal education; however, the wide 95% confidence intervals including the null value of 1 indicate that these results were not statistically significant (α= 0.05).

Among the reproductive exposures, having ever tested for HIV was more common in AGYW who have ever pregnant compared to never having been pregnant and much more common in AGYW with two or more pregnancies compared to never having been pregnant. Among AGYW who have been pregnant, having ever tested for HIV was more common in

AGYW who have received antenatal care compared to those who did not receive ANC and in AGYW who had their last birth at a health facility, compared to those who delivered at home. However, the wide 95% confidence intervals including the null value of 1 indicate that these results were not statistically significant (α= 0.05). Having ever tested for HIV was more prevalent in AGYW who used modern contraceptive methods.

Among the sexual activity exposures, having ever tested for HIV was less common as categorical age at first vaginal sex increased compared to those who first had vaginal sex at age 15; however, this association is statistically significant for only AGYW age 20 years or older. Having ever tested for HIV was more prevalent in AGYW who had one sexual partner in the last 12 months compared to those having two or more partners. Having ever tested for HIV was less common in AGYW who had age-similar relationships compared to those in age-disparate relationships.

Discussion

Our study sought to identify factors from the socio-demographic data and reproduction, sexual activity, and gender norms modules of the 2016 ZAMPHIA adult interview questionnaire that were associated with the outcome of ever having tested for HIV among AGYW in Zambia. From these results, we aimed to highlight areas of opportunity for increasing HIV testing among AGYW in Zambia, which will contribute primarily to the first component of the UNAIDS 90-90-90 targets for 2020: diagnosing 90% of all HIV-positive persons.

Our analyses confirmed several of the associations between socio-demographic and reproductive factors previously reported to be associated with testing in women: older age, increasing level of education ever attended, living in an urban area, having ever lived with a spouse or partner, and having ever been pregnant [18]. The previously described factors associated with HIV testing greatly impact a young woman's access to healthcare knowledge (such as level of education) and resources (such as urban residence) or are tied to major life and

health events (such as marriage and pregnancy). HIV testing is strongly associated with experiencing pregnancy because most AGYW become pregnant during age 15-24 years [Table 1]. Among AGYW who become pregnant, the vast majority receive antenatal care at local health clinics, an important avenue for obtaining HIV testing through client-initiated voluntary HIV testing and counseling (VCT) for the prevention of mother to child HIV transmission (PMCT) [18-21].

Zambia has widely implemented client-initiated and provider-initiated HIV testing and counseling in community health clinics, particularly clinics providing antenatal care. However, it is important to focus on increasing HIV testing opportunities for AGYW who don't experience pregnancy, are unmarried, are younger overall (15-19 years), and therefore do not come into contact with the healthcare delivery systems usually involved with antenatal care. One avenue worth examining is to increase opportunities for HIV testing among women who use modern contraceptive methods that require contact with a healthcare provider. In our analyses, women who use modern contraceptive methods had a higher prevalence of ever having tested for HIV compared to women who did not use a modern contraceptive method [Table 2]. This finding supports earlier calls for action in linking family planning services with HIV testing efforts, which would encompass AGYW who do not become pregnant [22, 23]. However, use of modern contraceptive methods among AGYW is low in Zambia [Table 2] and the integration of family planning and HIV services is not the norm in Zambia [24].

Our finding that having ever been tested for HIV was less common in AGYW participating in age-similar relationships at first seems to conflict with current literature on how age-disparate relationships are associated with higher risk for HIV infection [25, 26, 27]. Age-disparate relationships, defined as relationships where there is a 5 year or greater age difference, are associated with higher risk of HIV infection because older, age-disparate male partners of AGYW have a higher prevalence of HIV infection compared to age-similar male partners [28], and AGYW face greater challenges in negotiating safe sexual behaviors such as condom use [29].

Although being in an age-disparate relationship is a risk factor for HIV infection, the association between age-disparate relationships and greater prevalence of HIV testing remains plausible. Studies assessing factors associated with HIV testing in adolescents living in Sub-Saharan Africa indicate that younger people in general, such as AGYW and their age-similar partners, are less experienced and motivated in accessing healthcare knowledge and resources including HIV testing [30]. In addition, AGYW with older, age-disparate male partners perceive themselves at higher risk for HIV infection and are more motivated to obtain HIV testing [31]. These two associations could explain why HIV testing is more common in AGYW participating in age-disparate relationships compared to those in age-similar relationships.

A major strength of our study is the high quality and representativeness of the data collected by the 2016 ZAMPHIA survey and the national reach of the survey. Because the ZAMPHIA survey is national, cross-sectional household survey, we were able to determine nationally representative frequencies and prevalence ratios applicable to AGYW in Zambia, and such estimates are directly comparable to the same demographic population in other Sub-Saharan African countries. Because we used cross-sectional survey data and prevalence-based measures, we were not able to make causal inferences between our factors of interest and outcome of having ever tested for HIV; however, the results from our cross-sectional study are useful for creating hypotheses for studies assessing causal inference. The ZAMPHIA survey used electronic tablets and used skip patterns and required responses values to minimize missing data for survey variables. Despite this precaution, there was a sizable number of missing responses for receiving antenatal care, location of last birth delivery, and use of modern contraception. The 319 missing values for the receipt of antenatal care variable were coded in the survey as mothers missing data on antenatal care. The 372 missing values for the location of last delivery variable was comprised of 319 missing responses due to mothers missing data on antenatal care and 53 truly missing responses. The 297 missing values for the modern contraceptive use variable were truly missing responses. The considerable proportion of missing data for these three reproductive variables

likely contributed to the wide confidence intervals for these factors' point estimates and indicate potential selection bias where women who are missing responses for these variables could differ from women who have responses for these variables. Due to the stigma of HIV infection, there is potential misclassification bias of the outcome, having ever tested for HIV, because survey respondents may report that they have tested for HIV, even though in reality they have not, due to social desirability bias. However, there has been little evidence in the HIV testing literature to suggest that such social desirability bias will impact our analyses.

HIV testing is the first, essential step in identifying individuals living with HIV, linking these individuals to ART and other life-saving HIV resources, and preventing HIV transmission. AGYW in Zambia overall have a high rate of ever having tested for HIV at 84.7% because AGYW are most likely able to obtain HIV testing services when they access sexual and reproductive healthcare resources when they become sexually active or pregnant during the 15-24 age range. However, it is important to continue efforts to increase HIV testing for AGYW not exposed to HIV testing through traditional avenues such as antenatal care because more than 20% of AGYW do not become pregnant during the 15-24 age range [Table 1]. In order to reach the UNAIDS target of diagnosing 90% of all HIV-positive persons, efforts to increase HIV testing for AGYW should focus on AGYW not captured through common sexual and reproductive healthcare resources, particularly antenatal clinics, and therefore access sexual and reproductive healthcare resources later in life. HIV testing efforts should also continue to focus on AGYW who have characteristics that are strongly associated with lower prevalence of HIV testing such as younger age, lesser formal education, residing in a rural area, and having a higher number of lifetime sexual partners. Our study contributes to the body of research and programs, such as the DREAMS Partnership, addressing socio-behavioral risk factors for HIV infection among AGYW in Sub-Saharan Africa. We encourage investigation of the integration of HIV testing services with family planning services that require contact with a healthcare provider and the relationship between age-disparate relationships, perceived HIV risk, and motivation to obtain HIV testing.

Because AGYW account for a disproportionate number of new HIV infections compared to males of the same age groups, future research should focus on identifying factors associated with HIV testing for males of similar age groups and evaluate how socio-behavioral risk factors among AGYW impact the regularity at which AGYW pursue HIV testing compared to ever having tested for HIV.

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Tables

Table 1. Weighted Frequencies for Characteristics of HIV Negative Women Age 15-24 Who Have Reported at Least One Sexual Partner in the Last 12 Months by Ever Having Tested for HIV, Zambia, 2016 (ZAMPHIA 2016, n= 2,112 Unweighted)

| | | | Having ever tested for HIV | | | | | |
| | **Total** | | **Yes** | | **No** | | | |
	n	**W (%)**	**n**	**W (%)**	**n**	**W (%)**	**missing n**	**p-value**
Total observations	2,112	100.0	1,803	84.7	309	15.3	0	
Socio-demographic								
Age (years)	2,112						0	<.0001
15-19	720	36.2	513	30.1	207	69.5		
20-24	1,392	63.8	1,290	69.9	102	30.5		
Highest level of education attended	2,112						0	0.0122
None	53	3.9	53	3.4	19	6.6		
Primary	870	41.6	738	41.3	132	43.1		
Secondary	1,090	50.6	939	51.1	151	47.8		
More than secondary	80	3.9	73	4.2	7	2.5		
Current marital status	2,112						0	<.0001
Married or living together	1,216	56.3	1,127	61.6	89	27.1		
Widowed, divorced, or separated	104	4.9	93	5.1	11	3.9		
Never married	792	38.9	583	33.4	209	69.0		
Residence	2,112						0	0.0143
Urban	858	40.7	752	42.1	106	32.9		
Rural	1,254	59.3	1,051	57.9	203	67.1		
Reproduction								
Ever pregnant	2,095						17	<.0001
No	451	22.5	255	14.9	196	65.4		

Yes	1,644	77.5	1,538	85.1	106	34.6		
Number of pregnancies including current pregnancy	2,095						17	<.0001
0	451	22.5	255	14.9	196	65.4		
1	748	36.3	676	38.3	72	24.5		
2 or more	896	41.3	862	46.8	34	10.1		
Received antenatal care during last pregnancy, among mothers who delivered in past 3 years	1,793						319	<.0001*
No	7	0.3	5	0.3	2	0.5		
Yes	1,103	59.8	1,063	69.7	40	12.2		
N/A (non-mothers)	683	39.8	431	30.0	252	87.3		
Location where last birth occurred	1,740						372	<.0001*
At home	165	9.3	151	10.0	14	5.1		
At a health facility	1,114	62.8	1,080	71.3	34	12.9		
Other (in transit or other)	10	0.6	10	0.7	0	0.0		
N/A (women who have never been pregnant)	451	27.3	255	18.0	196	82.0		
Using a modern contraceptive method to delay or avoid pregnancy [a]	1,815						297	<.0001
Yes	845	45.5	792	50.7	53	18.1		
No	834	46.6	660	43.6	174	63.3		
N/A (don't have a partner/not applicable)	128	7.3	85	5.7	43	15.8		
Don't know/refused	8	0.6	2	0.1	6	2.8		
Sexual activity								
Age at first vaginal sex	2,112						0	0.0145
15	662	31.4	542	30.0	120	39.4		
16-17	706	33.9	607	34.1	99	32.4		
18-19	519	24.3	457	25.1	62	19.6		
20 or more	225	10.4	197	10.8	28	8.6		
Number of sexual partners in the last 12 months	2,074						38	<.0001

1	1,989	95.7	1,720	96.6	269	90.0		
2 or more	85	4.3	58	3.4	27	10.0		
Age-disparate relationship	2,112						0	<.0001
Yes	971	46.0	896	49.6	75	25.8		
No	1,141	54.0	907	50.4	234	74.2		
Transactional sex	2,063						49	0.0824
Yes	328	16.2	271	15.5	57	20.4		
No	1,735	83.8	1,497	84.5	238	79.6		
Gender norms								
Person who usually makes decisions about health care for yourself	1,204						908	0.0029
I do	374	19.9	350	20.2	24	16.8		
Partner/spouse	371	21.6	330	16.7	41	73.0		
We both do	459	58.5	436	63.1	23	10.2		

Abbreviations: HIV (human immunodeficiency virus); UW (unweighted); W (weighted); ZAMPHIA (Zambia Population-based HIV Impact Assessment).

[a] Modern contraceptive methods include female sterilization, OC pill, IUD/coil; injections, implants, male and female condoms.

* P-value from Fisher's Exact Test; otherwise, all other p-values are from Chi-Square Test.

Table 2. Row Percentages, Crude and Adjusted Weighted Prevalence Ratios, and 95% Confidence Intervals for the Outcome of Ever Having Tested for HIV in HIV Negative Women Aged 15-24 Who Have Reported at Least One Sexual Partner in the Last 12 Months, Zambia, 2016 (ZAMPHIA 2016, n= 2,112 Unweighted)

	Having Ever Tested for HIV		Crude Weighted Models			Adjusted Weighted Models		
	Yes	No	PR	95% CI		PR	95% CI	
	W (%)	W (%)		LL	UL		LL	UL
Socio-demographic								
Age (years)								
15-19	70.6	29.4	Ref	-	-	Ref	-	-
20-24	92.7	7.3	1.31	1.24	1.39	1.18	1.12	1.24
Highest level of education attended								
None	74.1	25.9	Ref	-	-	Ref	-	-
Primary	84.2	15.8	1.14	0.97	1.33	1.07	0.95	1.20
Secondary	85.6	14.4	1.15	0.99	1.35	1.11	0.99	1.25
More than secondary	90.2	9.8	1.22	1.02	1.45	1.14	0.99	1.31
Current marital status								
Never married	92.7	7.3	Ref	-	-	Ref	-	-
Separated, divorced, or widowed	87.8	12.2	1.21	1.11	1.31	1.13	1.03	1.23
Married or living together	72.7	27.1	1.27	1.21	1.34	1.21	1.15	1.27
Residence								
Rural	87.7	12.3	Ref	-	-	Ref	-	-
Urban	82.7	17.3	1.06	1.02	1.10	1.05	1.02	1.09
Reproduction								
Ever pregnant								
No	56.3	43.7	Ref	-	-	Ref	-	-
Yes	93.3	6.7	1.66	1.50	1.84	1.49	1.33	1.67
Number of pregnancies including current pregnancy								

0	56.3	43.7	Ref	-	-	Ref	-	-
1	89.8	10.2	1.60	1.44	1.77	1.53	1.35	1.73
2 or more	96.3	3.7	1.71	1.55	1.90	1.62	1.42	1.84
Visited a health facility for antenatal care during last pregnancy								
No	73.0	27.0	Ref	-	-	Ref	-	-
Yes	96.5	3.5	1.32	0.79	2.22	1.16	0.87	1.56
Location where last birth occurred								
At home	92.1	7.9	Ref	-	-	Ref	-	-
At a health facility	97.0	3.0	1.05	1.01	1.10	1.03	1.00	1.07
Using a modern contraceptive method to delay or avoid pregnancy [a]								
No	81.2	18.8	Ref	-	-	Ref	-	-
Yes	97.0	3.0	1.19	1.14	1.25	1.12	1.07	1.16
Sexual activity								
Age at first vaginal sex*								
15	80.9	19.1	Ref	-	-	Ref	-	-
16-17	85.4	14.6	1.06	1.00	1.12	1.03	0.98	1.07
18-19	87.6	12.4	1.08	1.02	1.15	0.97	0.91	1.03
20 or more	87.4	12.6	1.08	1.00	1.16	0.87	0.77	0.98
Number of sexual partners in the last 12 months								
2 or more	85.9	14.1	Ref	-	-	Ref	-	-
1	65.7	34.3	1.31	1.08	1.58	1.12	1.01	1.24
Age-disparate relationship								
Yes	91.5	8.5	Ref	-	-	Ref	-	-
No	81.3	18.7	0.86	0.83	0.90	0.92	0.89	0.96
Transactional sex								

Yes	81.1	18.9	Ref	-	-	Ref	-	-
No	85.7	14.2	1.06	1.00	1.12	1.00	0.96	1.05
Gender norms								
Person who usually makes decisions about health care for yourself								
I do	92.7	7.3	Ref	-	-	Ref	-	-
Partner/spouse	70.8	29.2	0.95	0.91	1.00	0.99	0.95	1.04
We both do	98.5	1.5	1.01	0.98	1.05	1.03	0.98	1.08

Abbreviations: HIV (human immunodeficiency virus); W (weighted); PR (prevalence ratio); CI (confidence interval); LL (lower limit); UL (upper limit), ZAMPHIA (Zambia Population-based HIV Impact Assessment).

[a] Modern contraceptive methods include female sterilization, OC pill, IUD/coil; injections, implants, male and female condoms.