# Prevalence of and factors associated with HIV testing among adolescent girls and young women in South Africa: Evidence from the South Africa Demographic and Health Survey 2016

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**Background.** Adolescent girls and young women (AGYW) remain vulnerable to HIV, with a higher incidence rate than their male counterparts.
**Objectives.** To determine the prevalence of and factors associated with HIV testing among AGYW in South Africa (SA).
**Methods.** A cross-sectional design was used to analyse the South Africa Demographic and Health Survey 2016. Only sexually active AGYW aged 15 - 24 years residing in SA at the time of the survey were included. Descriptive statistics were used to analyse baseline sociodemographic characteristics. Univariate and multivariate logistic regression models were used to determine factors associated with HIV testing. Statistical significance was set at $p<0.05$, and all analyses were adjusted using survey weights to account for unequal selection probabilities.
**Results.** The overall prevalence of HIV testing among sexually active AGYW was 85.2% (95% confidence interval (CI) 83.0 - 87.1). The AGYW who had a history of pregnancy (adjusted odds ratio (aOR) 4.47; 95% CI 2.90 - 6.89), were employed (aOR 3.29; 95% CI 1.75 - 6.21), belonged to a middle wealth index (aOR 1.80; 95% CI 1.04 - 3.10), had knowledge about mother-to-child transmission of HIV (aOR 3.29; 95% CI 2.26 - 4.79), had visited a health facility during the past 12 months (aOR 2.93; 95% CI 2.09 - 4.10), or had secondary/tertiary education (aOR 2.04; 95% CI 1.04 - 3.99) had higher odds of HIV testing.
**Conclusion.** The study identified an unmet need for HIV testing among sexually active AGYW in SA, especially adolescent girls aged 15 - 19 years. Increasing knowledge about HIV testing, adolescent-friendly services and other offsite strategies are therefore important for this particular key population.

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The impact of HIV/AIDS on public health has been significant, with global recorded cases estimated at 38 million in 2021, primarily affecting low- and middle-income countries.[1,2] South Africa (SA) still has the highest number of HIV cases globally.[3] SA's National Strategic Plan for HIV/AIDS, Tuberculosis, and Sexually Transmitted Infections (2017 - 2022)[4] adopted the Joint United Nations Programme on HIV/AIDS (UNAIDS) strategy to reduce the HIV/AIDS burden.[5] The strategy aims to reduce the HIV epidemic by 2030, focusing on awareness as a first step. However, the incidence of infection is higher among adolescent girls and young women (AGYW) than among males of the same age.[6] Young women accounted for 82% of new infections in 2019 in sub-Saharan Africa.[6]

SA's HIV testing capacity has improved, increasing awareness and reducing death and infection rates.[3] However, AGYW are disproportionately affected, with females aged 15 - 24 years being more likely than males of the same age to contract the disease.[6,7] Socioeconomic, biological and cultural factors contribute to this increased risk.[8-12] Intergenerational transmission, vertical transmission, poverty, and lack of healthcare facilities and education further increase the risk of infection among AGYW.[9]

HIV testing is crucial for global HIV prevention and control, especially among sexually active AGYW in SA.[2,3,5] Understanding the prevalence of and factors associated with HIV testing can improve HIV programmes for this population.

## Methods

### Setting

The South Africa Demographic and Health Survey 2016 (SADHS), conducted from July to November 2016 in SA, included representative estimates for nine provinces and urban and non-urban areas in 26 sampling strata.[13]

### Population and sampling

The present study involved sexually active adolescent girls aged 15 - 19 years and young women aged 20 - 24 years residing in SA. Participants were excluded from the study if they did not participate in the SADHS or had no history of sexual activity.

The SADHS used a two-stage random sampling method. Primary sampling units were sampled with a probability proportionate to size in the first stage, and dwelling units were sampled systematically in the second stage.[13] The sample consisted of 15 292 houses, of which 13 288 were inhabited. Of the inhabited homes, 11 083 were successfully reached for interviews, yielding an 83.4% response rate.[13] Of 750 primary sampling units, 224 were in traditional areas and 58 in farm areas. Individual interviews with 9 878 eligible women between the ages of 15 and 49 years were identified; 8 514 women agreed to participate, yielding an 86.2% response rate.[13] Of a total of 8 514 women, 2 913 AGYW made up the weighted sample size for the study, of whom 1 935 participants with a history of sexual activity were included in the present study.

## Measurements

### Primary variable

The primary outcome variable was self-reported HIV testing, which was a response to a question on whether the respondent had ever been tested for HIV. The participants were asked whether they ever had an HIV test, and the responses were 'yes', 'no' or 'no response'. The 'no response' category was treated as missing, so the outcome variable was binary (yes/no).

### Independent variables

The independent variables included sociodemographic, risky sexual behaviour and HIV knowledge variables. Age in years was analysed as a categorical variable (15 - 19/20 - 24). Employment history in the past 12 months had two categories (not employed/employed). Living with a partner (cohabiting) had two responses, cohabiting or not cohabiting. Place of residence (rural/urban), educational status (none/primary/secondary/higher), and wealth index (poorest/poorer/middle/richer/richest) were recorded.

The access to media variable was generated from responses on the frequency of reading newspapers, watching television and listening to the radio. 'Not at all' was coded as 0, while 'less than once a week' or 'at least once a week' were coded as 1. These responses were applied to watching TV, listening to the radio and reading a newspaper. The final access to media variable was coded as 0 for those who said 'not at all' for any media sources and as 1 for access to at least newspaper or TV or radio.

Risky sexual behaviours included factors such as the number of lifetime partners (1/2/≥3) and a history of sexually transmitted infections (STIs) (yes/no). Knowledge about mother-to-child transmission of HIV (MTCT) had two responses (yes/no), history of visiting a health facility during the past 12 months had two responses (yes/no), and history of ever having been pregnant had two responses (yes/no).

## Data analysis

The prevalence of HIV testing uptake among sexually active AGYW was calculated. Descriptive statistics were used to analyse the AGYW's characteristics associated with HIV testing. Multivariate logistic regression analysis was used to determine the factors associated with HIV testing: age, employment, education level, place of residence, wealth index, knowledge of HIV, and risky sexual behaviour. The univariate and multivariate models were used to determine the factors associated with HIV testing. All analyses were performed using Stata version 17 software (StataCorp, USA) and were adjusted using survey weights to account for unequal selection probabilities. Crude odds ratios (ORs) and adjusted odds ratios (aORs), with their corresponding 95% confidence intervals (CIs) and *p*-values, were computed and tabulated. Statistical significance was set at $p<0.05$.

## Ethical considerations

We sought permission to use SADHS data from the DHS Program via their website and agreed to all standards and laws applicable to accessing and utilising DHS data. The South African Medical Research Council Ethics Committee and the Institutional Review Board of ICF ethically approved the SADHS. The data are publicly available and have no personal identifiers. Ethical approval was also granted by the University of Pretoria Faculty of Health Sciences Research Ethics Committee (ref. no. 636/2022).

# Results

## Study cohort

The SADHS had a sample size of 9 878 women aged 15 - 49 years identified; 8 514 women agreed to participate. Of these, 2 913 AGYW aged 15 - 24 years completed the HIV questionnaire, of whom 1 935 participants with a history of sexual activity were included in the present study.

## Demographic characteristics of study participants

Of the 1 935 AGYW included in the study, 33.7% were aged 15 - 19 years and 66.3% were aged 20 - 24 years. The majority (83.7%) were not employed during the past 12 months, 85.0% were not living with a partner, 53.3% resided in the urban areas, 86.2% had secondary education as the highest level of education, and the richest were the minority (8.6%) (Table 1).

## Prevalence of HIV testing uptake

The prevalence of HIV testing uptake (ever tested for HIV) was 85.2% (95% CI 83.0 - 87.1). The proportion of adolescent girls aged 15 - 19 years who had ever had an HIV test was 76.8% (95% CI 72.4 - 80.6), as opposed to 89.2% (95% CI 86.7 - 91.3) of the young women.

## Factors associated with ever having an HIV test

The factors associated with ever having an HIV test are summarised in Table 2.

### Sociodemographic factors

The odds of HIV testing were higher in young women aged 20 - 24 years than in adolescent girls aged 15 - 19 years (89.2% v. 76.8%; OR 2.49; 95% CI 1.81 - 3.45; $p<0.001$); however, this was no longer significant after adjusting for potential confounders.

The employed AGYW had higher odds of HIV testing than those who were unemployed (94.0% v. 83.2%; OR 3.18; 95% CI 1.77 - 5.69; $p<0.001$), even after adjusting for confounders (aOR 3.29; 95% CI 1.75 - 6.21; $p<0.001$).

**Table 1. Sociodemographic characteristics of the adolescent girls and young women in the South Africa Demographic and Health Survey 2016 (*N*=1 935)**

| Characteristic | *n* (%) | 95% CI |
|---|---|---|
| Age group (years) | | |
| 15 - 19 | 652 (33.7) | 29.9 - 35.2 |
| 20 - 24 | 1 283 (66.3) | 64.8 - 70.1 |
| Employment in past 12 months | | |
| Not employed | 1 619 (83.7) | 79.1 - 84.2 |
| Employed | 316 (16.3) | 15.8 - 20.9 |
| Living with a partner (cohabiting) | | |
| Not cohabiting | 1 645 (85.0) | 79.7 - 85.0 |
| Cohabiting | 290 (15.0) | 15.0 - 20.3 |
| Residence | | |
| Urban | 1 031 (53.3) | 61.0 - 66.9 |
| Rural | 904 (46.7) | 33.1 - 39.0 |
| Highest educational level | | |
| No education | 8 (0.4) | 0.2 - 0.7 |
| Primary | 113 (5.8) | 4.8 - 8.1 |
| Secondary | 1 668 (86.2) | 82.2 - 86.6 |
| Higher | 146 (7.5) | 7.2 - 10.9 |
| Wealth index | | |
| Poorest | 450 (23.3) | 19.1 - 26.6 |
| Poorer | 493 (25.5) | 20.7 - 27.3 |
| Middle | 458 (23.7) | 18.3 - 24.3 |
| Richer | 367 (19.0) | 17.5 - 23.9 |
| Richest | 167 (8.6) | 9.2 - 15.2 |

CI = confidence interval.

**Table 2. Factors associated with HIV testing among adolescent girls and young women who participated in the 2016 South African Demographic and Health Survey (*N*=1 935)**

| | | Univariate | | | Multivariate | | |
|---|---|---|---|---|---|---|---|
| **Variable** | ***n* (% HIV tested)** | **OR** | **95% CI** | ***p*-value** | **aOR** | **95% CI** | ***p*-value** |
| Sociodemographic characteristics | | | | | | | |
| Age (years) | | | | | | | |
| 15 - 19 | 652 (76.8) | Ref. | - | - | Ref. | - | - |
| 20 - 24 | 1 283 (89.2) | 2.49 | 1.81 - 3.45 | <0.001* | 1.12 | 0.77 - 1.62 | 0.547 |
| Employment | | | | | | | |
| No | 1 619 (83.2) | Ref. | - | - | Ref. | - | - |
| Yes | 316 (94.0) | 3.18 | 1.77 - 5.69 | <0.001* | 3.29 | 1.75 - 6.21 | <0.001* |
| Living with a partner (cohabiting) | | | | | | | |
| No | 1 645 (84.0) | Ref. | - | - | Ref. | - | - |
| Yes | 290 (90.7) | 1.87 | 1.01 - 3.46 | 0.047* | 1.19 | 0.61 - 2.31 | 0.607 |
| Education | | | | | | | |
| No education/primary | 121 (78.7) | Ref. | - | - | Ref. | - | - |
| Secondary/tertiary | 1 814 (85.6) | 1.61 | 0.84 - 3.10 | 0.152 | 2.04 | 1.04 - 3.99 | 0.038* |
| Residence | | | | | | | |
| Urban | 1 031 (86.1) | Ref. | - | - | Ref. | - | - |
| Rural | 904 (83.5) | 0.82 | 0.60 - 1.11 | 0.200 | 0.86 | 0.57 - 1.30 | 0.480 |
| Wealth index | | | | | | | |
| Poorest | 450 (81.3) | Ref. | - | - | Ref. | - | - |
| Poorer | 493 (85.9) | 1.39 | 0.88 - 2.21 | 0.153 | 1.29 | 0.76 - 2.02 | 0.346 |
| Middle | 458 (89.1) | 1.88 | 1.19 - 2.98 | 0.007* | 1.80 | 1.04 - 3.10 | 0.035* |
| Richer | 367 (89.0) | 1.86 | 1.14 - 3.04 | 0.014 | 1.76 | 0.91 - 3.41 | 0.095 |
| Richest | 167 (77.1) | 0.77 | 0.45 - 1.33 | 0.353 | 0.64 | 0.30 - 1.35 | 0.242 |
| Access to media | | | | | | | |
| No | 407 (84.1) | Ref. | - | - | Ref. | - | - |
| Yes | 1 528 (85.4) | 1.10 | 0.76 - 1.60 | 0.590 | 0.93 | 0.59 - 1.47 | 0.752 |
| Risky sexual behaviour | | | | | | | |
| Lifetime number of sexual partners (*N*=1 907) | | | | | | | |
| 1 | 803 (81.3) | Ref. | - | - | Ref. | - | - |
| 2 | 398 (83.0) | 1.12 | 0.73 - 1.70 | 0.607 | 0.89 | 0.54 - 1.47 | 0.654 |
| ≥3 | 706 (90.5) | 2.19 | 1.46 - 3.30 | <0.001* | 1.47 | 0.95 - 2.28 | 0.088 |
| Had an STI | | | | | | | |
| No | 1 645 (84.3) | Ref. | - | - | Ref. | - | - |
| Yes | 290 (90.6) | 1.79 | 1.09 - 2.94 | 0.021* | 1.71 | 0.93 - 3.14 | 0.087 |
| Knowledge of MTCT | | | | | | | |
| No | 702 (73.5) | Ref. | - | - | Ref. | - | - |
| Yes | 1 233 (91.2) | 3.74 | 2.67 - 5.26 | <0.001* | 3.29 | 2.26 - 4.79 | <0.001* |
| Visited a health facility in past 12 months | | | | | | | |
| No | 588 (71.2) | Ref. | - | - | Ref. | - | - |
| Yes | 1 347 (91.4) | 4.32 | 3.12 - 5.98 | <0.001* | 2.93 | 2.09 - 4.10 | <0.001* |
| Ever been pregnant | | | | | | | |
| No | 913 (74.9) | Ref. | - | - | Ref. | - | - |
| Yes | 1 022 (94.5) | 5.73 | 3.71 - 8.83 | <0.001* | 4.47 | 2.90 - 6.89 | <0.001* |

OR = odds ratio; CI = confidence interval; aOR = adjusted odds ratio; STI = sexually transmitted infection; MTCT = mother-to-child transmission.
*Significant ($p$<0.05).

The AGYW who were cohabiting had higher odds of HIV testing than those who were currently not living with a partner (90.7% v. 84.0%; OR 1.87; 95% CI 1.01 - 3.46; $p$=0.047); however, this was no longer significant after adjusting for confounders.

Although this was not significant in univariate analysis, AGYW with secondary or tertiary education had higher odds of HIV testing than those with no or primary education (aOR 2.04; 95% CI 1.04 - 3.99; $p$=0.038) after adjusting for confounders.

Concerning the wealth index, the odds of HIV testing were higher in the middle group than in those who were poorest (89.1% v. 81.3%; OR 1.88; 95% CI 1.19 - 2.98; $p$=0.007), even after adjusting for confounders (aOR 1.80; 95% CI 1.04 - 3.10; $p$=0.035).

**Risky sexual behaviour**

The AGYW who had had three or more sexual partners had higher odds of HIV testing compared with those who had had only one partner

(90.5% v. 81.3%; OR 2.19; 95% CI 1.46 - 3.30; $p<0.001$); however, this was no longer significant after adjusting for confounders.

Participants who had had an STI during the past 12 months had higher odds of HIV testing than those who had not had an STI (90.6% v. 84.3%; OR 1.79, 95% CI 1.09 - 2.94; $p=0.021$); however, this was no longer significant after adjusting for confounders.

**Knowledge regarding MTCT**

The AGYW who knew about MTCT had higher odds of HIV testing than those with no knowledge (91.2% v. 73.5%; OR 3.74; 95% CI 2.67 - 5.26; $p<0.001$), and this remained statistically significant after adjusting for confounders (aOR 3.29; 95% CI 2.26 - 4.79; $p<0.001$).

**Visiting a health facility during the past 12 months**

AGYW who had visited a health facility during the previous 12 months had higher odds of testing for HIV than those who had not visited a health facility (91.4% v. 71.2%; OR 4.32; 95% CI 3.12 - 5.98; $p<0.001$), and this remained significant after adjusting for confounders (aOR 2.93; 95% CI 2.09 - 4.10; $p<0.001$).

**Pregnancy**

AGYW who had a history of pregnancy had higher odds of HIV testing than those with no history of pregnancy (94.5 % v. 74.9%; OR 5.73; 95% CI 3.71 - 8.83; $p<0.001$), even after adjusting for confounders (aOR 4.47; 95% CI 2.90 - 6.89; $p<0.001$).

Place of residence and access to media were not significantly associated with testing for HIV in either the univariate or the multivariate analyses. While living with the partner, lifetime number of partners, being poorer, richer or richest, and having a history of an STI were significant in the univariate analyses, they were no longer significant in the multivariate model.

## Discussion

The study found a prevalence of HIV testing uptake of 85.2% among sexually active SA AGYW aged 15 - 24 years, comparable to another study.[14] Adolescent girls aged 15 - 19 years had a lower uptake (76.8%) compared with young women aged 20 - 24 years (89.2%). Visits to health facilities were associated with HIV testing. This finding is consistent with previous studies in Lesotho, Zimbabwe and Rwanda, as well as in SA.[14-17] In adjusted analyses, the present study found that a history of pregnancy, knowledge of MTCT, having visited a health facility, a secondary or higher level of education, employment and wealth index were significantly associated with HIV testing.

The association between HIV testing and pregnancy is in alignment with HIV testing and PMTCT guidelines.[14,17,18] In the present study, 94.5% of AGYW who had a history of pregnancy had an HIV test. HIV testing during pregnancy is the first measure to prevent MTCT. Several studies confirm this association between a history of pregnancy and HIV testing.[15-17] In Sudan, pregnant women viewed HIV testing as important, but the rate of HIV testing was low.[18] Furthermore, we found that knowledge of MTCT was associated with HIV testing, and the study in Lesotho supports the association (79.6%).[15] AGYW who know about MTCT of HIV are more likely to have been pregnant and would have been informed about MTCT and the importance of HIV testing.

The present study identified a significant association between having visited a healthcare facility during the past 12 months and HIV testing. This finding can be attributed to the provision of provider-initiated counselling and testing (PICT) services in various health facilities. As part of achieving the UNAIDS 95-95-95 targets, most health facilities offer HIV testing services to every patient at every visit. Findings were similar in Ethiopia, where young women who visited health facilities had higher odds of HIV testing, which was aided by the adoption of PICT.[19] Additionally, with the implementation of adolescent-friendly health services (AFHSs), AGYW can access HIV testing according to their age group.[12]

The present study revealed a strong association between higher levels of education (secondary and higher education) and HIV testing, as opposed to no or primary education. A Gambian study also showed that that higher education increased the odds of HIV testing compared with no or primary education.[20] This association may be because education increases awareness and understanding of HIV and the ability to make positive lifestyle choices.[21] In addition, AGYW in secondary or higher education may request HIV testing services on their own. A cross-sectional study in Northern Uganda found that even primary education was associated with HIV testing.[22] In the present study, AGYW who were employed had higher odds of HIV testing than the unemployed, even though according to SA labour law, HIV testing is not compulsory in the workplace.[23] Higher odds of HIV testing in employed AGYW were also identified in Rwanda and Northern Uganda.[17,22] In the present study, the middle wealth index was found to be associated with HIV testing; similarly, the study in Rwanda noted an association between being rich and HIV testing.[17] Although HIV testing is free in SA, other costs such as transport may prevent people who are poor from accessing HIV testing in health facilities.

The present study had certain limitations. The DHSs provide high-quality data for secondary analysis; however, their limitations should be acknowledged. The study was subject to recall bias, as the survey data were collected from the self-reported responses. The participants may have given responses that they thought would be desirable, rather than the truth. The assumption is that the causality of all statistically significant variables is associated with HIV testing, since the study is cross-sectional. Owing to several incomplete questionnaires, data were missing for variables such as comprehensive HIV knowledge, non-discriminatory attitudes, knowing where to have an HIV test, knowledge and use of HIV test kits, receiving money or goods for sex, condom use at last sexual intercourse, and gender-based violence. Nevertheless, the study used a large sample of nationally representative sexually active AGYW in SA.

## Conclusion

The study findings indicate an unmet need for HIV testing among AGYW, especially adolescent girls aged 15 - 19 years. A history of pregnancy, knowledge of MTCT, having visited a health facility, a secondary or higher level of education, employment, and the wealth index were significantly associated with HIV testing. When developing HIV services for AGYW, it is therefore imperative to consider the factors that influence HIV testing. Upscaling HIV testing among adolescent girls is necessary to achieve the UNAIDS 95-95-95 targets. Increasing knowledge about the right to access and the importance of HIV testing, as well as available testing services, may be beneficial. Besides AFHSs, offsite HIV testing strategies such as community-based HIV testing and self-testing kits should be explored, as they have the potential to increase accessibility to adolescent girls as well as young women. Qualitative studies to investigate the obstacles to HIV testing, particularly in adolescents aged 15 - 19 years, are recommended.

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