

RESEARCH ARTICLE

Open Access



Self-reported sexually transmitted infections among sexually active men in Ghana

Abdul-Aziz Seidu^{1,2*} , Ebenezer Agbaglo³, Louis Kobina Dadzie¹, Justice Kanor Tetteh¹ and Bright Opoku Ahinkorah⁴

Abstract

Background: In sub-Saharan Africa, sexually transmitted infections (STIs) other than HIV are major public health problems. This study, therefore, sought to assess the prevalence and factors associated with self-reported STIs among sexually active men in Ghana.

Methods: Data from the 2014 Ghana demographic and health survey were used to conduct the study. This research included a total of 3051 sexually active men aged 15–59 years. Self-reported STI was the outcome variable. The data were analyzed using both descriptive (frequencies and percentages) and inferential (binary logistic regression) analysis.

Results: The prevalence of self-reported STIs in the past 12 months preceding the survey was 6.0% (CI: 4.7–6.8). Compared to men aged 45–59 years, those aged 25–34 (aOR = 2.96, CI: 1.64–5.35), 15–24 (aOR = 2.19, CI: 1.13–4.26), and 35–44 (aOR = 2.29, CI: 1.23–4.24) were more likely to report an STI. Men who had 2 or more sexual partners apart from their spouse were more likely to report an STI compared to those with no other partner apart from spouse (aOR = 4.24, CI: 2.52–7.14). However, those who had their first sex when they were 20 years and above (AOR = 0.66, CI: 0.47–0.93) and men who read newspaper/magazine had lower odds (aOR = 0.53, CI: 0.37–0.77) of reporting STIs compared to those who had sex below 20 and those who did not read newspaper/magazine respectively.

Conclusion: The study has revealed a relatively low prevalence of self-reported STI among sexually active men in Ghana. Sexually active men aged 25–34 years, those whose age at first sex is below 20 years and those with two or more sexual partners apart from their spouse had higher odds of reporting STIs. However, reading a newspaper was found to be positive in reducing the odds of reporting STIs. To reduce STIs among sexually active men in Ghana, it is important for health systems and stakeholders to consider these factors and put in place measures to mitigate those that put men at risk of STIs and encourage the adoption of the protective factors. Mass media can be used as a useful avenue for encouraging men to report STIs in order to avoid transmitting them to their partners.

Keywords: STIs, Men, Ghana, Public health, Global Health

* Correspondence: abdul-aziz.seidu@stu.ucc.edu.gh

¹Department of Population and Health, University of Cape Coast, Cape Coast, Ghana

²College of Public Health, Medical and Veterinary Sciences, James Cook University, Townsville, Queensland, Australia

Full list of author information is available at the end of the article



© The Author(s). 2021 **Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>. The Creative Commons Public Domain Dedication waiver (<http://creativecommons.org/publicdomain/zero/1.0/>) applies to the data made available in this article, unless otherwise stated in a credit line to the data.

Background

Sexually transmitted infections (STIs), also known as sexually transmitted diseases (STDs), comprise a number of diseases that are transmitted from one person to another through sexual intercourse [1–4]. They are part of the most common acute health conditions [1, 4]. While there are about 30 STIs, the commonest ones include vaginosis, herpes, chlamydia, trichomoniasis, gonorrhoea, hepatitis B virus, and syphilis [2]. Among these, chlamydia, gonorrhoea, syphilis, and trichomoniasis are curable [1, 3]. STIs have both health and psychological effects, such as genital symptoms, infertility, and enhanced HIV transmission [4]. Globally, the prevalence of STIs remain high. The prevalence of new infections of the four curable STIs rose from 359 million in 2012 [1] to 376 million in 2016 [3]. STIs and their complications are among the top five disease groups for which adults seek medical attention in low- and middle-income countries [3]. Other than HIV, STIs are a big public health problem in sub-Saharan Africa [2].

STIs pose a serious threat to the international community. Due to this, the WHO adopted a strategy in 2016 aimed at ending STIs [3]. Among the targets of the strategy is to increase information on STIs. This requires research to reveal the global burden of the disease [4]. Previous studies on STIs in sub-Saharan African countries have focused on the region as a whole [4] and on specific countries such as Ghana [5–7] and Ethiopia [2]. Such studies have identified religion, mass media exposure, and having multiple partners as predictors of STIs. In Ghana, such research has mainly focused on women [7–10]. In this present study, we sought to determine the prevalence and assess the factors associated with self-reported STIs among sexually active men in Ghana. Results emanating from this study are vital since they will be a major contribution to the existing literature on STIs in Ghana. Additionally, such information will be relevant to interventions such as education and counselling targeted at fighting against STIs.

Methods

Study design and data source

We sourced data from the 6th version of the Ghana Demographic and Health Survey (GDHS). The GDHS is a nationally representative survey that is mostly conducted in 5 year intervals in over 85 low and middle income countries globally. In Ghana, the first round was conducted in 1988, the second one in 1993, third in 1998, fourth in 2003, fifth in 2008 and the most recent one is the 2014 version. The 2014 version covered all the then ten regions (now sixteen) in Ghana. The 2014 GDHS was implemented by the Ghana Statistical Service and the Ghana Health Service with Inner City Fund International giving technical support through

MEASURE DHS [11, 12]. The survey gathers information on a variety of topics, including maternal and child health, to track key maternal and child health indicators in low- and middle-income countries. The survey also collects data from men aged 15–59 or 64 years in some countries. The DHS's sampling technique is a multistage procedure. For example, in the 2014 GDHS the first stage is marked by the collection of clusters made up of enumeration areas drawn up for the 2010 Census of Population and Housing [[11] p317–319]. The clusters were selected from the previous 10 administrative regions in Ghana containing both urban and rural areas. With the second stage households are selected from each cluster. Details of the methodology has been documented elsewhere [11] p317–19]. In the 2014 DHS, 4388 men aged 15 to 59 were interviewed, with 3,498 admitting to having ever had sex. However, for this analysis, 3,051 sexually active men were considered, all of whom had full details on all of the variables of interest.

Variables

Dependent variable

The dependent variable was self-reported STIs. It was derived from men's self-reporting of STI in the 12 months prior to the study. Men were asked if they had contracted a disease through sexual intercourse in the previous 12 months, and they were given two options: Yes or No [2, 12].

Independent variables

Independent variables included in the analysis were age (years) (15–24, 25–34, 35–44, 44+), residence (rural, urban), ecological zone (northern, middle, coastal), educational level (no education, primary, secondary/higher), wealth status (poor, middle, rich), marital status (married, not married), religion (Christianity, Islam, Other), ethnicity (Akan, Ga/Dangme/Ewe, Mole Dagbani, Other), employment status (working, not working), age at first sex (years) (<=19, 20 and above), number of sexual partners in the last 12 months apart from regular partner (0, 1, 2+), HIV testing (Yes, No), exposure to mass media (newspaper/magazine, radio, television) (Yes, No) and health insurance coverage (Yes, No) (see Table 1). We chose these factors due to their theoretical and empirical association with STIs in previous studies [1, 2, 12].

Statistical analyses

Stata 14.0 was used to conduct all of the analyses (Stata Corporation, College Station, TX, USA). To analyze our data, we used both descriptive and inferential statistics. We used frequencies and percentages to classify the sample using descriptive statistics. To pick possible variables for the multivariable logistic regression analysis, a Chi-square test was used. The multivariable binary

Table 1 Socio-demographic characteristics of the study participants and prevalence of self-reported sexually transmitted infections across independent variables

| Variables | Weighted sample (n = 3051) | | Had any STI in the last 12 months Yes (%) | 95%CI | |
|--|----------------------------|------------|--|-------------|-------------|
| | Frequency | Percentage | | Lower bound | Upper bound |
| Age (years) ($\chi^2 = 48.9, p < 0.001$) | | | | | |
| 15–24 | 501 | 16.41 | 9.8 | 7.63 | 14.24 |
| 25–34 | 961 | 31.49 | 7.83 | 5.67 | 9.92 |
| 35–44 | 839 | 27.48 | 4.4 | 3.07 | 6.28 |
| 45+ | 751 | 24.62 | 1.79 | 0.90 | 2.82 |
| Residence ($\chi^2 = 0.75, p = 0.385$) | | | | | |
| Urban | 1594 | 52.23 | 5.29 | 3.87 | 6.57 |
| Rural | 1457 | 47.77 | 6.01 | 4.98 | 8.17 |
| Ecological Zone ($\chi^2 = 13.8, p = 0.001$) | | | | | |
| Northern zone | 379 | 12.43 | 3.27 | 1.78 | 4.37 |
| Middle zone | 1449 | 47.5 | 7.12 | 5.28 | 8.17 |
| Coastal zone | 1223 | 40.07 | 5.61 | 3.95 | 7.70 |
| Education ($\chi^2 = 13.5, p = 0.001$) | | | | | |
| No education | 375 | 12.3 | 2.47 | 1.15 | 4.13 |
| Primary | 390 | 12.77 | 5.2 | 3.65 | 8.66 |
| Second/higher | 2286 | 74.93 | 6.58 | 5.12 | 7.66 |
| Wealth index ($\chi^2 = 5.1, p = 0.079$) | | | | | |
| Poor | 973 | 31.89 | 4.82 | 3.43 | 6.49 |
| Middle | 624 | 20.46 | 7.38 | 5.25 | 9.77 |
| Rich | 1454 | 47.65 | 5.72 | 4.28 | 7.53 |
| Marital status ($\chi^2 = 56.8, p < 0.001$) | | | | | |
| Not married | 1291 | 42.31 | 9.59 | 7.83 | 11.89 |
| Married | 1760 | 57.69 | 3.13 | 2.04 | 3.77 |
| Religion ($\chi^2 = 1.7, p = 0.429$) | | | | | |
| Christianity | 2206 | 72.3 | 5.96 | 4.76 | 7.22 |
| Islam | 521 | 17.07 | 4.6 | 2.72 | 6.46 |
| Other | 324 | 10.62 | 5.88 | 4.36 | 10.62 |
| Ethnicity ($\chi^2 = 9.8, p = 0.020$) | | | | | |
| Akan | 1497 | 49.07 | 6.71 | 4.99 | 8.35 |
| Ga/Dangme/ewe | 720 | 23.59 | 6.72 | 4.56 | 8.73 |
| Mole Dagbani | 417 | 13.67 | 3.89 | 2.42 | 6.37 |
| Other | 417 | 13.67 | 4.22 | 2.22 | 5.63 |
| Occupation ($\chi^2 = 0.2, p = 0.667$) | | | | | |
| Not working | 117 | 3.83 | 4.8 | 2.39 | 13.22 |
| Working | 2934 | 96.17 | 5.71 | 4.72 | 6.84 |
| Age at first sex (years) ($\chi^2 = 21.2, p < 0.001$) | | | | | |
| <=19 | 1705 | 55.9 | 7.45 | 6.15 | 9.31 |
| 20 and above | 1346 | 44.1 | 3.57 | 2.34 | 4.63 |
| Number of sex partners excluding spouse in the last 12 months ($\chi^2 = 123.9, p < 0.001$) | | | | | |
| 0 | 1790 | 58.68 | 3.14 | 2.08 | 3.84 |
| 1 | 1008 | 33.03 | 7.11 | 5.37 | 9.25 |
| 2+ | 253 | 8.3 | 21.2 | 14.46 | 28.17 |

Table 1 Socio-demographic characteristics of the study participants and prevalence of self-reported sexually transmitted infections across independent variables (Continued)

| Variables | Weighted sample (n = 3051) | | Had any STI in the last 12 months Yes (%) | 95%CI | |
|--|----------------------------|------------|--|-------------|-------------|
| | Frequency | Percentage | | Lower bound | Upper bound |
| Ever been tested for HIV ($\chi^2 = 2.9, p = 0.108$) | | | | | |
| No | 2250 | 73.76 | 6.06 | 5.19 | 7.71 |
| Yes | 801 | 26.24 | 4.52 | 2.66 | 5.68 |
| Exposure to Mass media | | | | | |
| Newspaper/magazine ($\chi^2 = 5.04, p = 0.025$) | | | | | |
| No | 1993 | 65.33 | 6.29 | 5.60 | 8.15 |
| Yes | 1058 | 34.67 | 4.24 | 2.50 | 5.35 |
| Radio ($\chi^2 = 0.82, p = 0.364$) | | | | | |
| No | 127 | 4.15 | 4.0 | 1.03 | 5.56 |
| Yes | 2924 | 95.85 | 5.76 | 4.85 | 7.01 |
| Television ($\chi^2 = 8.2, p = 0.004$) | | | | | |
| No | 469 | 15.38 | 3.28 | 2.10 | 5.86 |
| Yes | 2582 | 84.62 | 6.27 | 5.02 | 7.36 |
| Covered by NHIS ($\chi^2 = 2.5, p = 0.114$) | | | | | |
| No | 1618 | 53.04 | 6.34 | 5.12 | 8.24 |
| Yes | 1433 | 46.96 | 5.01 | 3.60 | 6.20 |
| STI Prevalence | | | 6.00 | 4.70 | 6.80 |

Source: 2014 GDHS

CI confidence interval

logistic regression model was used to model variables that had a chi-square test p -value of less than 0.05. Before fitting the final model, the variance inflation factor (VIF) was used to determine multi-collinearity among the independent variables (Mean VIF = 1.45, Minimum = 1.09, Maximum VIF = 2.03), and no evidence of collinearity was found. Adjusted odds ratios (aORs) with 95% confidence intervals (CIs) and p -values were used to present the regression results. Statistical significance was declared at $p < 0.05$ in all of the analyses. Using the sample weight (v005/1,000,000), the data were weighted to account for the complex sampling structure and non-response. The data was also adjusted using the 'svy' command to account for the complex survey nature.

Results

Socio-demographic characteristics of the study participants and prevalence of sexually transmitted infections across the independent variables

In Table 1, we present the socio-demographic characteristics of the respondents and STI prevalence. Slightly more than 30 % of the respondents were aged 25–34. More than half (52.2%) were in the urban areas, 47.5% were in the middle ecological zone, 74.9% had secondary/tertiary level of education, 47.7% were in the rich wealth index, 57.7% were married and 72.3% were Christians. Almost 60% of the participants (58%) were

married. Almost half of the study participants (49%) were of the Akan ethnic group. Almost all the participants (96%) reported being employed whereas 55.9% had their first sex during adolescence. Out of a total of 3051 study participants, 174 representing 6.0% (CI = 4.7–6.8), reported to have contracted STI within 12 months preceding the survey. The chi-square analysis also showed that ecological zone, education, marital status, ethnicity, age at first sex, number of sexual partners in the past 12 month and exposure to television had statistical significance with self-reported STIs.

Logistic regression analysis results on the factors associated with self-reported STI among sexually active men in Ghana

Table 2 presents adjusted odds ratio at 95% confidence level on the factors associated with STI among sexually active men in Ghana. Compared to men aged 45–59, those aged 25–34 (aOR = 2.96, CI:1.64–5.35), 15–24 (AOR = 2.19, CI: 1.13–4.26) and 35–44 (AOR = 2.29, CI: 1.23–4.24) were more likely to report STI. Respondents who had their first sex when they were 20 years and above had lower odds of reporting STIs compared to those who had their first sex at a younger age (aOR = 0.66, CI: 0.47–0.93). Respondents who had 2 or more sexual partners were more likely to report an STI (aOR = 4.24, CI: 2.52–7.14) as compared

Table 2 Factors associated with self-reported sexually transmitted infections among sexually active men in Ghana

| Variables | aOR | 95% CI | | P-value |
|--|--------------|-------------|-------------|------------------|
| | | Lower bound | Upper bound | |
| Age (years) | | | | |
| 15–24 | 2.195 | 1.13 | 4.26 | 0.020 |
| 25–34 | 2.96 | 1.64 | 5.35 | <i>P</i> < 0.001 |
| 35–44 | 2.29 | 1.23 | 4.24 | 0.009 |
| 45–59 | Ref | Ref | Ref | Ref |
| Ecological Zone | | | | |
| Northern zone | Ref | Ref | Ref | Ref |
| Middle zone | 1.59 | 0.86 | 2.93 | 0.142 |
| Coastal zone | 1.12 | 0.58 | 2.17 | 0.730 |
| Educational level | | | | |
| No education | 0.72 | 0.39 | 1.35 | 0.304 |
| Primary | 0.75 | 0.46 | 1.18 | 0.209 |
| Higher | Ref | Ref | Ref | Ref |
| Marital status | | | | |
| Not married | Ref | | | |
| Married | 0.77 | 0.47 | 1.28 | 0.311 |
| Ethnicity | | | | |
| Akan | 1.02 | 0.59 | 1.76 | 0.951 |
| Ga Adangme/Ewe | 1.33 | 0.72 | 2.45 | 0.353 |
| Mole Dagbani | 1.04 | 0.58 | 1.86 | 0.890 |
| Other | Ref | Ref | Ref | Ref |
| Age at first sex (years) | | | | |
| < =19 | Ref | Ref | Ref | Ref |
| 20 and above | 0.66 | 0.472 | 0.926 | 0.016 |
| Number of sex partners excluding spouse in the last 12 months | | | | |
| 0 | Ref | Ref | Ref | Ref |
| 1 | 1.51 | 0.94 | 2.412 | 0.087 |
| 2+ | 4.238 | 2.52 | 7.14 | <i>P</i> < 0.001 |
| Exposure to mass media | | | | |
| Newspaper/Magazine | | | | |
| No | Ref | Ref | Ref | Ref |
| Yes | 0.53 | 0.37 | 0.77 | <i>P</i> < 0.001 |
| Television | | | | |
| No | Ref | Ref | Ref | Ref |
| Yes | 1.45 | 0.88 | 2.38 | 0.144 |
| N | 3051 | | | |
| R² | 0.107 | | | |

Ref Reference category CI Confidence Interval
Source: 2014 GDHS

to their counterpart who had one or no sexual partner. Men who read newspaper had lower odds (aOR = 0.53, CI: 0.37–0.77) of reporting STI compared to their counterparts who reported that they were not reading newspaper.

Discussion

In sub-Saharan Africa, the top five disease groups for which adults seek health treatment includes STIs and their related complications [2]. This study sought to assess the prevalence and factors associated with self-

reported STIs among sexually active men in Ghana. The prevalence of self-reported STIs in this study was 6% which is higher than 3.5% prevalence reported in Ethiopia by Dagnew, Asresie and Fekadu [2] and SSA [12] but slightly lower than the prevalence of 7.4% in Kenya reported from a national population-based survey by Oluoch et al. [13].

It was also found that men in the ages of 15–44 were more likely to report STI, compared to those aged 45–59, with those aged 25–34 having the highest odds of self reporting STIs. Evidence suggests that young people in Ghana engage in risky sexual behaviours including sex without condoms and this might predispose them to the contraction of STIs [14, 15]. We further observed that age at first sex was significant in predicting the odds of STIs. Men who had their first sex after adolescence stage had lower risk of STI compared to those who had their first sex during the adolescence stage. This finding supports findings from previous studies in China [16], Tanzania [17], Lesotho [18], Malawi [19], and in Republic of Korea [20]. Evidence in other parts of sub-Saharan Africa and Ghana suggest that adolescence period is one that is associated with several risky sexual behaviours including multiple sexual partners, experimenting with sex, sex without condom and alcohol use during sexual intercourse [15, 21]. All these factors might predispose those who had their sex at that stage of their life to STIs.

We also found that among Ghana's sexually active men, the number of sexual partners was linked to self-reported STI. Men who had two or more sexual partners other than their spouses were more likely to report a STI infection than men who had no sexual partners other than their usual partners. This finding supports findings of studies conducted in Ethiopia [2, 22], South Africa [23], Kenya [24] and sub-Saharan Africa [12]. Studies have shown that STI testing in many sub-Saharan African countries are low and people are more likely to spread infections without their knowledge [25]. We therefore infer from the finding that the more sexual partners people have, the increased likelihood that one of them might already be infected and may transfer the infection to the others.

Exposure to mass media also showed statistically significant relationship with self-reporting STI. Specifically, those who read newspaper/magazine had lower odds of reporting STIs compared to their counterparts who did not. Studies have reported that access to mass media education such as newspapers positively affect ones behaviour towards unhealthy sexual practices [26, 27]. This study's results are consistent with those of a cross-sectional study in Ethiopia [2].

Strength and limitation

The study's key strength is its use of a nationally representative dataset with a relatively large sample size.

In terms of methodology, the DHS survey follows best practices, and this, combined with the use of experienced and well-trained data collectors, resulted in a high response rate. As a result, the findings of this study can be extended to all Ghanaian men who are sexually active. Despite these strengths, the cross-sectional study design prevents causal inference from the findings. Self-reports were used to measure the outcome variable, which were not checked or validated by any medical professional. Since many of the most common STIs are asymptomatic (most notably chlamydia and trichomoniasis in men), self-reporting is often restricted because asymptomatic infections are not recorded. It is also possible that some of the factors we controlled for (e.g., education, wealth index) may have affected symptom recognition or STI in a way that cannot be controlled for without biological testing. In addition, there is also the likelihood of recall and social desirability biases [28]. Furthermore, the type of STI was not specified [12].

Conclusion

The study has shown a relatively low prevalence of self-reported STIs among sexually active men in Ghana. This prevalence varied across the socio-demographic characteristics of the men. Age, age at first sex, number of sexual partners and exposure to newspaper are the factors associated with self-reported STIs among sexually active men in Ghana. Specifically, sexually active men in the ages of 25–34, those whose age at first sex is below 20 years and those with two or more sexual partners had higher odds of contracting STIs. Reading newspaper/magazine however was found to be positive in reducing the odds of contracting STIs. It is, therefore, recommended that to reduce STIs among sexually active men in Ghana, it is important for health systems and stakeholders to consider these factors and put in place measures to mitigate those that put men at risk of STIs and encourage the adoption of the protective factors. Mass media can be used as a useful avenue for encouraging men to report STIs in order to avoid transmitting them to their partners.

Abbreviations

AOR: Adjusted odds ratio; CI: Confidence interval; GDHS: Ghana demographic and health survey; STI: Sexually transmitted infections

Acknowledgments

We are grateful to MEASURE DHS project for giving us for free access to the original data.

Authors' contributions

Conception and design of study: AS; analysis and/or interpretation of data: AS and LKD; drafting the manuscript: AS, EA, BOA LKD and JKT; revising the manuscript critically for important intellectual content; AS, EA, BOA LKD and JKT. All authors have read and approved the final manuscript.

Funding

The study did not receive any funding.

Availability of data and materials

The dataset used and/or analysed during the current study is available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The study did not require ethical clearance since the authors used already existing secondary data from the DHS. However, the DHS reports that ethical clearance was obtained from the Institutional Review Board of Inner City Fund International and Ethical Review Committee of Ghana Health Service. Demographic and Health Survey (DHS) also anonymized all data before making them accessible to public. Permission to use the data was obtained from Measure DHS, which is a USAID-funded project that assists and fund population and health surveys in countries worldwide.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests. Bright Opoku Ahinkorah and Abdul-Aziz Seidu are members of the editorial board of this journal but were not involved in the editorial or decision-making process of this paper.

Author details

¹Department of Population and Health, University of Cape Coast, Cape Coast, Ghana. ²College of Public Health, Medical and Veterinary Sciences, James Cook University, Townsville, Queensland, Australia. ³Department of English, University of Cape Coast, Cape Coast, Ghana. ⁴The Australian Centre for Public and Population Health Research (ACPPHR), Faculty of Health, School of Public Health, University of Technology Sydney, Ultimo, Australia.

Received: 1 June 2020 Accepted: 11 May 2021

Published online: 26 May 2021

References

- Newman L, Rowley J, Vander Hoorn S, Wijesooriya NS, Unemo M, Low N, Stevens G, Gottlieb S, Kiarie J, Temmerman M. Global estimates of the prevalence and incidence of four curable sexually transmitted infections in 2012 based on systematic review and global reporting. *PLoS one*. 2015; 10(12):e0143304.
- Dagnew GW, Asresie MB, Fekadu GA. Factors associated with sexually transmitted infections among sexually active men in Ethiopia. Further analysis of 2016 Ethiopian demographic and health survey data. *Plos One*. 2020;15(5):e0232793.
- WHO. Report on global sexually transmitted infection surveillance. Geneva: WHO; 2018.
- Torrone EA, Morrison CS, Chen PL, Kwok C, Francis SC, Hayes RJ, et al. Prevalence of sexually transmitted infections and bacterial vaginosis among women in sub-Saharan Africa: an individual participant data meta-analysis of 18 HIV prevention studies. *PLoS Med*. 2018;15(2):e1002511. <https://doi.org/10.1371/journal.pmed.1002511>.
- Cassels S, Jenness SM, Biney AEA, Doodoo FN. Geographic mobility and potential bridging for sexually transmitted infections in Agbogboshie, Ghana. *Soc Sci Med*. 2017;184:27–39. <https://doi.org/10.1016/j.socscimed.2017.05.003>.
- Odonkor ST, Nonvignon J, Adu J, Okyere M, Mahami T. Sexually transmitted diseases (STDs) among adolescents in second cycle institutions in Accra, Ghana: trends in sexual behaviours. *Int J Recent Trends Sci Technol*. 2012; 3(1):9–17.
- Yirenya-Tawiah D, Annang TN, Apea-Kubi KA, Lomo G, Mensah D, Akyeh L, et al. Chlamydia trachomatis and neisseria gonorrhoeae prevalence among women of reproductive age living in urogenital schistosomiasis endemic area in Ghana. *BMC Res Notes*. 2014;7(1):349. <https://doi.org/10.1186/1756-0500-7-349>.
- Adanu RMK, Hill AG, Seffa JD, Darko R, Anarfi JK, Duda RB. Sexually transmitted infections and health seeking behavior among Ghanaian women in Accra. *Afr J Reprod Health*. 2008;12(3):151–8.
- Ohene O, Akoto IO. Factors associated with sexually transmitted infections among young Ghanaian women. *Ghana Medical Journal*. 2008;43(2):96–100.
- Opoku BK, Sarkodie YA. Prevalence of genital chlamydia and gonococcal infections in at risk women in the Kumasi metropolis, Ghana. *Ghana Med J*. 2010;44(1):21–4. <https://doi.org/10.4314/gmj.v44i1.68852>.
- Ghana Statistical Service; Ghana Health Service and ICF Macro. Ghana Demographic and Health Survey 2014: Key indicators. Accra: GSS, GHS and ICF Macro; 2015.
- Seidu AA, Ahinkorah BO, Dadzie LK, Tetteh JK, Agbaglo E, Okyere J, et al. A multi-country cross-sectional study of self-reported sexually transmitted infections among sexually active men in sub-Saharan Africa. *BMC Public Health*. 2020;20(1):1–1.
- Oluoch T, Mohammed I, Bunnell R, Kaiser R, Kim AA, Gichangi A, Mwangi M, Dadabhai S, Marum L, Orago A, Mermin J. Correlates of HIV infection among sexually active adults in Kenya: a national population-based survey. *Open AIDS J* 2012; 5(1): 125–134. <https://doi.org/https://doi.org/10.2174/1874613601105010125>.
- Darteh EKM, Dickson KS, Amu H. Understanding the socio-demographic factors surrounding young peoples' risky sexual behaviour in Ghana and Kenya. *J Community Health*. 2020. [https://doi.org/10.1007/s10900-019-00726-6;45\(1\):141–7](https://doi.org/10.1007/s10900-019-00726-6;45(1):141–7).
- Kangmenang J, Mkandawire P, Luginaah I. Determinants of risky sexual behaviours among adolescents in Central African Republic, Eswatini and Ghana: evidence from multi-indicator cluster surveys. *Afr J AIDS Res*. 2019 Jan 2;18(1):38–50. <https://doi.org/10.2989/16085906.2018.1552600>.
- Ma Q, Ono-Kihara, M, Cong L et al. Early initiation of sexual activity: a risk factor for sexually transmitted diseases, HIV infection, and unwanted pregnancy among university students in China. *BMC Public Health*. 2009; 9 (111). <https://doi.org/https://doi.org/10.1186/1471-2458-9-111>.
- Ghebremichael M, Larsen U, Paintsil E. Association of age at first sex with HIV-1, HSV-2, and other sexual transmitted infections among women in northern Tanzania. *Sex Transm Dis* 2009; 36(9): 570–576. <https://doi.org/https://doi.org/10.1097/OLQ.0b013e3181a866b8>.
- Motsima T, Malela-Majika J. The effects of early first sexual intercourse amongst Lesotho women: evidence from the 2009 Lesotho demographic and health survey. *Afr J Reprod Health*. 2016;20(2):34–42. Retrieved May 17, 2020, from www.jstor.org/stable/26357092. <https://doi.org/10.29063/ajrh2016/v20i2.4>.
- Ningpuanyeh WC, Sathya Susuman A. Correlates of early sexual debut and its associated STI/HIV risk factors among sexually active youths in Malawi. *J Asian Afr Stud* 2017; 52(8): 1213–1224. <https://doi.org/https://doi.org/10.1177/0021909616654300>.
- Jung, M. Risk factors of sexually transmitted infections among female sex workers in Republic of Korea. *Infect Dis Poverty*. 2019; 8(6). <https://doi.org/https://doi.org/10.1186/s40249-019-0516-x>.
- Tadesse G, Yakob B. Risky sexual behaviors among female youth in Tisbe Abay, a semi-urban area of the Amhara Region, Ethiopia. *PLoS One*. 2015;10(3).
- Mengistu K, Alemu K, Destaw B. Prevalence of malnutrition and associated factors among children aged 6–59 months at Hidabu Abote District, North Shewa, Oromia Regional State. *J Nutr Disord Ther* 2013; T1(001): 1–15. <http://doi.org/https://doi.org/10.4172/2161-0509.T1-001>.
- Francis SC, Mthiyane TN, Baisley K, Mchunu SL, Ferguson JB, Smit T, Crucitti T, Gareta D, Dlamini S, Mutevedzi T, Seeley J. Prevalence of sexually transmitted infections among young people in South Africa. Geneva: A nested survey in a health and demographic surveillance site. *PLoS medicine*. 2018;15(2):1–25.
- Winston SE, et al. Prevalence of sexually transmitted infections including HIV in street-connected adolescents in western Kenya. *Sex Transm Infect*. 2015; 91(5): 353–359. <https://doi.org/https://doi.org/10.1136/sextrans-2014-051797> PMID: 25714102.
- Agarwal S, de Araujo P, Jayash P. HIV-related knowledge and risky sexual behaviour in sub-Saharan Africa. *Oxf Dev Stud*. 2013;41(2):173–89. <https://doi.org/10.1080/13600818.2013.790950>.
- Sznitman S, Stanton BF, Vanable PA, Carey MP, Valois RF, Brown LK, DiClemente R, Hennessy M, Salazar LF, Romer D. (2011). Long term effects of community-based STI screening and mass media HIV prevention

messages on sexual risk behaviors of African American adolescents. *AIDS Behav* 2011; 15(8): 1755–1763. <https://doi.org/https://doi.org/10.1007/s10461-011-9946-6>.

27. Coyle K, Basen-Engquist K, Kirby D, Parcel G, Banspach S, Collins J, Baumler E, Carvajal S, Harrist R. Safer choices: reducing teen pregnancy, HIV, and STDs. *Public health reports*. 2016;116(1):82–93.
28. Morhason-Bello IO, Fagbamigbe AF. Association between Knowledge of Sexually Transmitted Infections and Sources of the Previous Point of Care among Nigerians: Findings from Three National HIV and AIDS Reproductive Health Surveys. *Int J Reprod Med*. 2020;2020:1–11.

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Ready to submit your research? Choose BMC and benefit from:

- fast, convenient online submission
- thorough peer review by experienced researchers in your field
- rapid publication on acceptance
- support for research data, including large and complex data types
- gold Open Access which fosters wider collaboration and increased citations
- maximum visibility for your research: over 100M website views per year

At BMC, research is always in progress.

Learn more biomedcentral.com/submissions

