scientific reports

OPEN

Spatial pattern and determinants of non-condom use among sexually active young people in Nigeria: a population-based, cross-sectional study

Olufunmilayo Esther Bello[1✉], Olorunfemi Akinbode Ogundele[1,2] & Oluyemi Adewale Okunlola[3]

Non-condom use is known as one of the risky sexual behaviors among youth and a contributing factor to the high prevalence of HIV in Nigeria. Therefore this study aimed to assess the spatial pattern and determinants of non-condom use among sexually active young people in Nigeria. The study employed a cross-sectional analysis of population-based data involving 288 males and 780 females aged 15–24 years, giving 1068 sexually active young people drawn from the 2018 NDHS. The study adopted a multi-level and spatial analysis to identify factors associated with non-condom use in Nigeria. The prevalence of non-condom use was 57.7% in this study. The spatial analysis showed that the Northeastern and South–South regions of Nigeria had a high proportion of non-condom use among young people, while the Northwest, North-Central, and Southwestern parts had low proportions of non-condom use. On multilevel analysis, the individual and community level factors associated with non-condom use included exposure to media (AOR 0.59; 95% CI 0.39–0.91) and younger age (AOR 0.72; 95% CI 0.53–0.98). Areas with a high proportion of non-condom use should receive the most attention through the promotion of condom use and education, alongside a focus on important associated factors.

Keywords Non-condom use, Spatial pattern, Sexually active young people, Cross-sectional study

One important public health measure to reduce the transmission of sexually transmitted diseases and HIV is the regular use of condoms during sexual intercourse[1]. HIV prevention has been a challenging issue due to high-risk sexual behavior which includes non-condom use. According to Khalifa and colleagues, an estimated 3.9 million [2.1–5.7 million] adolescents and young people aged 15–24 were living with HIV in the year 2017[2].

Adolescents and young people make up an increasing percentage of HIV-positive people globally, where 410,000 [194,000–690,000] young individuals between the ages of 10 and 24 contracted HIV for the first time in 2020, with 89% of them residing in sub-Saharan Africa[3].

Safe sex and consistent condom use have socio-demographic, financial, and health advantages that are crucial to improving young people's health and well-being[4]. Taking into account the potential repercussions of risky sexual behavior, several governments have turned to raising awareness of risky sexual behavior among youth to prevent teenage pregnancy, lower sexually transmitted infection rates, morbidity, and mortality, as well as provide young people with employment opportunities[5]. They have also emphasized the importance of consistent condom use, which is essential for promoting the health and well-being of young people[5].

To lower the prevalence of new infections, it is essential to prevent the further transmission of HIV among young people aged 15–24. At the end of 2015, there were approximately 36.7 (34.0–39.8) million HIV-positive individuals globally and 2.1 (1.8–2.4) million persons newly infected by the virus[6]. Almost 71% of people living with HIV/AIDS worldwide come from Sub-Saharan Africa, and young women between the ages of 15 and 24

[1]Department of Population Reproductive and Family Health, School of Public Health, University of Medical Sciences, Ondo City, Ondo State, Nigeria. [2]Department of Community Medicine, University of Medical Sciences, Ondo City, Ondo State, Nigeria. [3]Department of Mathematical and Computer Science, University of Medical Sciences, Ondo City, Ondo State, Nigeria. ✉email: funmibello001@gmail.com

account for more than fifty percent of all new infections[7]. Youths' risky sexual practices, including non-condom use, multiple sexual partners, high life-number of sexual partners, intergenerational sex, transactional sex, and early sexual debut, have been predominantly attributed to the high prevalence of HIV/AIDS among them[5].

Given the current national HIV prevalence in Nigeria (1.4%) and state-based stratification, data showed that the highest prevalence was discovered in Akwa Ibom (5.6%), Benue (4.9%), Rivers (3.8%), Taraba (2.7%), and Anambra (2.7%), and the lowest prevalence was reported in Jigawa (0.3%) and Katsina (0.3%)[8]. Concerns have been raised about the region's social differences and inequality[8]. The south and north of the country have different social, religious, economic, and cultural backgrounds, which makes the reactions to and acceptance of phenomena very different. This suggests that uniform intervention programs may not be appropriate for the two regions, according to a study on North–South disparities in the use of contraceptives in Nigeria[9].

In Nigeria, some of the earlier studies, were on condom use and sub-national, with primary data obtained from respondents in one or a few states within the region[6,10–13]. Furthermore, studies in sub-Saharan African nations, including Nigeria, reported low condom use among young people[14]. To combat the increased risk of HIV, STDS, and unwanted pregnancy, it is crucial to promote condom use. This will encourage healthier conduct that results in long-term, positive health outcomes for the sexual and reproductive health of adolescents[14].

Ajayi and colleagues reported that self-confidence, self-determination, partner communication, a positive attitude towards condoms, and condom use skills, all encourage condom use[15].

Bolarinwa et al. studied the spatial distribution of modern contraceptive usage among women of reproductive age but did not focus specifically on non-condom use among sexually active young people[16]. Unlike Bolarinwa et al. our study uses the most recent DHS to provide more recent estimates of non-condom use among sexually active young people. In addition, it assesses the spatial pattern to provide visual insights into the distribution of non-condom use across the regions, which is not presented by the figures to delineate the high and low spots in non-condom use among sexually active young. Furthermore, we included a significant number of individual and community-level factors to assess the contextual factors influencing non-condom use among young people. To the best of our knowledge, no previous study has assessed the spatial pattern and determinants of non-condom use among sexually young people using the current national sample and in addition, extensively considered identified contextual factors. The study addresses this gap to enable policymakers develop appropriate policies, plan, and implement targeted intervention across the regions of the country. This study assessed the spatial pattern and determinants of non-condom use among sexually active young people in Nigeria.

The conceptual framework for this study is shown in Fig. 1.

Methods

Study design

This was a secondary analysis of data from the 2018 Nigeria Demographic and Health Survey (NDHS) generated from the women and men survey. The NDHS is a nationally representative study that gathers data on men, women, and children on a diversity of subjects, including condom use[17].

Study population

The target population for this study are sexually active young people in Nigeria who do not use condoms.

Inclusion criteria

Unmarried youths aged 15–24 who had sexual intercourse in the last 4 weeks of conducting the 2018 National Demography Health survey, without the use of a condom.

Sampling technique

Information was obtained from 36 administrative entities and the Federal Capital Territory (FCT) using a two-stage sampling procedure. The samples were randomly selected from clusters and enumeration areas (EAs), which constitute the primary sampling element for the survey. The 2018 survey drew a total of 13,311 men and 41,821 women. From these numbers, 288 males and 780 females had complete information about condom use, and all the variables of interest were included in this study (Fig. 2).

The sample, pretesting, and comprehensive methodology of the 2018 NDHS have been published by the National Population Commission (NPC) and the International Centre for Migration (ICF)[17]. When writing this manuscript, the study complied with the epidemiology reporting standards for observational studies[18]. The dataset is freely accessible for download via https://dhsprogram.com/data/available-datasets.cfm.Sample.

Variables

Dependent variable: This was defined as unmarried young people who have had unprotected sex without a female or male condom in their last sexual intercourse.

Independent variables: Individual and community-level factors were considered. The individual-level factors included; age (15–19, 20–24), education attainment (no education, primary, secondary, and higher), religion (Christian, Islam, and traditionalist), ethnicity (Hausa, Yoruba, Igbos, others), media exposure (yes or no), and wealth index (poorest, poorer, middle, richer, and richest). Community-level factors include the type of place of residence (urban or rural) and region (Northcentral, Northeast, Northwest, Southeast, Southsouth, and Southwest). All these variables were considered based on their availability in the 2018 NDHS data set and their relevance to non-condom use[17].
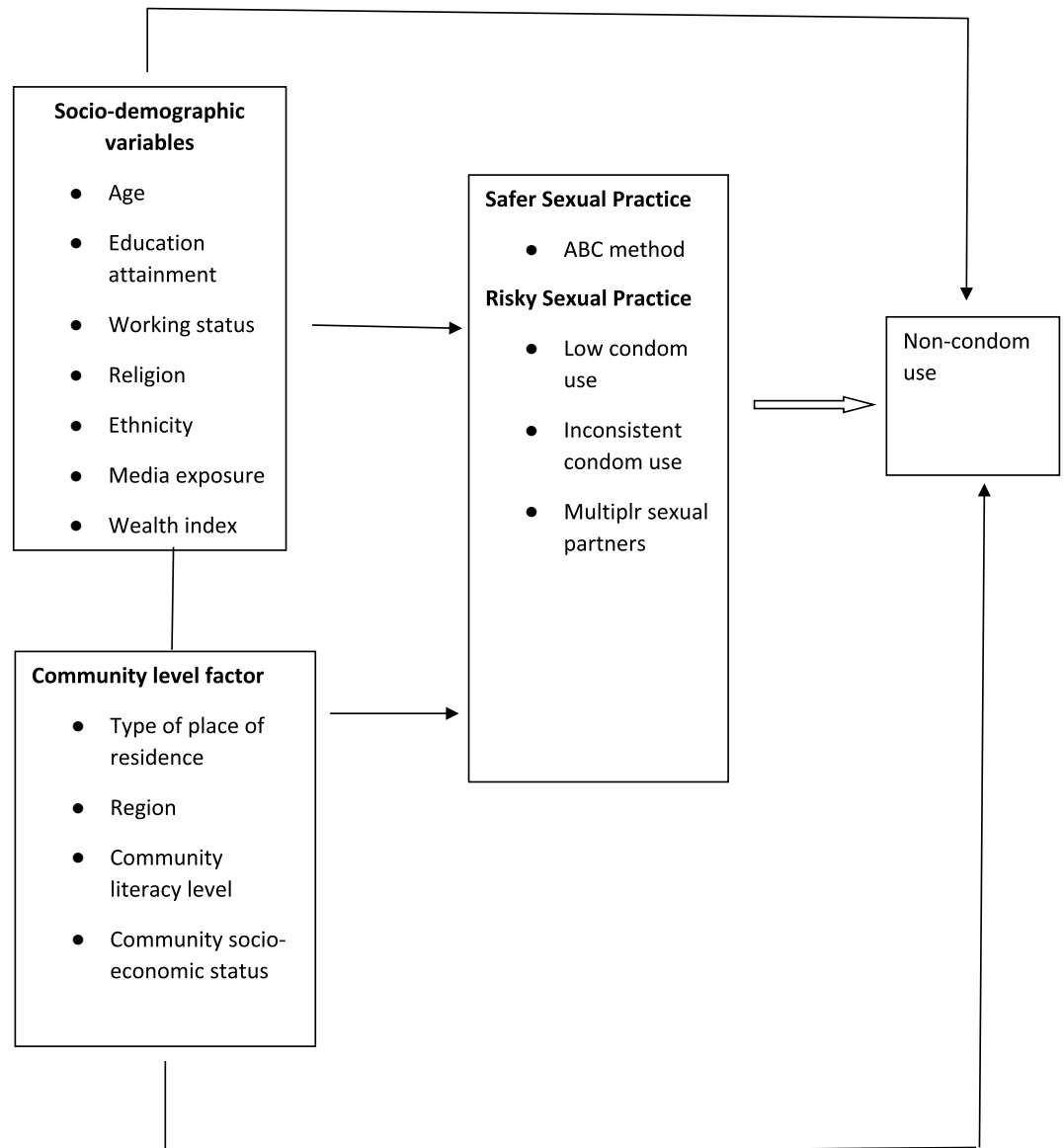
Fig. 1. Conceptual framework for the study.

Statistical analysis

This was conducted using Stata Software (version 15). There were three stages to the data analysis. Using frequency distributions for categorical data, we first produced a descriptive analysis of the variables. A p-value of 0.05 was established as a significant level at a 95% confidence level in the second step of bivariate analysis. Pearson's chi-square test was used to examine the association between individual and community-level characteristics and non-condom use. The significant variables with $p < 0.01$ and those with $p < 0.25$ were entered 0 for multivariable regression analysis.

Additionally, a multivariate mixed-effects logistics regression model was used in the third stage to examine the effect of community-level factors on the outcome variables, with young people at level 1 nested within the community at level 2. In the third stage, four models were built. Model 1 (the random intercept model) was fitted without the use of any explanatory variables to test the random variability of the intercept and display the overall variance in the exposure to non-condom use among young people in various communities. Model 2 examined the effect of individual-level variables. Model 3 looked into the effects of factors at the community level, while Model 4 looked into the effects of both individual and community-level factors concurrently. The results of fixed effects were presented as odds ratios with a 95% confidence level. To explain the percentage of variance and compare the succeeding models, the inter-cluster correlation coefficient (ICC) for each model was computed.

The measures of association (fixed effects) estimate the associations between non-condom use and independent variables (individual and community level factors) and are expressed as adjusted OR (AOR) and 95% CIs. The level of significance was set at $p < 0.05$ for each test. The measure of variation (random effects) was assessed using the ICC and estimated to determine the percentage variance explained by community-level variables[19].
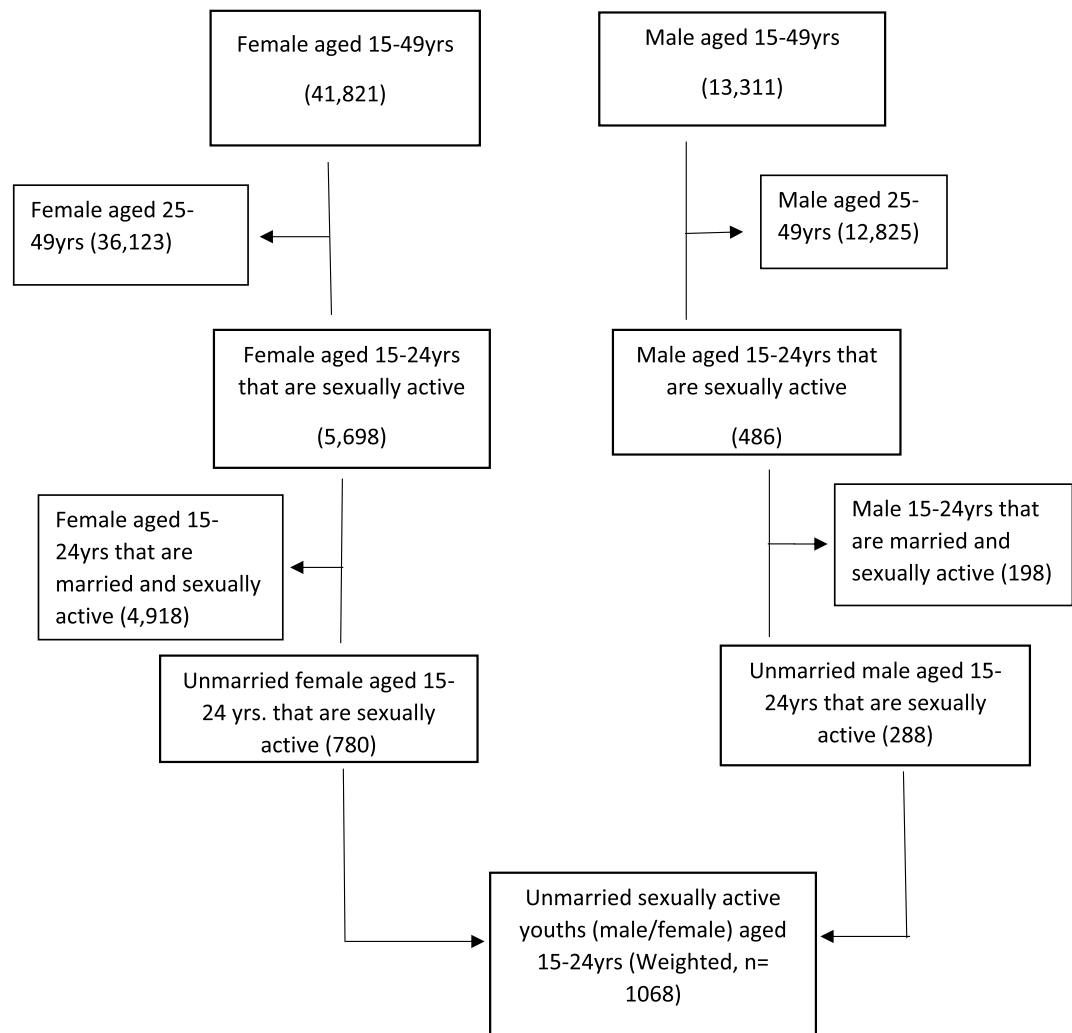
Fig. 2. Sample derivation flow chart.

In addition, we employed Schwarz's Bayesian information criteria and Akaike's information criteria to estimate the goodness of fit of the model[20]. The Variance Inflation Factor (VIF) was used to evaluate multicollinearity, with a VIF cutoff of 5[21].

Spatial analysis

From the data set for non-condom use coverage in Nigeria, spatial maps were created using the QGIS 3.10 program (https://qgis.org/). To normalize the data set for easy integration into the database and visualization in QGIS, which is a crucial step in data cleaning, the data structure was created in Google Sheets. Using the Join Attribute by Location Tool in QGIS, the attribute data were combined with the spatial data; this produced a database comprising the non-condom use results together with the Nigeria shape file received from the Natural Earth database. Each point of the attribute data for the variables was represented graphically in QGIS using the Equal Count (Quartile) mode and five classes. The classes show the proportion of each attribute's data that is contained in the database, and this information was shown using different color ramps.

Results
Socio-demographic characteristics and prevalence of non-condom use

Of the 1068 participants, 288 (27%) were male and 780 (73%) were female. Also, 402 (37.6%) and 666 (62.4%) were between the ages of 15–19 and 20–24, respectively. Furthermore, 768 (71.9%) had secondary education, and 874 (81.8%) practiced Christianity. Also, 308 (28.8%) were from the south–south region, 596 (54.9%) resided in rural areas, 336 (31.5%) were from richer households, and 57.7% did not use condoms during the last sexual intercourse (Table 1).

Variable	Frequency	Percentage
Age		
15–19	402	37.6
20–24	666	62.4
Sex		
Male	288	27.0
Female	780	73.0
Highest education level		
No education	52	4.9
Primary	77	7.2
Secondary	768	71.9
Higher	171	16.0
Religion		
Christian	874	81.8
Islam	188	17.6
Traditionalist	6	0.6
Ethnicity		
Hausa	26	68.4
Yoruba	111	56.1
Igbo	111	55.2
Others	368	58.3
Media exposure		
Yes	438	71.1
No	178	28.9
Region		
Northcentral	188	17.6
North East	185	17.3
North West	27	2.5
South East	167	15.6
South South	308	28.8
South West	193	18.1

Table 1. Socio-demographic characteristics of respondents, NDHS 2018 (n = 1068). Other variables not presented in the table.

Spatial distribution of non-condom use

A total of 1,388 clusters were considered for the spatial analysis of non-condom use in Nigeria. Each point on the map represents one enumeration area, with the proportion of non-condom use cases in each cluster. The purple color indicates areas with low proportions of non-condom use, which ranged from 0 to 12%, and the red color indicates enumeration areas with a high percentage of non-condom use, ranging from 48 to 60% (Fig. 3).

The spatial distribution of non-condom use in this study showed that a higher percentage of those who do not use condoms was located in the Northeastern and South–south parts of Nigeria. A low proportion of young people who do not use condoms was located in the Northwest, North Central, and Southwestern parts of Nigeria.

Factors associated with non-condom use among sexually active young people in Nigeria

A significantly higher proportion of females, those aged 20–24, those with secondary education, and those in the richer wealth index, were non-condom users. A significantly higher proportion of those who are exposed to social media were also non-condom users. However, religion ($p = 0.239$) had no association (Table 2).

On multivariable multilevel regression analysis, as presented in Table 3, and after adjusting for individual and community level factors in the final model, sexually active young females are 3.4 times more likely to be non-condom users than those who are male (AOR 3.41; 95% CI 2.43–4.79). Similarly, sexually active young people who are exposed to media had 41% less likelihood of being non-condom users than those who are not exposed to media (AOR 0.59; 95% CI 0.39–0.91). Sexually active young people aged 20–24 had 28% less likelihood of being non-condom users than those aged 15–19 ((AOR 0.72; 95% CI 0.53–0.98). Also, sexually active young people from the poorer wealth index had 58% less likelihood of being non-condom users (AOR 0.32; 95% (CI 0.40–0.72) (Table 3).

To determine the random or clustering effect and deviance, we utilized the interclass correlation coefficient (ICC) and compared the models. The ICC value for the null model was 0.099, indicating that approximately 9.9% of the total variation in non-condom use was due to unmeasured or unmeasurable factors (random effects), which was significant. The variation in non-condom use in models 2, 3, and the final model remained significant. The best-fitted model was identified as the final model, which had lower deviance (Table 4).
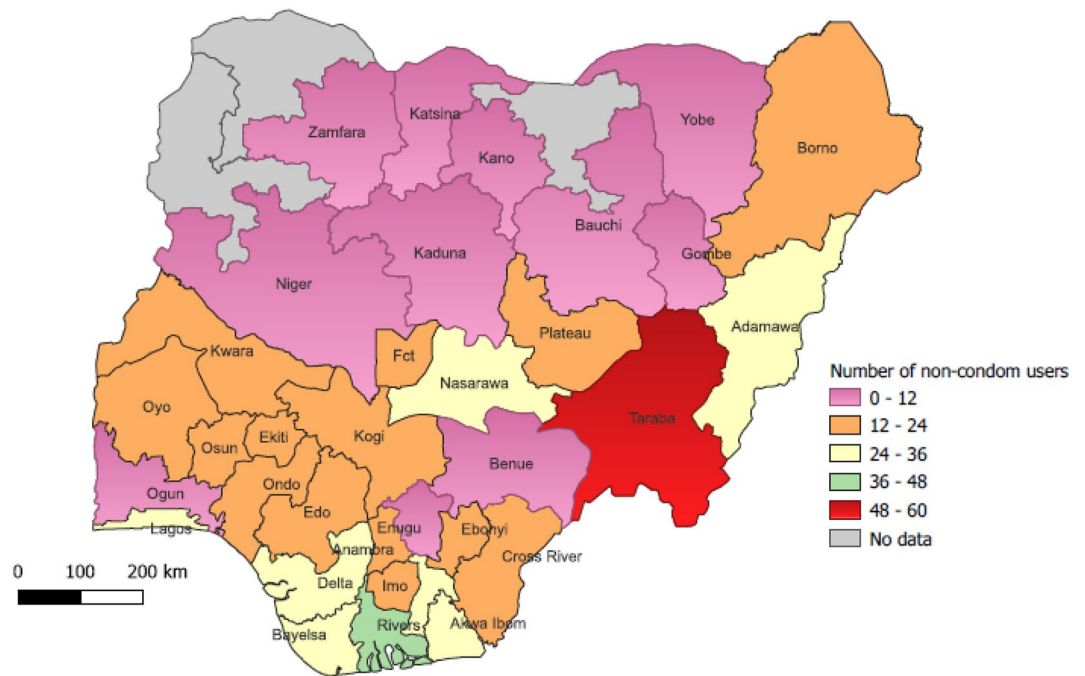
Fig. 3. Non-condom use coverage in Nigeria (NDHS 2018).

Variables	Condom-use		
	Non-user (%)	User (%)	*p*
Age			0.001
15–19	264 (42.9)	138 (31.0)	
20–24	352 (57.1)	314 (69.0)	
Sex			0.001
Male	111 (18.0)	177 (39.2)	
Female	505 (82.0)	275 (60.8)	
Education			0.001
No education	41 (6.7)	11 (2.4)	
Primary	51 (8.3)	26 (5.8)	
Secondary	444(72.1)	324 (71.7)	
Higher	80 (13.0)	91 (20.1)	
Media exposure			0.001
No	214 (34.7)	242 (53.5)	
Yes	402 (65.3)	210 (46.5)	
Region			0.091
Northcentral	108 (17.5)	80 (17.7)	
North East	125 (20.3)	60 (13.3)	
North West	15 (2.4)	12 (2.7)	
South East	92 (15.0)	75 (16.6)	
Southsouth	172 (28.0)	136 (30.1)	
South West	104 (16.9)	89 (19.7)	
Wealth index			0.001
Poorest	68 (11.0)	11 (2.4)	
Poorer	102 (16.6)	60 (13.3)	
Middle	141 (22.9)	99 (21.9)	
Richer	183 (29.7)	153 (28.3)	
Richest	122 (19.8)	129 (28.5)	

Table 2. Bivariable analysis on non-condom use among sexually active young people in Nigeria. Other variables not presented in the table.

Variable	Total number	Non-condom use	Model 4 AOR (95% CI)
All young people	1068	616 (57.7)	
Age			
15–19	402	264 (42.86)	1
20–24	666	352 (57.14)	0.72 (0.53–0.98)**
Sex			
Male	288	111 (18.02)	1
Female	780	505 (81.98)	3.41 (2.43–4.79)***
Education			
No education	52	41 (6.66)	1
Primary	77	51 (8.28)	0.56 (0.21–1.47)
Secondary	768	444 (72.08)	0.60 (0.26–1.36)
Higher	171	80 (13.0)	0.48 (0.20–1.18)
Religion			
Christian	874	258 (80.52)	1
Islam	188	115 (18.67)	1.37 (0.86–2.20)
Traditionalist	6	5 (0.81)	3.75 (0.36–39.27)
Media exposure			
No	214	154 (25.00)	1
Yes	854	462 (75.00)	0.59 (0.39–0.91)*
Place of residence			
Urban	482	258 (41.88)	1
Rural	586	358 (58.12)	1.11 (0.79–1.56)
Wealth index			
Poorest	79	68 (11.04)	1
Poorer	162	102 (16.56)	0.32 (0.40–0.72)**
Middle	240	141 (22.89)	0.29 (0.13–0.66)**
Richer	336	183 (29.71)	0.25 (0.11–0.57)**
Richest	251	122 (19.81)	0.20 (0.09–0.50)**

Table 3. Multilevel effect analysis for factors associated with non-condom use among young people in Nigeria, NDHS 2018 (n = 616). Other non-significant variables not presented in the table. *Significant $p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

Random effects (a measure of variation in non-condom use	Null model	Final model
Deviance	0.2350067	0.0300045
Intraclass coefficient (%)	0.099 (9.9%)	0.0992 (0.0300–0.2819)
Akaike Information Criterion	1369.501	1367.976
Loglikelihood	− 656.7505	− 654.98777
Swhwarz's Bayesian criterion	1518.76	1512.208

Table 4. Random effect and model comparison for factors associated with non-condom use using multilevel regression analysis.

Discussion

This study investigated the spatial distribution and determinants of non-condom use among sexually active young people in Nigeria, using the most recent NDHS data conducted in 2018. The study found that non-condom use in Nigeria ranged from 0 to 60% across the country. The study also showed that a higher percentage of non-condom use was located in the northeastern and South–south regions of Nigeria, and a low percentage of non-condom use was located in the Northwestern, North-central, and part of Southwestern regions of Nigeria. The finding of this study is related to a previous study by Akinyemi and colleagues, which found that non-condom use among young people during their last high-risk sex is high in some selected areas in Nigeria[22]. The spatial analysis revealed significant underlying factors that may not always be reflected by data collection in various surveys but are unique to certain regions and may strengthen or weaken the association with non-condom use.

The study found that non-condom use varied significantly across various regions of Nigeria. A plausible explanation for this finding is that the practice of safe sex with the use of condoms could be attributed to exposure to the media. Consistent condom use during sexual intercourse remains an important public health prevention

strategy against the spread of sexually transmitted diseases and HIV[23]. Therefore, this finding suggests that there still exists a knowledge gap about the importance of media awareness, and health education specific to the distinctiveness of each geographical location in Nigeria.

Furthermore, the current study found that older youth aged 20–24 are less likely to be non-condom users compared to the younger age group 15–19, which is contrary to the findings from a South African study[24], which suggests that older youth may be knowledgeable about the risks of non-condom use and being sexually active.

The findings of this study also suggest that sexually active young females are more likely than males not to use condoms. This finding corresponds to the study conducted by Chimbindi et al. that discovered that since condoms are a male-determined method of contraception, men are more likely than women to report using them[24]. A plausible explanation for this finding is that male condoms are considered easier to use and widely available.

Our research demonstrates that non-condom use varies by socioeconomic status. Young people with primary, secondary, and higher education levels are less likely to be non-condom users. This may be explained by the fact that education equips individuals to make well-informed decisions regarding important issues affecting their sexual and reproductive health which is in agreement with the results from an earlier study[4].

Additionally, the study also showed that young people in the poorer category of the wealth index had lower odds of non-condom use than their counterparts. This finding corroborates a study by Olorunsola et al. who reported that a poor economy was associated with a high percentage of risky sexual behavior[24]. A plausible explanation for this finding is that poor young people are prone to financial constraints that make it difficult to purchase condoms or seek sexual and reproductive health counseling from health facilities.

Sexually active young people who have media exposure are less likely to be non-condom users. This corroborated another study on media exposure and risky sexual behavior[25]. This finding suggests that awareness through mass media campaigns has a positive relationship with condom use among young people. Adolescents who have access to media are more likely to acquire accurate and meaningful information that can be beneficial in promoting safer sexual practices This highlights the significant role of media in providing education and health-related information[4]. In addition, young people from rural settings are more likely to be non-condom users. This contrasts a finding in sub-Saharan Africa that young people from urban areas have higher odds of non-condom use[24]. A possible reason for this finding is that young people in rural areas are less educated, and may have poor access to sexual and reproductive health services, reducing the likelihood of condom use.

In addressing the findings of this study, it is essential to implement a combination of interventions tailored to specific contexts, especially the hotspots of non-condom use. We suggest policies and programmes targeted to young people and aimed at promoting education on the dangers of risky sexual behaviors while also providing information on the benefits of condom use and safe sex practices, furthermore, it is essential to strengthen and scale existing programmes, such as youth-friendly health services, to regions without such services, especially the hotspot region, to enable young people to access health services where they find trust and can express themselves without reservation. This is important because young people often hesitate to seek help in conventional hospital settings for fear of judgment.

The strength of this study is its use of a nationally representative data set, which enhances the generalizability of our findings to young people in Nigeria. Additionally, using geographic information system (GIS) in the study allowed us to identify the hotspots for non-condom use among young people in the country.

The study, however, has its limitations. It relied on secondary data; thus the reliability of our findings depends on the quality of the NDHS. Nevertheless, the DHS is widely recognized as one of the most reliable data sources, particularly because it is the most extensive data collection program on health at the population level in Nigeria and most sub-Saharan African nations. Due to the cross-sectional nature of the data, it is difficult to conclude cause-and-effect relationships. Lastly, the self-reported nature of data on condom use makes it susceptible to recall bias with no means of verification of all information supplied. Future research using qualitative methods is suggested to explore other factors contributing to non-condom use that this study may not have addressed, mainly because it uses secondary data sets.

Conclusion

The study found that non-condom use in Nigeria ranged from 0 to 60% across the country, with regional variations. Therefore, to further improve condom use among young people in Nigeria, factors identified in this study should be given the most attention through health promotion and education.

Data availability

The dataset used for the preparation of this manuscript is available at https://dhsprogram.com/data/dataset. The result-based data are included in the manuscript.

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Acknowledgements

Author contributions

Conceptualization: O.E.B., O.A.O.; implementation: all authors; data access and extraction: O.A.O., O.E.B.; data analysis and interpretation: O.A.O.; writing (original draft): O.E.B. and O.A.O.; and writing (review and editing): O.E.B. and O.A.O.

Funding

Competing interests

The authors declare no competing interests.

Ethical approval

Permission to use the 2018 NDHS dataset for the study was sought and obtained from ICF International. Because we used a secondary dataset, all the information that could be used to identify the respondents was already removed by ICF International, and there was no attempt to identify any household or individual respondent interviewed in the survey. The 2018 NDHS protocol was approved by Nigeria's National Health Research Ethics Committee (NHREC/01/01/2007). Equally, the ICF Institutional Review Board approves all DHS to ensure they follow the U.S. Department of Health and Human Services ethical standards and regulations for the respect of human subjects. Detailed information on the ethical processes involved in the DHS program can be accessed at https://goo.gl/ny8T6X

Additional information

Correspondence and requests for materials should be addressed to O.E.B.

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