

Contents lists available at ScienceDirect

Drug and Alcohol Dependence



journal homepage: www.elsevier.com/locate/drugalcdep

Short communication

Drug use and needle sharing among adolescents and young adults in Nigeria: A cross-sectional secondary analysis of data from a multi-site clinical trial

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ARTICLE INFO

ABSTRACT

Keywords: Drug use Adolescents Young adults Nigeria Needle sharing Harm reduction	 Background: Adolescents and young adults (AYA, 14–24 years old) have the highest rates of drug use in most low-and middle-income countries. Little is known about the drivers of drug use among AYA in Nigeria and harm reduction services are limited. Methods: A secondary data analysis was performed of the baseline survey of the 'I-TEST' study involving AYA in Nigeria. The two primary outcomes of interest were lifetime measures of drug use and needle sharing. Logistic regression analyses were performed to obtain odds ratios for the associations between socio-demographic exposures and the two primary outcomes. Odds ratios were subsequently adjusted for age and sex. Results: 1500 AYA survey responses were analysed. Respondents were mostly unemployed, students, and living in southern Nigeria. Drug use was reported by 301/1500(20.3 %) AYA. Among these, 213/301(71.5 %) reported needle sharing. Drug use did not vary by age (OR:0.94, 95 %CI:0.73–1.22) or sex (OR:1.00, 95 %CI:0.77–1.28). AYA in the North-Central zone had higher odds of drug use (OR:1.86, 95 %CI:1.28–2.69) and needle sharing (OR:2.51, 95 %CI:0.75–5.91) compared to AYA in the South-West zone of Nigeria. AYA aged 14–19 had higher odds of needle sharing compared to those aged 20–24 (OR:3.49, 95 %CI:1.94–6.26). Female AYA had higher odds of needle sharing compared to males (OR:5.05, 95 %CI:2.85–8.95). Conclusions: Drug use and needle sharing are common among AYA in Nigeria. There is an urgent need for harm reduction services and research informed by AYA.

1. Introduction

Illicit drug use is a significant global public health concern among adolescents and young adults (AYA). We define AYA as people aged 14–24 years old. AYA often face barriers accessing drug treatment services (O'Keefe et al., 2017; Degenhardt et al., 2016). Many AYA in lowand middle-income countries are vulnerable to the harmful consequences of drug use (O'Keefe et al., 2017; Degenhardt et al., 2016; de la Torre-Luque et al., 2021). Nigeria has the largest AYA population of any country in Africa (United Nations D of E and SA, 2022). A deeper understanding of patterns of AYA drug use is essential for informing harm reduction strategies.

In 2018, the United Nations Office on Drugs and Crime (UNODC) published the first national review of drug use in Nigeria (United

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https://doi.org/10.1016/j.drugalcdep.2025.112666

Available online 3 April 2025

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Nations Office on Drugs and Crime and Division for treaty affairs, 2018). Surveys of people aged 15–64 years in Nigeria estimated that 14.4 % had used illicit drugs in the last year, almost three times higher than the global estimate of 5.6 % (United Nations Office on Drugs and Crime and Division for treaty affairs, 2022). They estimated that one in five people who undertook 'high-risk' drug use were injecting drugs. Drug use patterns and harm reduction needs are population- and region-specific. However, AYA are often excluded from research due to ethical and practical considerations (Siembida et al., 2020; Day et al., 2020). There is a paucity of data looking specifically at drug use and needle sharing among AYA in Nigeria.

We applied ecosocial theory to consider potential drivers of drug use among AYA in Nigeria (Fig. 1) (Krieger, 2012; Levins and Lopez, 1999; Oyediran et al., 2020). These were explored through analysis of the baseline survey of the Innovative Tools to Expand youth-friendly HIV Self-Testing (I-TEST) trial.Iwelunmor et al., 2022a

2. Methods

2.1. Ethical approval

Ethical approval was obtained from the Nigerian Institute of Medical Research, Saint Louis University, University of North Carolina at Chapel Hill and London School of Hygiene and Tropical Medicine. I-TEST fulfilled criteria defined by the National Health Research Ethics Committee of Nigeria to waive parental consent for minors enrolled in research (Nigerian Health Research Ethics Committee of Nigeria NHREC, 2016).

2.2. I-TEST

'4 Youth by Youth' (4YBY) (For Youth by Youth,) is a collaborative platform that develops crowdsourced interventions to improve access to HIV self-testing for AYA in Nigeria (Iwelunmor et al., 2022a; Tahlil et al., 2021; Iwelunmor et al., 2022b, 2023). The I-TEST study, by 4YBY, aims to evaluate the effectiveness of an HIV self-testing strategy, co-produced with AYA, using a stepped-wedge, cluster randomised trial. A stepped-wedge trial is a type of cluster trial in which groups are incrementally exposed to the intervention at different times.

Each I-TEST participant completed a paper baseline survey instrument. The survey was self-administered. Research assistants were available to address any questions. The survey gathered information about the participants' history of recreational drug use, needle sharing, socio-demographic exposures and sexual health (Iwelunmor et al., 2022a).

This report is a secondary analysis of the I-TEST trial baseline survey dataset.

2.3. Study population

The I-TEST study recruited participants from 32 Local Governmental



Proposed drivers of drug use among

*Drivers investigated in this secondary data analysis Figure created using Canva

Fig. 1. Proposed drivers of drug use among AYA in Nigeria, structured using ecosocial theory.

Areas (LGAs) across the South-South, South-West, South-East and North-Central geopolitical zones of Nigeria, between May and September 2021. Eligible individuals were aged 14–24 years, planned to live in the same LGAs for at least one year, and owned a mobile phone. Written consent was obtained from all 1500 participants enrolled.

Data were anonymised, encrypted and stored on a passwordprotected laptop. Data analysis was performed with Stata software (version 18).

2.4. Key variables

This study focussed on two primary outcomes. 'Drug use' included marijuana, but not alcohol or tobacco. We used a UNODC construct and asked participants about whether they had ever used drugs for recreation or stress relief (United Nations Office on Drugs and Crime and Division for treaty affairs, 2018, 2022). We also collected information, about the type of drug used. 'Needle sharing' was asked as a single item focussed on whether they had ever shared needles or other injection equipment.

Socio-demographic exposures were analysed to understand their associations with the two primary outcomes. Exposures included age, sex, gender, geopolitical zone, ethnicity, highest level of education, student status, employment status, annual income, current disability and marital status.

Conceptual frameworks were created to explore how sociodemographic exposures might interact. Confounding variables were identified. Age and sex were considered confounders for all associations because UNODC data reports that drug use in Nigeria is more common among men and people of older ages (United Nations Office on Drugs and Crime and Division for treaty affairs, 2018). Remaining confounders were assessed on a case-by-case basis.

2.5. Data analysis

Logistic regression analysis was conducted to examine the associations between socio-demographic exposures and the two primary outcomes. Results were reported as unadjusted odds ratios (ORs) with 95 % confidence intervals (95 %CIs). Subsequently, in multivariable analysis, identified confounders were included using forward selection to determine adjusted odds ratios (aORs) (Bursac et al., 2008). A likelihood ratio test (LRT) was performed to obtain a p-value per ratio. A significance level of α = 0.05 was used.

Socio-demographic exposures missing more than 10 % data were excluded from analyses. Additionally, to ensure statistical reliability, each exposure sub-category required at least 10 participants to be included in the analysis (Peduzzi et al., 1996, 1995). For remaining data, complete case analysis was performed: only participants with data available for all relevant variables were included per analysis (Liu, 2016). For the analysis of drug use, logistic regression of socio-demographic exposures was performed for all participants, whereas for needle sharing, this was restricted to only participants who reported drug use.

3. Results

All 1500 survey responses were analysed. Participant characteristics are summarised in Table 1. There were 871(58.4 %) participants aged 20–24 and 620(41.6 %) aged 14–19. Of these 752(50.2 %) were male and 745(49.8 %) were female. Five(0.3 %) participants identified with a gender different from their sex assigned at birth. The South-West zone had the greatest number of participants, 548(36.6 %), followed by the South-South, 500(33.4 %), South-East, 250(16.7 %) and North-Central, 200(13.4 %) zones. Over a third of AYA participants were of Igbo ethnicity, 541(36.3 %), and less than a third were of Yoruba ethnicity, 443(29.7 %). The remaining participants reported 85 different ethnicities.

Table 1

Distribution of socio-demographic exposures among AYA who completed the I-TEST baseline survey instrument from May to September 2021 (n = 1500).

Exposure	Category	Frequency (%)*	Missing data			
Contra do una se altico d	1500)	(,				
Socio-demographics (n = 1500) Account $20, 24$ means ald 0.71 (50.4) 0.71						
Age	20–24 years old	8/1 (58.4)	9			
0	14–19 years old	620 (41.6)	0			
Sex	Male	752 (50.2)	3			
0 1	Female	745 (49.8)	0			
Gender	Same as sex assigned at birth	1492 (99.7)	3			
	Different to sex assigned at birth	5 (0.3)				
Geopolitical zone	South-West	548 (36.6)	2			
	South-South	500 (33.4)				
	South-East	250 (16.7)				
	North-Central	200 (13.4)				
Ethnicity	Igbo	541 (36.3)	8			
	Yoruba	443 (29.7)				
	Other	508 (34.0)				
Highest level of	Primary or nil	177 (11.9)	14			
education	Secondary	1025 (69.0)				
	Higher	284 (19.1)				
Student status	Not current student	340 (22.8)	10			
	Current student	1150 (77.2)				
Employment	Unemployed	958 (64.7)	20			
status	Self employed	329 (22.2)				
	Employed part-time	116 (7.8)				
	Employed full-time	77 (5.2)				
Estimated annual	< N r216.000	616 (42.4)	541^{\dagger}			
income (in	₦216.000 to ₦420.000	238 (16.4)				
Nigerian naira)	> ₩420.000	105 (7.2)				
Current disability	No	1362 (91.3)	78			
	Yes	60 (4.0)				
Marital Status	Never married / Single	1461 (98.0)	9			
	Other	30 (2.0)	-			
Prevalence of drug us	se(n = 1500)	,				
A history of drug	No	1184 (79.7)	15			
use	Ves	301 (20.3)				
Needle sharing amon	g AYA with a history of drug use (n	= 301)				
Ever shared No. 85 (28.5) 3						
needles	Yes	213 (71.5)	-			

*Percentages calculated with exclusion of missing data

[†]Missing data > 10 % of n

Abbreviations: AYA - adolescents and young adults

Drug use was reported by 301(20.3 %) respondents. Among these, 213(71.5 %) reported needle sharing. Data for drug use and needle sharing were missing for 15 and 3 respondents, respectively.

Marijuana was the most commonly reported drug used (60 participants) followed by tramadol (Jatau et al., 2021) and codeine (Liu, 2016). Five or fewer participants reported using poppers, rohypnol, cocaine, morphine, madras, glue or amphetamine. No participants reported heroin use.

3.1. Socio-demographic exposures and drug use

AYA in the North-Central zone had higher odds of drug use compared to AYA in the South-West zone (OR:1.86, 95 %CI:1.28–2.69). This effect was less evident after adjusting for age, sex, and ethnicity (aOR:1.49, 95 %CI:1.01–2.19).

There was a lack of evidence that historical drug use varied with age, sex, ethnicity, education, student status, employment, or disability (Table 2).

3.2. Socio-demographic exposures and needle sharing

AYA aged 14–19 had higher odds of having ever shared needles compared to AYA aged 20–24 (OR:3.49, 95 %CI:1.94–6.26). Female AYA had higher odds of having ever shared needles compared to male AYA (OR:5.05, 95 %CI:2.85–8.95).

AYA in the North-Central zone had higher odds of having ever shared

Table 2

Univariable and multivariable analyses of the association between socio-demographic exposures and a history of drug use among AYA who completed the I-TEST baseline survey instrument from May to September 2021 (n = 1500).

Exposure	Category	Proportion drug use (%)	Unadjusted OR (95 %CI)	P value*	Adjusted OR^{\dagger} (95 %CI)	P value*
Age	20–24 §	179/863 (20.7)	1	0.659	-	-
(n = 1479)	14–19	122/616 (19.8)	0.94 (0.73-1.22)		-	
Sex	Male [§]	151/746 (20.2)	1	0.980	-	-
(n = 1484)	Female	149/738 (20.2)	1.00 (0.77-1.28)		-	
Geopolitical zone	South-West [§]	108/506 (21.3)	1	< 0.0001	1	< 0.0001
(n = 1398)	South-South	57/475 (12.0)	0.50 (0.35-0.71)		0.31 (0.21-0.47)	
	South-East	41/229 (17.9)	0.80 (0.54-1.20)		0.61 (0.38-1.00)	
	North-Central	63/188 (33.5)	1.86 (1.28-2.69)		1.49 (1.01–2.19)	
Ethnicity	Igbo [§]	105/531 (19.8)	1	0.373	1	0.723
(n = 1473)	Yoruba	83/441 (18.8)	0.94 (0.68–1.30)		0.94 (0.68–1.30)	
	Other	112/501 (22.4)	1.17 (0.87–1.58)		1.16 (0.86–1.57)	
Highest level of education	Higher [§]	52/271 (19.2)	1	0.481	1	0.254
(n = 1393)	Secondary	177/958 (18.5)	0.95 (0.68–1.35)		0.97 (0.68–1.39)	
	Primary or nil	37/164 (22.6)	1.23 (0.76–1.97)		1.42 (0.82–2.49)	
Student status	Not current student [§]	60/318 (18.9)	1	0.910	1	0.852
(n = 1378)	Current student	203/1060 (19.2)	1.02 (0.74–1.40)		0.97 (0.69–1.35)	
Employment status	Unemployed [§]	155/896 (17.3)	1	0.080	1	0.166
(n = 1380)	Self-employed	62/304 (20.4)	1.22 (0.88-1.70)		1.29 (0.92-1.82)	
	Employed part-time	28/109 (25.7)	1.65 (1.04-2.63)		1.49 (0.93-2.40)	
	Employed full-time	18/71 (25.4)	1.62 (0.93-2.85)		1.53 (0.86-2.72)	
Current disability	Νο [§]	259/1344 (19.3)	1	0.653	1	0.643
(n = 1403)	Yes	10/59 (17.0)	0.85 (0.43–1.71)		0.85 (0.43–1.70)	

*P value: likelihood ratio test of association with drug use

[†]Potential confounders used in the final adjusted models: Geopolitical zone adjusted for age, sex and ethnicity. Ethnicity adjusted for age and sex. Highest level of education adjusted for age, sex and geopolitical zone. Student status adjusted for age, sex and geopolitical zone. Employment status adjusted for age, sex and geopolitical zone. Current disability adjusted for age and sex.

⁸Reference category

Abbreviations: AYA - adolescents and young adults

needles compared to AYA in the South-West (OR:2.51, 95 % CI:1.07–5.91). This effect was evident after adjusting for age, sex, and ethnicity (aOR:4.48, 95 %CI:1.74–11.56) (Table 3).

4. Discussion

One in five(20.3 %) AYA in this study reported a history of drug use, aligning with recent estimates in Nigeria (Olanrewaju et al., 2022; Ajayi and Somefun, 2020; Mehanović et al., 2020). However, prevalence was higher than in similar age cohorts in the Nigerian UNODC survey

(United Nations Office on Drugs and Crime and Division for treaty affairs, 2018). This discrepancy may be due to a broader focus of the UNODC survey on adults, potentially underestimating drug use among AYA (United Nations Office on Drugs and Crime, 2003). While this this was not a population-based sample, drug use prevalence did not vary significantly with age, sex, ethnicity, education, employment or disability. These findings underscore the need for harm reduction services that are accessible to all AYA in Nigeria.

Needle sharing was highly prevalent among AYA who had used drugs (71.5 %), a level alarmingly higher than the 38.9 % reported by the

Table 3

Univariate and multivariate analyses of the association between socio-demographic exposures and a history of needle sharing among AYA who completed the I-TEST baseline survey instrument from May to September 2021 and have a history of drug use (n = 301).

Exposure	Category	Proportion with needle sharing (%)	Unadjusted OR (95 % CI)	P value*	Adjusted OR [†] (95 % CI)	P value*
Age	20–24 [§]	110/177 (62.2)	1	< 0.0001	-	-
(n = 298)	14–19	103/121 (85.1)	3.49 (1.94-6.26)		-	
Sex	Male [§]	83/148 (56.1)	1	< 0.0001	-	-
(n = 297)	Female	129/149 (86.6)	5.05 (2.85-8.95)		-	
Geopolitical zone	South-West [§]	78/107 (72.9)	1	0.0003	1	< 0.0001
(n = 267)	South-South	30/57 (52.6)	0.41 (0.21-0.81)		0.54 (0.23-1.27)	
	South-East	32/41 (78.1)	1.32 (0.56-3.10)		1.13 (0.39–3.33)	
	North-Central	54/62 (87.1)	2.51 (1.07-5.91)		4.48 (1.74–11.56)	
Ethnicity ($n = 297$)	Igbo [§]	78/103 (75.7)	1	0.473	1	
	Yoruba	57/82 (69.5)	0.73 (0.38-1.40)		0.81 (0.40-1.64)	0.769
	Other	77/112 (68.8)	0.71 (0.39-1.29)		0.80 (0.42-1.54)	
Highest level of education	Tertiary/Postgraduate [§]	31/52 (59.6)	1	< 0.0001	1	
(n = 264)	Secondary/National	126/175 (72.0)	1.74 (0.91–3.12)		1.68 (0.82-3.46)	0.022
	diploma					
	Primary or nil	36/37 (97.3)	24.39 (3.10–191.87)		11.07 (1.27-96.13)	
Student status ($n = 261$)	Not current student [§]	43/60 (71.7)	1	0.764	1	0.397
	Current student	148/201 (73.6)	1.10 (0.58–2.10)		0.74 (0.36–1.50)	

*P value: likelihood ratio test of association with needle sharing

[†]Potential confounders used in the final adjusted models: Geographical zone adjusted for age, sex and ethnicity. Ethnicity adjusted for age and sex. Highest level of education adjusted for age, sex. Student status adjusted for age, sex.

[§]Reference category

Abbreviations: AYA - adolescents and young adults

Nigerian HIV/STI Integrated Biological and Behavioural Surveillance Survey 2021 of people aged 15–49 (Federal Ministry of Health, 2020). Several factors may explain this difference, including the younger age of our cohort and the lifetime measure of needle sharing rather than a time-bound assessment. Nevertheless, these findings are critical as needle sharing is a potential driver of the growing population of AYA in Nigeria living with HIV and other BBVs (Federal Ministry of Health, 2020; Nigeria HIV/AIDS Indicator and Impact, 2019).

Marijuana was the most commonly reported drug. However, this was an optional survey question with frequent missing data. As such, our study offers limited insight into the types of drugs injected, a key limitation that warrants further investigation.

Despite being so close in age, AYA aged 14–19 had higher odds of needle sharing compared to those aged 20–24. This may reflect a growing prevalence of needle sharing among this younger generation of AYA. Systematic reviews suggest that peer influence may be a key driver of drug use among AYA, and emphasise the effectiveness of peer-led interventions (MacArthur et al., 2016; Henneberger et al., 2021). In Nigeria, there is evidence that AYA receive drugs from people in their social networks, reinforcing the need for peer-based harm reduction strategies (Jatau et al., 2021).

Female AYA had higher odds of needle sharing than their male counterparts, consistent with global trends (Roberts et al., 2010). Research in Nigeria suggests that women often inject using a male sexual partner's needle as an act of trust, (Nelson and Abikoye, 2019) reflecting gendered power dynamics in access to drugs and injection paraphernalia. These findings highlight the need for gender-equitable harm-reduction services.

Regional differences were observed, with AYA in the North-Central zone having higher odds of both drug use and needle sharing compared to the South-West. This finding is supported by another study which demonstrated that drug use was more common among AYA in Northern than Southern states (Vigna-Taglianti et al., 2019). However, UNODC data reports lowest prevalence of drug use in the North-Central zone among people aged 15–64 (United Nations Office on Drugs and Crime and Division for treaty affairs, 2018). Our findings suggests that drug use among AYA in Northern states may be higher than previous estimates. Addressing this disparity is crucial to ensuring harm reduction services meet AYA needs nationwide. Notably, few studies have focussed on drug use in the North-East and North-West zones. Future research and interventions should aim to include these regions.

Our study has several limitations. Certain groups were underrepresented including, non-students, AYA without mobile phones and AYA living in rural areas. However, research has previously shown rates of drug use to be similar among 'in-school' adolescents in urban and rural areas of Osun state (Ogunsola and Fatusi, 2017). We argue that future research and provision of services should include AYA in rural areas. Self-reported drug use may have underestimated actual drug use due to stigma. Additionally, the survey instrument was not primarily designed to focus on drug use and did not capture all relevant aspects. However, lifetime drug use is a commonly reported metric and allows for meaningful comparisons with other studies (Belete et al., 2023; Soremekun et al., 2020).

UNODC data indicates that faith-based treatment centres are the most commonly used drug treatment services in Nigeria (United Nations Office on Drugs and Crime and Division for treaty affairs, 2018). Future research should examine the relationship between religion and drug treatment services. Adding more harm reduction services into existing faith-based drug treatment services could be beneficial.

Drug use in Nigeria has been described as part of a syndemic, (Singer, 1996) interacting with socio-economic factors, sexual practices and mental health to heighten vulnerability to HIV (Ogunbajo et al., 2020; Dirisu et al., 2022). Our findings suggest multiple components contributing to this syndemic, warranting qualitative research to explore facilitators of needle sharing and AYA agency over drug use.

The Nigerian Government has identified drug use among AYA as a

public health issue and supports harm reduction research and services targeting this group. We welcome the National Drug Control Master Plan for 2021–2025 which acknowledges people who inject drugs as a key population and recognises the vulnerability of children, adolescents and youth (United Nations Office on Drugs and Crime, 2021). The plan is now in its final year, so it is imperative to evaluate its progress and ensure services are being effectively developed and accessed.

Additionally, we support the UNODC's Strategic Vision for Nigeria 2030 which prioritises HIV prevention and emphasises youth involvement in drug prevention initiatives (United Nations Office on Drugs and Crime, 2024). Our findings reinforce the urgent need for peer-informed interventions, tailored to the realities of AYA drug use in Nigeria.

The UNODC identified four major barriers to harm reduction services: cost, stigma, lack of services and limited awareness of existing services (United Nations Office on Drugs and Crime and Division for treaty affairs, 2018). These barriers are exacerbated by the criminalisation of same-sex relationships in Nigeria. Research suggests low uptake of services in Nigeria is a linked to law enforcement strategies, underscoring the need for systemic change that supports harm reduction efforts (Nelson, 2024).

In conclusion, urgent action is needed to address the high levels of drug use and needle sharing among AYA in Nigeria. Younger age, female sex and residence in the North-Central geopolitical zone were identified as key factors associated with needle sharing. These findings provide new evidence to inform the development of multi-sectorial, culturally appropriate and youth-informed interventions aimed at preventing drug-related harms among AYA in Nigeria.

CRediT authorship contribution statement

Kuriakose Kevin: Writing - review & editing, Visualization. Iwelunmor Juliet: Writing - review & editing, Funding acquisition. Gbaja-Biamila Titilola: Writing - review & editing, Project administration, Investigation. Xian Hong: Writing - review & editing, Methodology, Formal analysis, Data curation. Agunbiade Simisola: Writing - original draft, Visualization, Methodology, Formal analysis, Conceptualization. Ezechi Oliver: Writing - review & editing, Supervision, Project administration, Funding acquisition. Oladele David: Writing - review & editing, Project administration, Investigation. Tucker Joseph: Writing - review & editing, Supervision, Project administration, Methodology, Funding acquisition, Conceptualization. Obiezu-Umeh Chisom: Writing - review & editing, Project administration, Investigation. Muse Adesola: Writing - review & editing, Formal analysis, Data curation. Blessing Lateef: Writing - review & editing, Project administration, Investigation. Tahlil Kadija: Writing - original draft, Methodology, Formal analysis, Data curation. Akinsolu Folahanmi: Writing review & editing, Project administration, Investigation. Conserve Donaldson: Writing - review & editing, Project administration, Funding acquisition. Adeoti Ebenezer: Writing - review & editing, Project administration, Investigation.

Clinical trial registration details

HIV Self-Testing (I-TEST) trial; ClinicalTrials.gov ID NCT04710784.

Funding

The authors are supported by two National Institutes of Health Grants (NICHD UG1HD113156, NIAID K24AI143471)

KMT is supported by the National Institute of Allergy and Infectious Diseases (NIAID) grant number: T32AI007001.

The funders had no role in study design, data collection, and analysis, decision to publish, or preparation of the manuscript.

Declaration of Competing Interest

No declarations of competing interest

References

- Ajayi, A.I., Somefun, O.D., 2020. Recreational drug use among Nigerian university students: prevalence, correlates and frequency of use. PLoS One 15 (5).
- Belete, H., Mekonen, T., Espinosa, D.C., Ambaw, F., Connor, J., Chan, G., et al., 2023. Cannabis use in sub-Saharan Africa: a systematic review and meta-analysis. Addiction 118 (7), 1201–1215.
- Bursac, Z., Gauss, C.H., Williams, D.K., Hosmer, D.W., 2008. Purposeful selection of variables in logistic regression. Source Code Biol. Med 3.
- Day, S., Kapogiannis, B.G., Shah, S.K., Wilson, E.C., Ruel, T.D., Conserve, D.F., et al., 2020. Adolescent participation in HIV research: consortium experience in low and middle-income countries and scoping review. Lancet HIV 7 (12), e844–e852.
- Degenhardt, L., Stockings, E., Patton, G., Hall, W.D., Lynskey, M., 2016. The increasing global health priority of substance use in young people. Lancet Psychiatry 3 (3), 251–264.
- Dirisu, O., Adediran, M., Omole, A., Akinola, A., Ebenso, B., Shoyemi, E., et al., 2022. The syndemic of substance use, high-risk sexual behavior, and violence: a qualitative exploration of the intersections and implications for HIV/STI prevention among key populations in Lagos, Nigeria. Front. Trop. Dis. 3.
- Federal Ministry of Health. HIV/STI Integrated Biological and Behavioural Surveillance Survey (IBBSS) - 2021 [Internet]. 2020. 2020 [cited 2023 Jun 19]. Available from: (https://wacphd.org/wp-content/uploads/2022/04/IBBSS-2020-FINAL-REPORT.pd f)
- For Youth by Youth. 4YBY For Youth by Youth [Internet]. [cited 2023 Jun 19]. Available from: $\langle https://4yby.org\rangle$
- Henneberger, A.K., Mushonga, D.R., Preston, A.M., 2021. Peer influence and adolescent substance use: a systematic review of dynamic social network research. Adolesc. Res Rev. 6 (1), 57–73.
- Iwelunmor, J., Ezechi, O., Obiezu-Umeh, C., Gbaja-Biamila, T., Musa, A.Z., Nwaozuru, U., et al., 2022b. Enhancing HIV self-testing among nigerian youth: feasibility and preliminary efficacy of the 4 youth by youth study using crowdsourced youth-led strategies. AIDS Patient Care STDS 36 (2), 64–72.
- Iwelunmor, J., Ezechi, O., Obiezu-Umeh, C., Gbaja-Biamila, T., Musa, A.Z., Nwaozuru, U., et al., 2023. Tracking adaptation strategies of an HIV prevention intervention among youth in Nigeria: a theoretically informed case study analysis of the 4 Youth by Youth Project. Implement Sci. Commun. 4 (1), 44.
- Iwelunmor, J., Tucker, J.D., Obiezu-Umeh, C., Gbaja-Biamila, T., Oladele, D., Nwaozuru, U., et al., 2022a. The 4 Youth by Youth (4YBY) pragmatic trial to enhance HIV self-testing uptake and sustainability: study protocol in Nigeria. Conte Clin. Trials 114.
- Jatau, A.I., Sha'aban, A., Gulma, K.A., Shitu, Z., Khalid, G.M., Isa, A., et al., 2021. The burden of drug abuse in Nigeria: a scoping review of epidemiological studies and drug laws. Public Health Rev. 42.
- Krieger, N., 2012. Methods for the scientific study of discrimination and health: an ecosocial approach. Am. J. Public Health 102 (5), 936–944. Available from: (htt ps://ajph.aphapublications.org/doi/full/10.2105/AJPH.2011.300544).
- Levins, R., Lopez, C., 1999. Toward an Ecosocial View of Health. Int. J. Health Serv. 29 (2), 261–293.
- Liu, X., 2016. Methods for handling missing data. Methods and Applications of Longitudinal Data Analysis. Elsevier, pp. 441–473.
- MacArthur, G.J., Harrison, S., Caldwell, D.M., Hickman, M., Campbell, R., 2016. Peer-led interventions to prevent tobacco, alcohol and/or drug use among young people aged 11–21 years: a systematic review and meta-analysis. Addiction 111 (3), 391–407.
- Mehanović, E., Virk, H.K., Akanidomo, I., Pwajok, J., Prichard, G., van der Kreeft, P., et al., 2020. Correlates of cannabis and other illicit drugs use among secondary school adolescents in Nigeria. Drug Alcohol Depend. 206, 107457.
- Ediomo-Ubong Nelson. Harm reduction programmes for people who inject drugs in Nigeria: Challenges in implementation and sustainability. 2024 May.

- Nelson, E.U.E., Abikoye, G.E., 2019. Syringe sharing and the risk of viral transmission among people who inject drugs in Nigeria: structural, relational, and subjective influences on behaviors. J. Drug Issues 49 (2), 387–404.
- Nigeria HIV/AIDS Indicator and Impact, 2019. 2018 Nigeria HIV/AIDS Indicator and Impact Survey. National Summary Sheet.

Nigerian Health Research Ethics Committee of Nigeria (NHREC). Policy Statement Regarding Enrollment of Children in Research in Nigeria (PS2.1016). 2016.

- O'Keefe, D., Stoové, M., Doyle, J., Dietze, P., Hellard, M., 2017. Injecting drug use in low and middle-income countries: opportunities to improve care and prevent harm. J. Viral Hepat. 24 (9), 714–724.
- Ogunbajo, A., Oke, T., Jin, H., Rashidi, W., Iwuagwu, S., Harper, G.W., et al., 2020. A syndemic of psychosocial health problems is associated with increased HIV sexual risk among Nigerian gay, bisexual, and other men who have sex with men (GBMSM). AIDS Care 32 (3), 337–342.
- Ogunsola, O.O., Fatusi, A.O., 2017. Risk and protective factors for adolescent substance use: a comparative study of secondary school students in rural and urban areas of Osun State, Nigeria. Int J. Adolesc. Med Health 29 (3).
- Olanrewaju, J.A., Hamzat, E.O., Enya, J.I., Udekwu, M.O., Osuoya, Q., Bamidele, R., et al., 2022. An assessment of drug and substance abuse prevalence: a cross-sectional study among undergraduates in selected southwestern universities in Nigeria. J. Int. Med. Res. 50 (10).
- Oyediran, K.A., Ishola, G., Bankole, A., 2020. Relationship between religion and
- unintended childbearing in Nigeria: a cross-regional perspective. Genus 76 (1), 15. Peduzzi, P., Concato, J., Feinstein, A.R., Holford, T.R., 1995. Importance of events per independent variable in proportional hazards regression analysis II. Accuracy and precision of regression estimates. J. Clin. Epidemiol. 48 (12), 1503–1510.
- Peduzzi, P., Concato, J., Kemper, E., Holford, T.R., Feinstein, A.R., 1996. A simulation study of the number of events per variable in logistic regression analysis. J. Clin. Epidemiol. 49 (12), 1373–1379.
- Roberts, A., Mathers, B., Degenhardt, L., National Drug and Alcohol Research Centre (Sydney). Women who inject drugs: a review of their risks, experiences and needs. National Drug and Alcohol Research Centre; 2010..
- Siembida, E.J., Loomans-Kropp, H.A., Trivedi, N., O'Mara, A., Sung, L., Tami-Maury, I., et al., 2020. Systematic review of barriers and facilitators to clinical trial enrollment among adolescents and young adults with cancer: identifying opportunities for intervention. Cancer 126 (5), 949–957.
- Singer, M., 1996. A dose of drugs, a touch of violence, a case of AIDS: conceptualizing the SAVA syndemic. Free Inq. Creat Socio 24, 99–110.
- Soremekun, R.O., Folorunso, B.O., Adeyemi, O.C., 2020. Prevalence and perception of drug use amongst secondary school students in two local government areas of Lagos State, Nigeria. South Afr. J. Psychiatry 26.
- Tahlil, K.M., Obiezu-Umeh, C., Gbajabiamila, T., Nwaozuru, U., Oladele, D., Musa, A.Z., et al., 2021. A designathon to co-create community-driven HIV self-testing services for Nigerian youth: findings from a participatory event. BMC Infect. Dis. 21 (1), 505.
- de la Torre-Luque, A., Ozeylem, F., Essau, C.A., 2021. Prevalence of addictive behaviours among adolescents from 73 low-and middle-income countries. Addict. Behav. Rep. 14, 100387.
- United Nations D of E and SA. UN Population Division Data Portal [Internet]. 2022 [cited 2023 Nov 9]. Available from: (https://population.un.org/dataportal/home) United Nations Office on Drugs and Crime. Global Assessment Programme on Drug
- United Nations Office on Drugs and Crime. Global Assessment Programme on Drug Abuse (GAP). Toolkit Module 2. Estimating Prevalence: Indirect Methods for Estimating the Size of the Drug Problem [Internet]. 2003. Available from: (www.un odc.org),
- United Nations Office on Drugs and Crime. National Drug Control Master Plan 2021-2025. 2021.
- United Nations Office on Drugs and Crime. UNODC Strategic Vision for Nigeria 2030. 2024;
- United Nations Office on Drugs and Crime and Division for treaty affairs. Drug Use in Nigeria. 2018.
- United Nations Office on Drugs and Crime and Division for treaty affairs. World Drug Report 2022. UNITED NATIONS; 2022.
- Vigna-Taglianti, F., Alesina, M., Damjanović, L., Mehanović, E., Akanidomo, I., Pwajok, J., et al., 2019. Knowledge, attitudes and behaviours on tobacco, alcohol and other drugs among Nigerian secondary school students: differences by geopolitical zones. Drug Alcohol Rev. 38 (6), 712–724.