International Journal of Mental Health and Addiction (2021) 19:1787–1798
https://doi.org/10.1007/s11469-020-00263-7

ORIGINAL ARTICLE

Descriptive Epidemiology of Alcohol Use in the Lagos State Mental Health Survey (LSMHS), Nigeria

Abiodun O. Adewuya[1,2] · Bolanle A. Ola[1] · Olurotimi Coker[1] · Olayinka Atilola[1] · Olufemi Olugbile[3] · Tolulope Ajomale[4] · Adedolapo Fasawe[4] · Olajide Idris[4]

Published online: 18 March 2020

Abstract

This study aimed to describe the level and form of alcohol consumption, drinking motives and the correlates of alcohol use disorders in Lagos, Nigeria. Adults ($n = 11,246$) selected via multi-staged random sampling, completed questionnaire detailing sociodemographic variables, alcohol and other psychoactive substance use, presence of common mental disorders and disability. Results showed an average daily intake (ADI) of 35.5 g of alcohol. There were 6510 (57.9%) current drinkers. The rate of heavy episodic drinking (HED) was 21.9%. About 17.5% of the population started regular drinking before the age of 21 years. The most endorsed reasons for drinking were social and coping motives. The rate of alcohol use disorders (AUD) was 7.1% (SE 0.2) and the significant associated factors were being male (OR 4.4), not married (OR 1.2) and non-Muslim (OR 6.42). Our study emphasised the need for large local surveys to generate data order for planning mental health services in sub-Saharan Africa countries.

Keywords Alcohol use disorders · Prevalence · Pattern · Epidemiology · Nigeria

There has been reports of rapid increase in alcohol availability and consumptions across all age groups in recent times in sub-Saharan Africa, especially Nigeria (WHO 2014; WHO 2018). Other reports have also suggested changes in pattern of drinking, intake of more harmful brand of alcohol and reduction in age of heavy drinking (Ferreira-Borges et al. 2017). Alcohol has been reported to be responsible for about 5.5% of all deaths, 5% of the global burden of diseases and 4.1% of

✉ Abiodun O. Adewuya
abiodun.adewuya@lasucom.edu.ng

[1] Department of Behavioural Medicine, Lagos State University College of Medicine, 1-5, Oba Akinjobi Way, Ikeja, Lagos, Nigeria

[2] Centre for Mental Health Research & Initiative (CEMHRI), Lagos, Nigeria

[3] Synthesiz Consults, Opebi, Lagos, Nigeria

[4] Lagos State Ministry of Health, Lagos, Nigeria

disability adjusted life year (DALY) in Africa (Griswold et al. 2018; WHO 2018). Alcohol causes large health-care costs in addition to substantial, but largely unmeasured, social cost (WHO 2018).

There are very few published data on the epidemiology of alcohol use and alcohol use disorders in Nigeria. The newly released '*Global status report on alcohol and health*' (GSRAH) (WHO 2018) suggested an extremely low rate of alcohol use disorders (AUDs) of 0.6% in Nigeria. This is in stark contrast to what was reported in other parts of sub-Saharan Africa (e.g. 7.0% on Cameroun, 10.0% on Cote d'Ivoire, 7.1% on Botswana, 4.1% in Ghana and 7.0% in South Africa). This has given rise to concerns and reservations in adopting the recent released report for planning alcohol intervention in the country. Although not expressly stated, the latest GSRAH seemed to have relied solely on the data generated from the Nigerian National Survey of Mental Health and Wellbeing (NSMHW) which was carried out as part of the World Mental Health Surveys (WMHS) initiative (Gureje et al. 2007). It had been suggested that the extremely low rates of disorders from the NSMHW may be due to the cultural applicability/validity of the diagnostic instrument (Composite International Diagnostic Interview-CIDI) (Gureje et al. 2006; Kessler and Bromet 2013). Of concerns also was the moderate sample size of the Nigerian survey as only 2143 participants were interviewed for the second stage of the survey. Recently, Lasebikan and Ola (2016) had assessed 1213 participants in 2 rural communities, but they had also estimated only for lifetime (57.9%) and current use (23.7%) of alcohol and not alcohol use disorders (AUDs). The recent Drug Use Survey for Nigeria (UNODC 2018) had focussed majorly on other psychoactive substances apart from alcohol and had only estimated alcohol use and not AUDs. A valid descriptive epidemiology of alcohol use disorders in Nigeria will require a survey with a large sample with an optimal mix of age group, gender, tribe and religion and using culturally appropriate and well-validated instruments.

Lagos state in southwestern Nigeria has a population of over 17.5 million (NBS 2014) and accounts for about 10% of Nigeria's population. Because of heavy migration from other parts of Nigeria and surrounding countries, Lagos has a very diverse population with all ethnic groups in the country well represented. The Lagos State Mental Health Survey (LSMHS) was initiated to assess the types, patterns and severity of common mental health disorders, alcohol and substance use problems in Lagos, in order to generate the data for planning mental health services in the state. The overall aim of this study was to provide a descriptive epidemiology of alcohol use in Lagos, using the data from the LSMHS. Our specific objectives were to (1) describe the level of alcohol consumption amongst adult residents of Lagos, Nigeria; (2) determine their commonly used brand of alcohol, the age at regular drinking and motives for drinking; (3) determine the rate and sociodemographic correlates of AUDs in this population and (4) determine the rate of co-morbidity of AUDs with substance use disorders, common mental health problems and disability. We hypothesise that our results will provide a more valid and reliable projections of epidemiology of alcohol use and alcohol use disorders in Nigeria than presently available.

Methods

Sampling Strategies

The sampling and recruitment method had been earlier described (Adewuya et al. 2018a, b) and a summary is provided here. The multistage procedure involved random selection of 2

Local Council Development Authorities (LCDAs) from each of the 5 administrative divisions of Lagos. From the selected LCDAs, enumeration areas (EAs) were determined according to the National Population Commission (NPC) demarcation. Listing of all the housing units and households in each EA showed an average of 3–5 households per housing unit. A systematic random sampling was used to select 5720 housing units. In the final stage of the selection, 2 households were randomly selected from a housing unit (making 11,440 households in all). The full list of all residents in each household above 18 years was obtained and the Kish table selection method (Kish 1985) was used to select one eligible person as the respondent from each household. The Kish method is essentially designed to ensure that the person most likely to answer a question is not different in a specific way from the rest of the population. When the primary respondent was either unavailable following repeated calls or refused participation, no replacement was made within the household.

Ethical Considerations

The International Guidelines for Ethical Review of Epidemiological Studies was followed throughout the project. The Ethics and Research Committee of the Lagos State University Teaching Hospital (LASUTH) gave the ethical approval for the project. Written informed consent was obtained from the participants before the questionnaire was administered.

Instruments

The LSMHS instruments were included in a booklet used for each participant. The household questionnaire included the following:

1. Sociodemographic details: This included age, gender, occupation, working status, marital status, ethnicity, highest education and religion
2. Alcohol use details: The participants were asked if they have ever drunk alcohol in their lifetime. For those who answered positively, drinking frequency was first assessed for every participant, while drinking pattern, drinking motives and alcohol use disorders were assessed only for those with significant alcohol use.

    a. Alcohol consumption: The short form of the Alcohol Use Disorders Identification Test (AUDIT-C) (Bush et al. 1998) was used to assess for alcohol consumption level. The AUDIT had been validated in Nigeria with good psychometric properties (Adewuya 2005). Standard drink and its local equivalent were explained. For the purpose of this study, a standard drink was defined as a drink containing 13.5 g of alcohol. To assist respondents, we illustrated examples of local equivalents of standard drinks in the questionnaire booklets and these were explained by trained research assistants (e.g. 1 can of ordinary beer – 330 ml at 4%, one shot of spirit – 30 ml at 40%, one glass of wine or small glass of sherry – 100 ml at 12% or 70 ml at 18% and a small glass of liqueur or aperitif – 50 ml at 25%). This 3-item short form of AUDIT has a cutoff score of 4 and above for men and 3 and above for women considered to be significant alcohol consumption level.
    b. Brand of alcohol and age at regular drinking: Participants scoring above the cutoff score for AUDIT-C were asked to name their usual brand of alcohol and age at which they started drinking regularly.
    c. Drinking motive: Drinking motive was assessed using the short form of the revised version of the Drinking Motives Questionnaire (DMQ-R-SF) (Kuntsche and Kuntsche

2009) which is a 12 self-report items designed to determine the motives behind drinking behaviour. The DMQ-R-SF measures four motives: social (for example, 'how often do you drink because it helps you enjoy a party?'), conformity (for example, 'how often do you drink to be liked?'), enhancement (for example, 'how often do you drink because you like the feeling?') and coping (for example, 'how often do you drink to forget your worries?'). Each factor is represented by three (3) items, to which respondents rate the relative frequency at which they consume alcohol for that reason on a 5-point Likert scale (1 = *almost never*/*never*, 5 = *almost always*/*always*). It has been proven to be valid across all cultures including Nigeria. The DMQ-R-SF was completed only by those scoring above the cutoff score on AUDIT-C.

d. Alcohol use disorders (AUDs): AUDs were assessed with the alcohol module of the 5th version of the Mini International Neuropsychiatric Interview (MINI-5.0) (Sheehan et al. 1998). The MINI-5.0 is a short structured clinical interview specifically designed for epidemiological studies, which enables researchers to make diagnoses of psychiatric disorders (including alcohol use disorders) according to DSM-IV. Although the MINI-5.0 was designed for DSM-IV diagnosis, we modified it for DSM-5. It is to be noted that out of the 11 criteria of the DSM-5 for AUD, 10 are from the combined DSM-IV abuse and dependence criteria, excluding the criteria of '*legal problems*', and an addition of a new criterion for '*craving*'. The DSM-5 has diagnostic threshold of at least 2 criteria (out of the 11), and establishment of a severity metric based on the criteria count. In our modified form, although all the 11 DSM-IV items were completed by the participants, we only used the 10 criteria from the DSM-IV that were included in the DSM-5 (excluding 'legal problems') in our analysis and we did not use the severity metric. All the participants completed the interviews.

3. Use of other psychoactive substances: Psychoactive substance use disorders (SUDs) were assessed using the modified SUD module of the MINI 5.0 (Kroenke et al. 2001). It was modified to include common locally used psychoactive substance and, like the alcohol module, although all the 11 DSM-IV items were completed by participants, only the 10 DRM-5 criteria were used for analysis of SUD.
4. Common mental disorders (depression and anxiety): These were assessed by the depression and anxiety modules of the Patient Health Question. The depression (PHQ-9) and anxiety (GAD-7) modules of the PHQ-9 (Kroenke et al. 2001; Spitzer et al. 2006) had been well validated in Nigeria (Adewuya et al. 2006; Amoran et al. 2007; Ogunsemi et al. 2010) and both have the score of 10 and above considered to be clinically significant symptoms.
5. Disability: Disability was assessed using the 12-item version of the WHO Disability Assessment Schedule (WHODAS 2.0) (Üstün et al. 2010). The WHODAS is a generic assessment instrument for health and disability applicable in both clinical and general population settings. It produces standardized disability levels and profiles and is applicable across cultures. A score of 13 and more on WHODAS is considered moderate to severe disability.

Procedure

Translation All the instruments were translated into the three major languages and Pidgin English (spoken by nearly 80% of Lagos population) using the WHO translation protocols. The translated versions were pilot tested on 100 participants before data collection.

Pre-Field Work Training and Pilot Study Research assistants ($n = 50$), supervisors ($n = 5$), monitors ($n = 3$) and the overall coordinator ($n = 1$) who were experienced field workers of the National Population Commission (NPC) with at least a university degree underwent a 1-week standardised training in interviewing skills and in administration of the questionnaire. Training includes field practical and dummy exercises.

Data Collection and Quality Control Survey data collection exercise was done over a period of 4 weeks of August to September 2015. Data collection was via face to face interviews using the paper and pencil method. In order to increase self-disclosure, self-completion of the questionnaire booklet was encouraged for literate participants and were given the self-administered booklets (of any language of their choice). For the non-literate participants, the questions were read to them in private and their responses ticked.

Data Analysis Data was centrally analysed using the IBM SPSS Statistics for Windows, Version 22.0 by independent statisticians. The sample was weighted to account for the stratified, multistage sampling procedure, the household clustering, and to also adjust for the differences between the sample and the total Nigerian population. Results were calculated as frequencies (%), means and standard deviations. Cross tabulations were used to estimate and compare females and males for rates of AUDs. Chi-square analysis was performed with p values recorded. For ease of interpretation, best subset model logistic regression analysis was done for each of the categories of age, gender, marital status, education level, occupation, employment status, ethnicity and religion. For each of these variables, the other variables were controlled for. Adjusted odds ratio (and 95% confidence interval) was reported. Statistical significance was set at 0.05.

Results

Sociodemographic Profiles

A total of 11,246 out of the 11,414 participants (98.5%) had completed questionnaire and were used for analysis (98.5% response rate). The mean age was 36.75 (SD 12.3) years with a range of 18–74 years. Majority (40.5%) of the participants were of age group 31–45 years. There were 4721 (42.0%) males, majority (69.3%) were married and 78.1% ($n = 8787$) had at least secondary education. Most (66.9%) were either petty traders or artisans, only 8379 (774.5%) were presently employed, 5503 (48.9%) were from the Yoruba ethnic group and 55.8% ($n = 6276$) were Christians. The rest of the sociodemographic profile is shown in Table 1.

Alcohol Use Details

Level of Consumption Table 2 showed that a total of 4079 participants (36.3%) including 958 males (20.3%) and 3121 females (47.8%) have never taken alcohol (lifetime abstainers). There are 657 (5.8%) former drinkers (previously consumed alcohol but not in the previous 12 months) while there are 6510 (57.9%) current drinkers (consumed alcohol in the previous 12 months). Using the 2nd item on the AUDIT-C (number of drinks on a typical day drinking), there was an average daily intake (ADI) of 2.6 drinks (35.5 g of pure alcohol) for the total

population and 4.5 drinks (60.7 g of pure alcohol) for the drinkers only. There were 2734 (21.9% of total population and 42.0% amongst drinkers) scoring 2 or more on item 3 of AUDIT-C (6 or more drinks on one occasion at least monthly in the past 1 year) and were considered having heavy episodic drinking (HED). The mean AUDIT-C score was 0.93 (SD 1.32) with mean scores for males (1.37, SD 1.62) significantly higher than for females (0.62, SD 0.94). A total of 976 (8.7%) participants have hazardous alcohol consumption with 634 (13.4%) males scoring 4 or more and 342 (13.4%) females scoring 3 or more on AUDIT-C.

Preferred Alcohol Brand and Age at Regular Drinking Table 3 showed that the most reported brand of alcohol was beer (29.3%) followed by palm wine (15.5%), local gin (13.8%), light vodka (13.4%), local bitters (12.5%), distilled and dry gin (12.4%) and others

Table 1 Sociodemographic details of the participants

	Total	%
Administrative regions		
Ikeja	3989	35.5
Ikorodu	3280	29.1
Badagry	1508	13.4
Lagos Island	1369	12.2
Epe	1100	9.8
Age range		
18–24 years	1758	15.6
25–54 years	8220	73.1
55–64 years	895	8.0
> 64 years	373	3.3
Sex		
Male	4721	42.0
Female	6525	58.0
Marital status		
Single	2624	23.3
Married (+ cohabiting)	7797	69.3
Divorced/widowed	825	7.3
Highest educational level		
No education	575	5.1
Primary	1884	16.8
Secondary	5958	53.0
Tertiary	2829	25.2
Occupation		
Housewife/student/retiree	2018	17.9
Petty trader/artisan	7526	66.9
Civil servant	771	6.9
Professionals/business	931	8.3
Working status		
Presently working	8379	74.5
Presently not working	2867	25.5
Ethnicity		
Yoruba	5503	48.9
Igbo	2214	19.7
Hausa	1822	16.2
Others	1707	15.2
Religion		
Christianity	6276	55.8
Islam	4490	39.9
Others	480	4.3

(3.1%). Figure 1 showed that the age at regular drinking peaked at 26–30 years (28.6%), although it should be noted that a substantial percentage (22.1%) started regular drinking at the age of 21–25 and another 13.5% started much earlier at between 16 and 20 years of age. Only 12.2% started drinking regular from 36 years and above.

Drinking Motives The mean scores on DMQ-R-SF was 9.11 (SD 3.89) for *enhancement motive*, 10.49 (SD 3.84) for *social motive*, 8.39 (SD 3.99) for *conformity motive* and 10.41 (SD 3.74) for *coping motives* (Table 2). This indicates social and coping motives to be the most endorsed for drinking and conformity motives the least endorsed.

Alcohol Use Disorders A total of 802 participants (597 males and 205 females) met 2 or more of the DSM-5 criteria and regarded as having diagnosis of AUD. The weighed sample showed a prevalence of 7.1% (SE 0.24), specifically 12.5% (SE 0.48) for males and 3.1% (SE 0.22) for females.

Clinical Disorders and Disability

The MINI could identify 237 (2.1%) as having other substance use disorders (SUDs). The mean scores for PHQ-9 was 2.29 (SD 3.64) and for GAD-7 was 2.63 (SD 3.01). There were 627 participants meeting the criteria for clinically significant depressive symptoms and 387 meeting the criteria for clinically significant anxiety symptoms respectively. The mean score on WHODAS-II was 4.45 (SD 6.94) with 1239 (11.0%) scoring 13 or more and categorised as having significant (moderate to severe) disability.

Sociodemographic and Clinical Correlates of AUDs

Table 4 showed the adjusted OR (95% CI) after logistic regression for sociodemographic correlates of AUD. While age, level of education, employment status and ethnicity had no significant association with AUD, there was significant higher rates in males (OR 4.46, 95% CI 3.78–5.28) and those who were not married (OR 1.24, 95% CI 1.07–1.45), while there was a significantly higher rates amongst Christians (OR 4.57, 95% 3.70–5.69) and other religions (OR 6.42, 95% CI 4.50–8.96) compared with Muslims. Table 4 also revealed that diagnosis of AUD is highly co-morbidity with diagnosis of SUD (15.1%), depression (14.3%), anxiety (19.6%) and disability (17.6%).

Table 2 Alcohol consumption details of the participants

Alcohol consumption variables	Total ($n = 11,246$)	Male ($n = 4721$)	Female ($n = 6525$)
Lifetime abstainers	4079 (36.3%)	958 (20.3%)	3121 (47.8%)
Former drinkers	657 (5.8%)	423 (9.0%)	234 (3.6%)
Current drinkers	6510 (57.9%)	3340 (70.7%)	3170 (48.6%)
Average daily intake (ADI)	35.5 g*	52.7 g**	22.9 g***
Heavy episodic drinking (HED)	2473 (21.9%)+	1820 (38.6%)++	653 (10.0%)+++
AUDIT-C mean scores	0.93 (SD 1.32),	1.37 (SD 1.62)	0.62 (SD 0.94)
Hazardous alcohol consumption	976 (8.7%)	634 (13.4%)	342 (13.4%)

*, 60.7 g for current drinkers only; **, 74.3 g for current drinkers only; ***, 47.3 g for current drinkers only; +, 42.0% of current drinkers only; ++, 54.5% for current drinkers only; +++, 20.6% for current drinkers only

Table 3 Preferred alcohol brand and drinking motive

Preferred alcohol brand	Total ($n = 976$)
Beer	286 (29.3%)
Palm wine	151 (15.5%)
Local gin	135 (13.8%)
Distilled spirit and dry gin	121 (12.4%);
Light vodka and wine	131 (13.4%)
Local bitters	122 (12.5%)
Others	30 (3.1%)
DMQ-R-SF domains	Mean (SD)
Enhancement motives	9.11 (3.89)
Social motives	10.49 (3.84)
Conformity motives	8.39 (3.99)
Coping motives	10.41 (3.74)

Discussion

In this study, we aimed to provide an overview of the descriptive epidemiology of alcohol use in Lagos, Nigeria, using the data from the LSMHS. Despite the availability of cross-national data from the NMSHW and the newly released GSRAH, we were convinced of the need for local study to inform local health policy and services. We had conducted a face to face interview with a large population, had used scales that had been well validated locally and had attempted to evaluate for AUDs and its comorbid conditions.

Our rates of lifetime users (63.7%) and current users (57.9%) of alcohol was similar to the estimates by the GSRAH (69.6% lifetime and 67.0% current users) but much higher than those reported by the NMSHW (57.6% lifetime and 19.9% current users), the Drug Use Survey for Nigeria (25% lifetime and 19% current users) and in the semi-urban communities in south-western Nigeria (57.9% lifetime and 23.7% current users). The validity of our findings can be supported by our much larger sample size, the recency of our data (collected 12 years after that of the NMSHW) and the heterogenous nature of our sample. It could also be argued that city dwellers are much more likely to use alcohol compared with those in semi-urban and rural areas as urbanicity had been implicated in alcohol consumption rates (Borders and Booth 2007). Heavy episodic drinking (HED) seemed to be increasingly common in the sub-Saharan Africa. Our rate of 21.9% was a bit lower than the projected 28.9% by GSRAH. This pattern of drinking is more likely to be associated with intoxication, accidents and violence. Although the

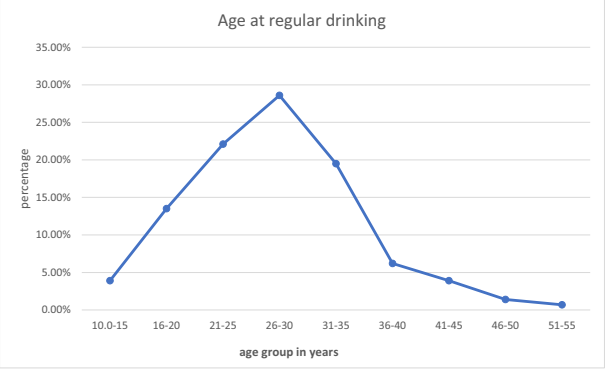

Fig. 1 Age at regular drinking

Table 4 Sociodemographic correlates and clinical co-morbidity with alcohol use disorders

Variables	Rate	Adjusted OR (95% CI)	*P* value
Sociodemographic			
Age			
18–24 years	6.7%	1 (ref)	
25–54 years	7.5%	1.13 (0.92–1.39)	0.276
55–64 years	5.3%	0.79 (0.55–1.12)	0.203
> 64 years	5.3%	0.79 (0.46–1.29)	0.397
Sex			
Female	3.1%	1 (ref)	
Male	12.6%	4.46 (3.78–5.28)	< 0.001*
Marital status			
Married (+ cohabiting)	6.7%	1 (ref)	
Single/widowed/divorced	8.2%	1.24 (1.07–1.45)	0.005*
Highest education			
Nil/primary	6.5%	1 (ref)	
Secondary	7.1%	1.10 (0.91–1.34)	0.333
Tertiary	7.8%	1.23 (0.99–1.52)	0.066
Occupation			
High level	5.9%	1 (ref)	
Low level	7.3%	1.27 (1.02–1.60)	0.039*
Employment status			
Presently not employed	6.5%	1 (ref)	
Presently employed	7.3%	1.14 (0.96–1.35)	0.154
Ethnicity			
Yoruba	6.9%	1 (ref)	
Others	7.3%	1.07 (0.92–1.24)	0.381
Religion			
Islam	2.3%	1 (ref)	
Christianity	10.0%	4.57 (3.70–5.69)	< 0.001*
Others	13.5%	6.42 (4.56–8.96)	< 0.001*
Co-morbidity	With AUD ($n = 802$)	Without AUD ($n = 10,444$)	Adjusted OR (95% CI)
Substance use disorders	121 (15.1%)	116 (1.1%)	13.58 (10.64–17.34)
Depression	115 (14.3%)	512 (4.9%)	3.25 (2.09–4.04)
Anxiety	157 (19.6%)	230 (2.2%)	8.89 (7.35–10.75)
Disability	141 (17.6%)	1098 (10.5%)	1.67 (1.43–1.98)

rate of HED amongst the population is said to be decreasing globally, our study showed its remains high in Nigeria particular amongst drinkers (at 42.0%).

Our second objective was to determine the commonly used brand of alcohol, age at regular drinking and drinking motives. In agreement with earlier studies (Abiona et al. 2006; Lasebikan and Ola 2016), beer was still the leading brand of alcohol consumed in Lagos, Nigeria. This was followed by the local palm wine and local gin/spirits. We had assessed for age at 'regular' drinking instead of age at first taste of alcohol because we believed that regular drinking age would be clinically important and easy to remember validly thereby reducing recall bias. Nearly 20% of the drinking population started drinking regularly before the age of 20 years with about 4% specifically before the age of 15 years. This emphasises the importance of addressing adolescents drinking. However, commencement of regular drinking was most common between the ages of 26 and 30 years coinciding with the age group many starts working and earning income in Nigeria. Our study established that social and coping motives are the most endorsed reasons for drinking. Apart from large parties and social gatherings where free alcohol is served, there has been a rapid shift in the social context of drinking in Nigeria, with a

large proportion of regular drinkers favouring outdoor-open space drinking, such as motor parks, and by the road sides (Lasebikan et al. 2018).

We found a rate of 7.1% for AUDs in our study. This was far higher than the 0.6% reported by NMSHW (and replicated by GSRAH) but much more in agreement with the estimated 6.0 to 7.0% ranges for most sub-Saharan Africa countries. We believe our findings are much valid than earlier studies as we have earlier noted the concerns with the NMSHW from which the GSRAH rates were derived and there had been rapid changes in the drinking habits of young adults in urban centres of recent. Alcohol advertisement by popular sports and media personalities, sponsorship of sporting and musical events by alcohol producing companies have probably led to a surge in the drinking rates and attendant AUDs. Although we modified the DSM-IV criteria to make a DSM-5 diagnosis of AUD, it should be noted that DSM-5 criteria were designed to give an overall prevalence of AUD similar to that determined from DSM-IV criteria (Hasin et al. 2013). Whereas it could be argued that our rate may be lower than the actual rate if the DSM-5 criteria were used, a recent review of studies prevalence of AUD based on DSM-IV and DSM-5 criteria concluded that DSM-5 may have 'inflated' rates of AUD (Bartoli et al. 2015).

Traditionally males had often consumed much more alcohol and have alcohol-related problems than females and our study showed this gender difference in ADI, HED and AUDs. It has been shown that marriage has some impact in decreasing alcohol consumption (Dinescu et al. 2016; Kendler et al. 2016). Our study supports the hypothesis that both the social and psychological effects of marriage, especially health-monitoring spousal interactions, lead to reduced alcohol consumption and protect against the development of AUD. High level occupations are likely to correlate with higher social status and findings have indicated that people with higher socioeconomic status may consume similar or greater amounts of alcohol compared with people with lower socioeconomic status although the latter group seems to bear a disproportionate burden of negative alcohol-related consequences (Collins 2016). Our study agrees with earlier studies that have found that Moslems had a significantly lower likelihood of using alcohol or having AUDs compared with other faiths (Gureje et al. 2007; Lasebikan and Ola 2016). This is probably due to the Islamic injunction against the use of alcohol being a strong deterrent amongst Moslems in Nigeria.

Our study lends support to the widely reported co-morbidity of AUD with other SUD and other common mental health problems. Alcohol is most of the time consumed before, along with, or after other psychoactive substance use (WHO 2018). The precise cause and effect relationship between depression and alcoholism is still controversial. In women, depressive episodes may predate the onset of alcoholism, and in men, a larger percentage of alcoholics experiencing a major depressive episode (Boden and Fergusson 2011). It has been proposed that short-term anxiety reduction from alcohol use, in concert with longer-term anxiety induction from chronic drinking and withdrawal, can initiate a vicious feed-forward cycle of increasing anxiety symptoms and alcohol use that results in co-morbidity (Kushner et al. 2000)In agreement with other studies (Lee et al. 2015; Samokhvalov et al. 2010), we found a strong link between AUD and disabilities either with or without a comorbid affective disorder. The GSRAH had earlier reported that the age-standardized alcohol-attributable burden of disease and injury was highest in the WHO African Region (WHO 2018).

There are some limitations to our study. First, we had assessed alcohol use through self-report which may be liable to biases, although earlier studies have found self-report to be an acceptable form of collecting information on alcohol and psychoactive substance use. Second, our survey had been limited to Lagos state which is about 10% of the total Nigeria population.

However, Lagos is cosmopolitan in nature and our sampling method enabled us to capture the major ethic and religious groups in the country. We had also supplemented this by using appropriate weighting adjustment to account for the national age and gender distribution. Thirdly, we had used DSM-IV-based instruments to measure AUD and assessed AUD based only on 10 instead of 11 criteria for DSM-5 and we did not account for the severity as advised in DSM-5. There are however several strengths of our study. We had the largest sample size of any mental health or alcohol use survey in sub-Saharan Africa, our sample was diverse in ethnicity and religion, we explored not only for alcohol consumption, but also for drinking motives and alcohol use disorders.

In conclusion, we have reinforced the growing evidence of a high level of heavy episode drinking amongst the African populace and we have shown that the rate of alcohol use disorders in Nigeria may actually be much higher than earlier reported and probably in the same range as those from other African countries. Lastly, we have demonstrated that results from large multinational studies alone may not be sufficiently valid for planning health services in LMICs and that several local surveys are needed to supplement.

Compliance with Ethical Standards Ethical approval for the LSMHS was obtained from the Research Ethics unit of the Lagos State University College of Medicine. Ikeja. Lagos, Nigeria. All the research procdeures followed due ethic guildelines.

Conflict of Interest The authors have no conflcit of interest to declare.

References

Abiona, T. C., Aloba, O. O., & Fatoye, F. O. (2006). Pattern of alcohol consumption among commercial road transport workers in a semi-urban community in south western Nigeria. *East African Medical Journal, 83*, 494–499.

Adewuya, A. O. (2005). Validation of the alcohol use disorders identification test (audit) as a screening tool for alcohol-related problems among Nigerian university students. *Alcohol and Alcoholism, 40*, 575–577.

Adewuya, A. O., Ola, B. A., & Afolabi, O. O. (2006). Validity of the patient health questionnaire (PHQ-9) as a screening tool for depression amongst Nigerian university students. *Journal of Affective Disorders, 96*, 89–93.

Adewuya, A. O., Atilola, O., Ola, B. A., et al. (2018a). Current prevalence, comorbidity and associated factors for symptoms of depression and generalised anxiety in the Lagos State Mental Health Survey (LSMHS), Nigeria. *Comprehensive Psychiatry, 81*, 60–65.

Adewuya, A. O., Coker, O. A., Atilola, O., et al. (2018b). Gender difference in the point prevalence, symptoms, comorbidity, and correlates of depression: Findings from the Lagos State Mental Health Survey (LSMHS), Nigeria. *Archives of Women's Mental Health, 21*, 591–599.

Amoran, O., Lawoyin, T., Lasebikan, V. (2007). Prevalence of depressionamong adults in Oyo state, Nigeria: a comparative study of rural andurban communities. *Australian Journal of Rural Health, 15*, 211–215.

Bartoli, F., Carra, G., Crocamo, C., & Clerici, M. (2015). From DSM-IV to DSM-5 alcohol use disorder: An overview of epidemiological data. *Addictive Behaviors, 41*, 46–50.

Boden, J. M., & Fergusson, D. M. (2011). Alcohol and depression. *Addiction, 106*, 906–914.

Borders, T. F., & Booth, B. M. (2007). Rural, suburban, and urban variations in alcohol consumption in the United States: Findings from the National Epidemiologic Survey on Alcohol and Related Conditions. *The Journal of Rural Health, 23*, 314–321.

Bush, K., Kivlahan, D. R., McDonell, M. B., Fihn, S. D., & Bradley, K. A. (1998). The AUDIT alcohol consumption questions (AUDIT-C): An effective brief screening test for problem drinking. *Archives of Internal Medicine, 158*, 1789–1795.

Collins, S. E. (2016). Associations between socioeconomic factors and alcohol outcomes. *Alcohol Research: Current Reviews, 38*, 83–94.

Dinescu, D., Turkheimer, E., Beam, C. R., Horn, E. E., Duncan, G., & Emery, R. E. (2016). Is marriage a buzzkill? A twin study of marital status and alcohol consumption. *Journal of Family Psychology, 30*, 698–707.

Ferreira-Borges, C., Parry, C. D., & Babor, T. F. (2017). Harmful use of alcohol: A shadow over sub-Saharan Africa in need of workable solutions. *International Journal of Environmental Research and Public Health, 14*, 346.

Griswold, M. G., Fullman, N., Hawley, C., et al. (2018). Alcohol use and burden for 195 countries and territories, 1990–2016: A systematic analysis for the Global Burden of Disease Study 2016. *Lancet, 392*, 1015–1035.

Gureje, O., Lasebikan, V. O., Kola, L., & Makanjuola, V. A. (2006). Lifetime and 12-month prevalence of mental disorders in the Nigerian Survey of Mental Health and Well-Being. *The British Journal of Psychiatry, 188*, 465–471.

Gureje, O., Degenhardt, L., Olley, B., Uwakwe, R., Udofia, O., Wakil, A., Adeyemi, O., Bohnert, K. M., & Anthony, J. C. (2007). A descriptive epidemiology of substance use and substance use disorders in Nigeria during the early 21st century. *Drug and Alcohol Dependence, 91*, 1–9.

Hasin, D. S., O'Brien, C. P., Auriacombe, M., et al. (2013). DSM-5 criteria for substance use disorders: Recommendations and rationale. *The American Journal of Psychiatry, 170*, 834–851.

Kendler, K. S., Lönn, S. L., Salvatore, J., Sundquist, J., & Sundquist, K. (2016). Effect of marriage on risk for onset of alcohol use disorder: A longitudinal and co-relative analysis in a Swedish national sample. *The American Journal of Psychiatry, 173*, 911–918.

Kessler, R. C., & Bromet, E. J. (2013). The epidemiology of depression across cultures. *Annual Review of Public Health, 34*, 119–138.

Kish, L. (1985). *Survey sampling*. New York: Wiley.

Kroenke, K., Spitzer, R. L., & Williams, J. B. (2001). The PHQ-9: Validity of a brief depression severity measure. *Journal of General Internal Medicine, 16*, 606–613.

Kuntsche, E., & Kuntsche, S. (2009). Development and validation of the drinking motive questionnaire revised short form (DMQ–R SF). *Journal of Clinical Child and Adolescent Psychology, 38*, 899–908.

Kushner, M. G., Abrams, K., & Borchardt, C. (2000). The relationship between anxiety disorders and alcohol use disorders: A review of major perspectives and findings. *Clinical Psychology Review, 20*, 149–171.

Lasebikan, V. O., & Ola, B. A. (2016). Prevalence and correlates of alcohol use among a sample of Nigerian semirural community dwellers in Nigeria. *Journal of Addiction, 2016*, 2831594.

Lasebikan, V. O., Ayinde, O., & Odunleye, M. (2018). Assessment of the alcohol consumption among outdoor bar drinkers in Nigeria by qualitative methods. *BMC Public Health, 18*, 318.

Lee, R. S., Dore, G., Juckes, L., de Regt, T., Naismith, S. L., Lagopoulos, J., Tickell, A., Hickie, I. B., & Hermens, D. F. (2015). Cognitive dysfunction and functional disability in alcohol-dependent adults with or without a comorbid affective disorder. *Cognitive Neuropsychiatry, 20*, 222–231.

NBS (2014). *National Bureau of Statistics: Lagos Household Survey.* Central Office of Statistics (COS) - Lagos State Government. 2014.

Ogunsemi, O. O., Oluwole, F. A., Abasiubong, F., Erinfolami, A. R., Amoran, O. E., & Ariba, A. J. (2010). Detection of mental disorders with the patient health questionnaire in primary care settings in Nigeria. *Mental Illness, 2*, e10.

Samokhvalov, A. V., Popova, S., Room, R., Ramonas, M., & Rehm, J. (2010). Disability associated with alcohol abuse and dependence. *Alcoholism, Clinical and Experimental Research, 34*, 1871–1878.

Sheehan, D., Lecruiber, Y., Sheehan, K. H., et al. (1998). The mini international neuropsychiatric interview (MINI): The development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. *The Journal of Clinical Psychiatry, 59*, 22–23.

Spitzer, R. L., Kroenke, K., Williams, J. B., & Löwe, B. (2006). A brief measure for assessing generalized anxiety disorder: The GAD-7. *Archives of Internal Medicine, 166*, 1092–1097.

UNODC. (2018). *Drug use in Nigeria. A FMOH/NBS/UNODC report*. Vienna: UNODC.

Üstün, T. B., Kostanjsek, N., Chatterji, S., & Rehm, J. (2010). *Measuring health and disability: Manual for WHO disability assessment schedule (WHODAS 2.0)*. Geneva: WHO.

WHO. (2014). *World Health Organization. Management of substance abuse unit. Global status report on alcohol and health, 2014*. World Health Organization.

WHO. (2018). *World Health Organization. Global status report on alcohol and health 2018*. World Health Organization.