

# Assessment of the use of different forms of tobacco products among Nigerian adults: Implications for tobacco control policy

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## ABSTRACT

**INTRODUCTION** This study assessed the determinants of tobacco use among adults in Nigeria, exploring associations between different types of tobacco products and gender.

**METHODS** Study data were derived from the 2013 Nigerian Demographic and Health Survey (NDHS). The NDHS is a nationally representative household survey of 39 902 women, 17 359 men and 38 522 households. Country weighted data were collected on participants' demographic characteristics and current tobacco use by type. Weighted prevalence estimates and 95% confidence intervals (CI) were performed to examine individual sociodemographic factors and tobacco use. A multivariate logistic regression was also performed to assess the relationship between tobacco use, adjusting for sociodemographic characteristics.

**RESULTS** Overall prevalence of any tobacco use in 2013 was 2.9% (n=1621, 95% CI: 2.8–3.0). The prevalence of any tobacco use was 8.3% (95%CI: 7.8–8.8, p<0.001) in men and 0.4% (95%CI: 0.3–0.5, p<0.001) in women. Cigarettes and snuff were the most commonly used tobacco products in men and women. Dual (smoking and smokeless tobacco products) use was associated with increased odds among men (AOR=26.1, 95%CI: 11.7–58.5, p<0.001), aged 45–59 years (AOR=5.6, 95%CI: 2.1–15.2, p<0.01) and completely/semi-illiterate (AOR=1.8, 95CI: 1.1–2.9, p<0.05).

**CONCLUSIONS** Men and women differed in their preference of type of tobacco product and the associated risk factors. Tobacco control policies need to take these specific differences into consideration for the design and implementation of interventions aimed at addressing tobacco use.

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## INTRODUCTION

Tobacco use is the leading cause of preventable death and is responsible for about 6 million deaths each year worldwide<sup>1,2</sup>. The death toll is expected to rise to 8 million by 2030, if current trends continue<sup>2</sup>. Thus, urgent action to curb the consumption of tobacco products is imperative, particularly in developing countries where tobacco use is becoming alarmingly popular<sup>3</sup>. About 80% of the current 1.3 billion smokers live in low and middle income countries<sup>4</sup>. In 2010, annual tobacco-related deaths in low and middle income countries were estimated at 4.3 million, corresponding to about 25% more deaths

than tuberculosis, malaria and HIV/AIDS<sup>5</sup>.

The increasing prevalence of tobacco consumption in developing countries is associated with aggressive marketing strategies, employed by the tobacco industry, which explicitly target the youth and women<sup>6,7</sup>. Meanwhile, tobacco consumption, particularly cigarette smoking, is on the decline in many developed countries<sup>1,8</sup>, a result of successful anti-tobacco campaigns and national tobacco control policies. As a consequence, the tobacco industry has targeted new emerging markets, leading to tobacco consumption spreading across the globe<sup>9,10</sup>.

The increase in tobacco use in developing

countries is a cause for concern. Tobacco in any form is lethal; tobacco use is a major risk factor for chronic health conditions including cancer and cardiovascular disease<sup>11</sup>. The economic costs of tobacco related diseases and deaths are huge, currently costing hundreds of billions of dollars each year<sup>11</sup>. Future impact of tobacco use is expected to be considerably severe in developing countries with unprecedented mortality rates due the fragile poorly resourced health care systems in these countries. Recognizing that prevention is the most cost effective measure, the WHO Framework Convention on Tobacco Control (WHO FCTC) was adopted in 2003 to curb the globalization of tobacco use<sup>12</sup>. The framework includes the **MPOWER** measures: **M**onitor tobacco use and prevention policies; **P**rotect people from tobacco smoke; **O**ffer help to quit tobacco use; **W**arn about the dangers of tobacco; **E**nforce bans on tobacco advertising, promotion, and sponsorship; and **R**aise taxes on tobacco.

Tobacco consumption in Africa is considered historically low but trends are changing<sup>13</sup>. The continent provides a unique opportunity for early interventions to stop the tobacco epidemic. At current consumption trends, the prevalence of smoking among African adults is expected to increase from 15.8% to 26.5% in 2030. Currently, 43 African countries have ratified or acceded to the WHO FCTC and implemented some form of anti-tobacco initiative<sup>14,15</sup>. However, the lack of research and dearth of data has been identified as a limitation to understanding the determinants of tobacco use and to inform policy in the region<sup>16</sup>.

### Tobacco use in Nigeria

The prevalence of tobacco use in Nigeria is considered low. A multi-country study found the lowest prevalence of current use of any tobacco product in Nigeria (5.6%, 95%CI: 4.9–6.2) and the highest rates in Bangladesh (43.2%, 95%CI: 41.5–44.8)<sup>17</sup>. A similar prevalence rate was also reported by the 2012 Nigeria Global Adult Tobacco Survey (GATS, 2012)<sup>28</sup>. Both forms of tobacco, smoking and smokeless, are available in the country, and consumption was more prevalent among men (12%, 95%CI: 11.1–12.8,  $p < 0.001$ ) compared to women (0.6%, 95%CI: 0.4–0.8,  $p < 0.001$ )<sup>19</sup>. Tobacco use varies: by ethnicity, with the highest prevalence

among the Igbo ethnic group (6.7%, 95%CI: 5.9–7.5,  $p < 0.0001$ ); religion, with highest prevalence among Muslims (19.2%, 95%CI: 14.4–24.1,  $p < 0.001$ ); and place of residence, with a higher prevalence among rural dwellers (4.5%, 95%CI: 4.0–4.9,  $p = 0.05$ )<sup>19</sup>.

Very few studies have assessed tobacco in Nigeria using nationally representative data<sup>19–21</sup>. Also, most of these studies restricted their analysis to tobacco use in men<sup>20,22</sup>. So far, only one study provides country-level analysis of tobacco use in both men and women, using the most recent DHS data; however determinants of tobacco use were not country specific but a regional assessment of 30 sub-Saharan African countries<sup>21</sup>. This study adds to the scarce literature by providing a more detailed country analysis of tobacco use and its determinants in Nigeria. Given predictions of increasing use of tobacco products in developing countries, it is imperative to identify and understand the determinants of tobacco use to inform the design and implementation of effective interventions and public policies that address risk health behaviors.

## METHODS

### Data source

The present study used data from the 2013 Nigerian Demographic and Health Survey (NDHS). The NDHS is a nationally representative household survey of a wide range of indicators that include demographic, behavior and nutrition. The 2013 NDHS used a stratified three-stage cluster design based on the 2006 census enumeration areas. A total of 904 clusters were stratified by urban and rural areas, to select a representative sample of 40 680 households. Women and men aged 15–49 years who were either permanent residents or visitors in the households selected were eligible for the study. A fixed sample of 45 households was selected per cluster. A sample of 38 522 out of 40 680 households was successfully interviewed with a response rate of 99%. Successfully interviewed were 38 948 of the 39 902 eligible women, and 17 359 of the eligible men. Data were collected via in-person interviews. Response rate for eligible women and men was 98 percent and 95 percent, respectively.

### Measures

The 2013 NDHS collected information on respondents' sociodemographic characteristics,

which included age, ethnicity, education, marital status, employment, religion, region/geopolitical zone, and place of residence whether urban or rural. Income was measured using a wealth index in five quintiles – lowest, second, middle, fourth and highest. The index was derived from a principal component analysis of household assets that included owning a refrigerator, radio, television, mobile phone etc; and living conditions such as access to electricity, source of drinking water, type of sanitation facility, type of flooring material, and number of rooms in the dwelling; and area specific indicators based on place of residence if rural or urban.

Tobacco use data were derived from four related questions: 1) ‘Do you currently smoke cigarettes?’; 2) ‘In the last 24 hours, how many cigarettes did you smoke?’; 3) ‘Do you currently smoke or use any (other) type of tobacco?’; 4) ‘What (other) type of tobacco do you currently smoke or use?’ with options being pipe, chewing tobacco, snuff or other. Tobacco use variables were further categorized into smoking and smokeless. Smokers were characterized as respondents who answered ‘yes’ to current cigarette smoking or smoked pipes, while smokeless tobacco users were characterized as respondents who answered ‘yes’ to using chewing tobacco and snuff.

### Data analyses

Univariate and multivariate analyses, including prevalence estimates and 95% confidence intervals

(CI), were performed to examine individual sociodemographic factors and tobacco use. Bivariate analyses using contingency tables were performed to determine whether there were differences between respondents who use tobacco products and those who were not stratified by demographic characteristics. Separate analyses were conducted for men and for women. For analysis purposes, some study variables were combined and recategorized to increase sample size. To analyze overall prevalence of tobacco use by gender and tobacco product, both datasets were combined. A multivariate logistic regression model was also performed to assess the relationship between tobacco use, adjusting for sociodemographic characteristics of the respondent. The combined sample of men and women was used for the analysis. Logistic regression analyses computed OR and 95%CI associations of all variables of interest. Study weights were used in analysis of date. Statistical analyses were performed using STATA (StataCorp. 2013. Statistical Software. Release 13. College Station, TX, USA).

### RESULTS

The prevalence of any tobacco use was low; 8.3% of men (95%CI: 7.8–8.8,  $p < 0.001$ ) and 0.4% of women (95%CI 0.3–0.5,  $p < 0.001$ ) reported using any tobacco products in 2013. Overall prevalence of any tobacco use (men and women) was 2.9% ( $n = 1621$ , 95% CI: 2.7–3.0). Among men who used tobacco products ( $n = 1466$ ) (Table 1), 72.3 % smoked

Table 1. Sociodemographic characteristics by type of tobacco products (men)

Characteristics	Cigarettes (n = 1111)		Pipes (n = 61)		Chew tobacco (n = 33)		Snuff (n = 292)		Any tobacco (n = 1166)	
	%	95%CI	%	95%CI	%	95%CI	%	95%CI	%	95%CI
<b>Age group</b>	[ $p = 0.000$ ]		[ $p = 0.062$ ]		[ $p = 0.564$ ]		[ $p = 0.000$ ]		[ $p = 0.000$ ]	
15 – 24	13.5	(11.0–16.4)	19.5	(10.4–33.4)	35.1	(17.1–58.6)	11	(6.3–18.3)	13.5	(11.2–16.2)
25 – 34	42.3	(38.8–45.9)	38.8	(24.5–55.4)	40.9	(24.7–59.3)	28	(21.8–35.0)	39.9	(36.9–43.1)
35 – 44	29.9	(26.7–33.2)	26.1	(14.5–42.4)	14.2	(4.7–35.4)	38.3	(31.8–45.0)	31.3	(28.4–34.3)
45 – 59	14.3	(11.9–16.9)	15.6	(8.2–28.7)	9.8	(3.2–26.5)	22.7	(17.9–28.2)	15.3	(13.2–17.6)
<b>Marital status</b>	[ $p = 0.000$ ]		[ $p = 0.532$ ]		[ $p = 0.379$ ]		[ $p = 0.000$ ]		[ $p = 0.000$ ]	
Never married	35.2	(31.1–39.5)	41.4	(27.5–56.6)	62.5	(39.7–80.8)	18.6	(13.6–24.9)	32.5	(29.1–15.2)
Married	62.4	(58.1–66.4)	54.9	(40.4–68.5)	32.3	(15.3–55.7)	77.8	(71.4–83.0)	64.6	(61.1–68.1)
Widowed/ divorced/ separated	2.5	(1.6–3.7)	3.7	(0.7–16.5)	5.3	(0.8–27.9)	3.6	(1.5–8.1)	2.8	(1.9–4.1)
<b>Ethnicity</b>	[ $p = 0.000$ ]		[ $p = 0.001$ ]		[ $p = 0.058$ ]		[ $p = 0.000$ ]		[ $p = 0.000$ ]	
Hausa	12.7	(9.9–16.1)	29.4	(11.9–56.1)	15.8	(5.9–35.9)	7.3	(4.3–12.0)	12.2	(9.7–15.2)
Igbo	21.6	(17.9–25.8)	16.2	(7.3–32.0)	10.5	(3.0–30.8)	23.7	(18.3–30.1)	22.4	(18.9–26.3)

Continued

Table 1. Continued

Characteristics	Cigarettes (n=1144)		Pipes (n=61)		Chew tobacco (n=33)		Snuff (n=292)		Any tobacco (n=1466)	
	%	95%CI	%	95%CI	%	95%CI	%	95%CI	%	95%CI
Yoruba	9.3	(7.2–11.8)	0.9	(0.1–3.5)	3.4	(0.5–21.3)	8.1	(3.9–15.5)	8.7	(6.8–11.1)
Others	56.4	(51.1–61.6)	53.5	(31.4–74.2)	70.3	(51.5–84.0)	60.9	(52.9–68.3)	56.7	(51.9–61.3)
<b>Region</b>	[p=0.000]		[p=0.0001]		[p=0.068]		[p=0.000]		[p=0.000]	
North Central	20.1	(14.5–24.2)	27.5	(10.6–54.6)	7.8	(1.7–29.8)	29.7	(21.4–39.4)	21.4	(16.3–27.7)
North East	9.3	(6.8–12.7)	7.4	(2.4–20.3)	44.5	(20.5–71.3)	17.1	(12.0–23.8)	11.3	(8.4–14.9)
North West	18.7	(14.1–24.3)	32.2	(13.9–58.1)	9.5	(2.1–33.7)	13.2	(6.8–23.6)	17	(12.8–22.1)
South East	16.4	(13.0–20.3)	13.9	(5.8–29.5)	9.8	(2.3–30.6)	20.1	(14.7–26.7)	17.1	(13.9–20.9)
South Central	20.3	(16.9–24.2)	19	(9.4–34.4)	25	(11.6–45.9)	7.7	(4.0–14.2)	18.3	(15.4–21.6)
South West	15.2	(12.1–18.9)	0		3.4	(0.5–21.3)	12.2	(7.3–19.7)	14.9	(11.9–18.4)
<b>Religion</b>	[p=0.000]		[p=0.775]		[p=0.747]		[p=0.000]		[p=0.000]	
Christian	68.7	(63.7–72.9)	47.6	(27.1–68.9)	50.5	(25.8–75.0)	63.1	(53.6–71.6)	66.9	(62.1–71.3)
Islam	28	(23.4–33.0)	49.6	(28.5–70.5)	46.4	(22.0–72.6)	27.4	(19.6–36.7)	28.3	(23.8–33.2)
Traditional	3.5	(2.1–5.7)	2.9	(0.4–17.6)	3.1	(0.4–19.5)	9.5	(5.1–16.8)	4.8	(3.3–7.2)
<b>Residence</b>	[p=0.516]		[p=0.099]		[p=0.862]		[p=0.382]		[p=0.950]	
Urban	45.6	(39.8–51.5)	26.3	(13.2–45.4)	37.2	(16.5–63.8)	39.8	(30.7–49.6)	43.7	(38.4–49.2)
Rural	54.4	(48.5–60.2)	73.7	(54.5–86.7)	62.8	(36.1–83.4)	60.2	(50.3–69.2)	56.3	(50.8–61.6)
<b>Level of education</b>	[p=0.000]		[p=0.339]		[p=0.064]		[p=0.000]		[p=0.000]	
None	15	(11.9–18.7)	39.1	(18.4–64.5)	10.9	(3.7–28.2)	19.7	(14.4–26.2)	16.4	(13.4–19.9)
Primary school	27.6	(24.3–31.1)	16.9	(8.2–31.6)	35.2	(20.6–53.1)	35.9	(29.3–42.8)	29.1	(26.0–32.3)
Secondary school	46.7	(42.7–50.6)	38.1	(21.1–58.5)	44.3	(26.6–63.6)	37.5	(31.1–44.2)	44.6	(40.7–48.5)
Higher education	10.7	(8.7–13.1)	5.9	(1.5–20.1)	9.6	(3.1–26.4)	6.9	(4.1–11.3)	9.9	(8.2–11.8)
<b>Literacy</b>	[p=0.045]		[p=0.138]		[p=0.334]		[p=0.000]		[p=0.000]	
Completely/semi-illiterate	38.5	(34.1–43.1)	55.1	(33.9–74.5)	44.7	(26.6–64.4)	50.8	(43.6–57.8)	41.3	(37.3–45.4)
Literate	61.5	(56.9–65.9)	44.9	(25.4–66.0)	55.3	(35.6–73.4)	49.2	(42.1–56.3)	58.7	(54.6–62.7)
<b>Employment status</b>	[p=0.000]		[p=0.000]		[p=0.013]		[p=0.000]		[p=0.000]	
Yes	92.2	(89.8–94.0)	99.6	(97.3–99.9)	94.3	(77.6–98.8)	94.4	(90.0–96.9)	92.3	(90.1–94.1)
No	7.8	(5.9–10.2)	0.4	(0.0–2.6)	5.7	(1.2–22.4)	5.6	(3.0–9.9)	7.7	(5.9–9.9)
<b>Occupation group</b>	[p=0.000]		[p=0.001]		[p=0.004]		[p=0.000]		[p=0.000]	
Not working	5.1	(3.7–6.9)	0		5.7	(1.2–22.4)	3.2	(1.3–7.8)	4.7	(3.4–6.5)
Professional/technical	6.3	(4.9–8.2)	5.1	(1.3–17.3)	1.7	(0.4–7.1)	7.3	(4.2–12.6)	6.3	(4.9–8.0)
Clerical and sales	14.6	(11.9–17.8)	19.5	(9.8–34.9)	13.5	(4.5–33.9)	7.8	(5.0–11.9)	13.7	(11.4–16.4)
Agriculture (self-employed/employee)	31.4	(26.3–36.7)	40.3	(22.7–60.8)	47.4	(22.8–73.4)	55.8	(47.6–63.8)	35.6	(31.0–40.5)
Household and domestic services	7.6	(5.8–9.8)	5.9	(1.2–23.9)	0		2.5	(1.3–4.9)	7.1	(5.5–9.2)
Manual (skilled/unskilled)	35.1	(31.2–39.1)	29.3	(16.9–45.7)	31.7	(13.9–57.1)	23.3	(17.2–30.6)	32.5	(29.1–36.1)
<b>Wealth index</b>	[p=0.001]		[p=0.677]		[p=0.232]		[p=0.0001]		[p=0.001]	
Lowest (poorest)	10.5	(7.8–14.1)	32.9	(14.6–58.4)	6.8	(1.9–21.7)	17.8	(12.6–24.3)	12.1	(9.5–15.4)
Second (poorer)	19.6	(16.2–23.5)	17.4	(7.7–34.4)	23.8	(10.8–44.5)	23.8	(18.2–30.4)	20.1	(17.0–23.7)
Middle (middle)	21.1	(17.1–24.9)	19.1	(8.6–37.1)	32.3	(14.1–57.9)	27.8	(20.4–36.6)	22	(18.6–25.8)
Fourth (richer)	23.6	(19.6–28.1)	15.5	(7.4–29.5)	27.5	(11.9–51.7)	19.8	(13.3–28.1)	23.1	(19.6–27.1)
Highest (richest)	25.2	(21.1–29.8)	15	(6.2–31.9)	9.6	(3.1–26.4)	10.8	(6.4–17.5)	22.6	(19.0–26.7)

cigarettes (95%CI: 69.3–75.0,  $p < 0.001$ ), 21.6% used snuff (95%CI: 19.1–24.4,  $p < 0.001$ ), 3.7% smoked pipe (95%CI: 2.7–5.0,  $p < 0.001$ ) and 2.4% chewed tobacco (95%CI: 1.6–3.6,  $p < 0.001$ ). In contrast, among women who used tobacco products ( $n=155$ ) (Table 2), 45.5% smoked cigarettes (95%CI: 36.7–

55.2,  $p < 0.001$ ), 33.0% used snuff (95%CI: 24.7–42.3,  $p < 0.001$ ), 14.0% chewed tobacco (95%CI: 8.5–22.1,  $p < 0.001$ ), and 7.2% smoked pipe (95%CI: 3.5–14.3,  $p < 0.001$ ). Cigarette smoking and snuff were the most commonly used forms of tobacco in Nigeria.

There were statistically significant sociodemographic

Table 2. Sociodemographic characteristics by type of tobacco products (women)

Characteristics	Cigarettes (n=83)		Pipes (n=8)		Chew tobacco (n=20)		Snuff (n=51)		Any tobacco (n=155)	
	%	95%CI	%	95%CI	%	95%CI	%	95%CI	%	95%CI
<b>Age group</b>	[ $p=0.036$ ]		[ $p=0.256$ ]		[ $p=0.007$ ]		[ $p=0.001$ ]		[ $p=0.000$ ]	
15 – 24	21.8	(12.2–36.1)	0		0		4.7	(1.1–17.3)	14.1	(7.8–24.2)
25 – 34	31.7	(20.9–44.9)	0		46.4	(24.1–70.3)	26.6	(14.3–44.1)	29.5	(21.5–38.9)
35 – 44	25.1	(16.1–36.7)	49.8	(38.7–66.9)	37.1	(19.3–59.2)	25.6	(14.9–40.2)	29	(21.5–37.6)
45 – 59	21.4	(13.1–32.9)	50.2	(33.1–67.3)	16.5	(4.6–44.4)	43.1	(26.5–61.5)	27.4	(19.2–37.4)
<b>Marital status</b>	[ $p=0.331$ ]		[ $p=0.088$ ]		[ $p=0.605$ ]		[ $p=0.011$ ]		[ $p=0.004$ ]	
Never married	20.8	(10.7–36.4)	0		15.2	(22.8–75.0)	7.3	(2.3–21.1)	14.5	(7.9–25.3)
Married	71.7	(53.1–85.1)	80.5	(39.9–96.2)	72.7	(38.9–91.6)	74.4	(57.5–86.2)	75.5	(62.4–83.7)
Widowed/ divorced/ separated	7.5	(3.0–17.5)	19.6	(3.8–60.0)	11.9	(2.2–43.8)	18.3	(9.2–33.0)	11	(6.4–18.2)
<b>Ethnicity</b>	[ $p=0.025$ ]		[ $p=0.238$ ]		[ $p=0.320$ ]		[ $p=0.000$ ]		[ $p=0.000$ ]	
Hausa	21.4	(9.3–42.0)	23	(5.7–59.2)	48.5	(22.8–75.0)	26.9	(11.2–51.8)	27.3	(16.5–41.6)
Igbo	13.9	(6.8–26.3)	0		8.7	(1.2–42.5)	33.3	(16.6–55.4)	18.7	(11.2–29.5)
Yoruba	4.4	(1.6–11.4)	0		5.6	(1.3–21.4)	0		3.3	(1.4–7.4)
Others	60.3	(42.4–75.8)	77	(40.8–94.2)	37.2	(14.5–67.3)	39.8	(23.1–59.2)	50.8	(37.9–63.6)
<b>Region</b>	[ $p=0.195$ ]		[ $p=0.460$ ]		[ $p=0.280$ ]		[ $p=0.001$ ]		[ $p=0.001$ ]	
North Central	34.3	(17.2–56.7)	57.1	(16.6–89.9)	9.5	(1.3–45.1)	4.1	(1.2–13.5)	21.7	(10.9–38.5)
North East	23.8	(9.5–47.8)	35.3	(7.2–79.4)	2.9	(0.3–18.5)	0		14.4	(5.9–31.1)
North West	16.9	(8.4–31.2)	0		63.7	(35.8–84.6)	31	(14.3–54.0)	24.7	(15.1–37.6)
South East	10.2	(4.6–21.0)	0		8.7	(1.2–42.6)	29.2	(13.6–51.8)	16.5	(9.5–27.1)
South Central	8.7	(3.8–18.5)	7.6	(0.8–43.2)	4.4	(6.5–26.4)	35.7	(20.2–54.9)	17.7	(11.4–26.5)
South West	6.2	(2.5–14.5)	0		10.8	(2.4–37.2)	0		5	(2.4–10.5)
<b>Religion</b>	[ $p=0.146$ ]		[ $p=0.367$ ]		[ $p=0.018$ ]		[ $p=0.062$ ]		[ $p=0.031$ ]	
Christian	62.5	(42.8–78.7)	40.6	(16.6–69.9)	51.5	(24.9–77.2)	61.8	(45.9–86.3)	61.1	(47.1–73.6)
Islam	33.4	(17.3–54.6)	35.6	(6.0–82.5)	48.5	(22.8–75.0)	27.3	(11.4–52.5)	30	(22.6–49.9)
Traditional	4.2	(1.2–13.4)	23.8	(8.0–52.9)	0		2.8	(0.7–10.8)	3.9	(1.6–9.1)
<b>Residence</b>	[ $p=0.905$ ]		[ $p=0.139$ ]		[ $p=0.373$ ]		[ $p=0.465$ ]		[ $p=0.902$ ]	
Urban	40.9	(23.7–60.8)	10.7	(1.3–52.7)	55.6	(28.6–79.6)	49.9	(30.2–69.6)	43	(30.2–56.8)
Rural	59	(39.2–76.7)	89.3	(47.3–98.7)	44.4	(20.4–71.4)	50.1	(30.4–69.8)	57	(43.2–69.8)
<b>Level of education</b>	[ $p=0.177$ ]		[ $p=0.229$ ]		[ $p=0.008$ ]		[ $p=0.032$ ]		[ $p=0.012$ ]	
None	27.1	(18.2–38.3)	44.3	(10.5–84.3)	67.9	(36.6–88.6)	45.7	(26.3–66.6)	37.9	(27.9–49.0)
Primary school	32.9	(19.4–49.9)	55.7	(15.7–89.5)	30	(9.9–62.3)	28.8	(15.3–47.7)	32.1	(22.2–44.0)
Secondary school	34	(21.1–49.8)	0		2.1	(0.3–14.7)	23.5	(12.3–40.2)	25.9	(17.2–36.9)
Higher education	5.9	(2.1–15.7)	0		0		2	(0.2–13.2)	4.1	(1.7–9.8)
<b>Literacy</b>	[ $p=0.351$ ]		[ $p=0.044$ ]		[ $p=0.001$ ]		[ $p=0.148$ ]		[ $p=0.009$ ]	
Completely/ semi-illiterate	59.9	(44.7–73.6)	100		97.9	(85.3–99.7)	67.6	(48.7–82.0)	67.8	(56.6–77.2)
Literate	40	(26.4–55.3)	0		2.1	(0.3–14.7)	32.4	(17.9–51.3)	32.2	(22.8–43.4)

Continued

Table 2. Continued

Characteristics	Cigarettes (n=83)		Pipes (n=8)		Chew tobacco (n=20)		Snuff (n=54)		Any tobacco (n=155)	
	%	95%CI	%	95%CI	%	95%CI	%	95%CI	%	95%CI
<b>Employment status</b>	[p=0.370]		[p=0.910]		[p=0.998]		[p=0.005]		[p=0.114]	
Yes	69.3	(51.4–82.9)	64.7	(20.6–92.8)	62.2	(32.8–84.7)	82.5	(66.4–91.8)	70.9	(58.6–80.8)
No	30.7	(17.1–48.6)	35.3	(7.2–79.4)	37.8	(15.3–67.2)	17.5	(8.2–33.6)	29.1	(19.2–41.4)
<b>Occupation group</b>	[p=0.026]		[p=0.529]		[p=0.033]		[p=0.009]		[p=0.181]	
Not working	26.4	(13.2–45.8)	35.3	(7.2–79.4)	29.1	(10.0–60.2)	17.5	(8.2–33.5)	25.4	(15.8–38.2)
Professional/technical	7.1	(2.4–18.8)	0		0		7.5	(2.1–23.6)	5.1	(2.1–11.9)
Clerical and sales	12.9	(6.8–23.4)	0		21	(7.6–46.2)	57.3	(37.9–74.7)	28.7	(19.4–40.2)
Agriculture (self-employed/employee)	35.2	(19.9–54.3)	64.7	(20.6–92.8)	20.3	(6.1–50.0)	11.8	(5.6–23.0)	26.7	(16.4–40.3)
Household and domestic services	9.1	(3.9–19.8)	0		2.2	(0.3–14.3)	0.7	(0.1–5.1)	5.8	(2.7–11.8)
Manual (skilled/unskilled)	9.3	(3.5–22.2)	0		27.3	(8.9–59.1)	5.2	(0.8–26.8)	8.3	(3.9–16.5)
<b>Wealth index</b>	[p=0.437]		[p=0.259]		[p=0.122]		[p=0.325]		[p=0.155]	
Lowest (poorest)	10.7	(4.9–21.3)	19.6	(4.4–56.3)	7.9	(2.1–25.5)	11.9	(4.5–27.8)	12.3	(7.3–19.9)
Second (poorer)	27.1	(15.8–42.2)	62.1	(33.6–84.2)	29	(11.8–55.3)	11.8	(5.0–25.5)	22.9	(14.9–33.7)
Middle (middle)	18.9	(10.8–30.9)	18.3	(3.5–57.9)	27	(11.7–50.7)	30.7	(18.0–47.1)	24.8	(17.6–33.6)
Fourth (richer)	25.1	(14.7–39.3)	0		31.2	(11.1–62.2)	29.2	(16.7–45.9)	24.8	(17.1–34.4)
Highest (richest)	18.4	(10.1–31.0)	0		4.9	(1.1–18.5)	16.4	(7.4–32.4)	15.2	(9.7–23.1)

differences associated with tobacco use by type of tobacco product and gender (Tables 1 and 2). Cigarette smoking in men was highest among Christians (68.7%, 95%CI: 63.7–72.9,  $p<0.001$ ), who were married (62.4%, 95%CI: 58.1–66.4,  $p<0.001$ ), from the minority ethnic groups (56.4%, 95%CI: 51.1–61.6,  $p<0.001$ ), aged 25–34 years (42.3%, 95%CI: 27.0–38.8–45.9,  $p<0.001$ ), and from the South Central region (20.3%, 95%CI: 16.9–24.2,  $p<0.001$ ). Also, snuff use was highest among married (77.8%, 95%CI: 71.4–83,  $p<0.001$ ), Christians (63.1%, 95%CI: 53.6–71.6,  $p<0.001$ ), minority ethnic groups (60.9%, 95%CI: 52.9–68.3,  $p<0.001$ ), aged 35–44 years (38.3%, 95%CI: 31.84–5.0,  $p<0.001$ ), and living in the North Central region (29.7%, 95%CI: 21.4–39.4,  $p<0.001$ ).

Among women, cigarette smoking was highest among those who were members of minority ethnicity (60.3%, 95%CI: 42.4–75.8,  $p<0.05$ ), aged 25–34 years (31.7%, 95%CI: 20.9–44.9,  $p<0.05$ ), and employed in the agricultural sector (35.2%,

95%CI: 19.9–54.3,  $p<0.05$ ). Also, the prevalence of snuff use was highest for those who were married (74.4%, 95%CI: 57.5–86.5,  $p=0.01$ ), Christian (61.8%, 95%CI: 45.9–86.3,  $p=0.06$ ), aged 45–59 years (43.1%, 95%CI: 26.5–61.5,  $p<0.01$ ), a member of a minority ethnicity (39.8%, 95%CI: 23.1–59.2,  $p<0.001$ ), and lived in the South Central geopolitical zone (35.7%, 95%CI: 20.20–54.9,  $p<0.01$ ).

Notable associations of tobacco use were found among those who were completely illiterate or semi-literate, particularly in women. The prevalence of use of all types of tobacco products – cigarettes (59.9%, 95%CI: 44.7–73.6,  $p=0.351$ ), pipe (100%,  $p<0.05$ ), chewing tobacco (97.9%, 95%CI: 85.3–99.7,  $p<0.01$ ) and snuff use (67.6%, 95%CI: 48.7–82.0,  $p=0.148$ ) were highest among women who were completely illiterate, i.e. could not read, or semi-literate, i.e. able to read only parts of a sentence, compared to those who were literate. While for men, pipe (55.1%, 95%CI: 33.9–74.5,  $p=0.138$ ) and snuff use (50.8%, 95%CI: 43.6–57.8,  $p<0.001$ ) were more prevalent

among those who were completely illiterate or semi-literate.

Also, statistical significant associations with level of education show that the prevalence of tobacco use was highest among men who have a secondary education, for both cigarette smoking (46.7%, 95%CI: 42.7–50.6,  $p < 0.001$ ) and snuff use (37.5%, 95%CI: 31.1–44.2,  $p < 0.001$ ). While among women, the prevalence was highest among those who had no formal education, both for chewing tobacco (67.9%, 95%CI: 36.6–88.6,  $p < 0.01$ ) and snuff (45.7%, 95%CI: 26.3–86.6,  $p < 0.05$ ).

The use of tobacco products differed significantly by religion. The prevalence of tobacco use was highest among Christians compared to those who practised traditional religion and Muslims. Among men who identified themselves as Christians, the most commonly used tobacco product was the cigarette (68.7%, 95%CI: 63.7–72.9,  $p < 0.001$ ), while among Muslims and those who practised traditional religion, the pipe (49.6%, 95%CI: 28.5–70.5,  $p = 0.775$ ) and chewing tobacco (9.5%, 95%CI: 5.1–16.8,  $p < 0.001$ )

were most commonly used, respectively. In contrast, among women who identified as Christian, the cigarette was the most commonly used tobacco product (62.5%, 95%CI: 42.8–78.7,  $p = 0.146$ ), while among Muslims and those who practised traditional religion, chewing tobacco (48.5%, 95%CI: 22.8–75.0,  $p < 0.05$ ) and pipe (23.8%, 95%CI: 8.0–52.1,  $p = 0.367$ ) were most commonly used, respectively.

By ethnic group, the prevalence of tobacco use was highest among adults who were from a minority ethnic group for all types of tobacco products. Among men from minority ethnic groups, snuff was most commonly used (70%, 95%CI: 51.5–84.0,  $p = 0.058$ ) while among women in this group, the pipe was most commonly used (77.0%, 95%CI: 40.8–94.2,  $p = 0.238$ ). The prevalence of tobacco use was highest among adults in rural areas compared to those who lived in urban areas, but this association was not statistically significant for both men and women.

Results from a multivariable logistic regression (Table 3) show that the odds of smoking tobacco products and using smokeless tobacco products

Table 3. Multivariate logistic regression analysis of pooled data of both men and women participants (2013)

Characteristics	Smoking			Smokeless			Dual use		
	AOR	(95%CI)	p	AOR	(95%CI)	p	AOR	(95%CI)	p
<b>Gender (ref: female)</b>									
Male	34.5	(27.4–43.5)	0.001	13.6	(10.2–18.1)	0.001	26.1	(11.7–58.5)	0.001
<b>Age group (ref: 15–24)</b>									
25 – 34	4.2	(3.4–5.2)	0.001	3.1	(2.0–4.8)	0.001	4	(1.8–9.1)	0.01
35 – 44	3.9	(3.1–5.1)	0.001	4.6	(2.9–7.4)	0.001	3.5	(1.4–9.0)	0.01
45 – 59	4	(3.0–5.3)	0.001	6.2	(3.8–10.1)	0.05	5.6	(2.1–15.2)	0.01
<b>Marital status (ref: married)</b>									
Never married	1.3	(1.1–1.5)	0.05	0.8	(0.5–1.1)	0.134	1.4	(0.7–2.6)	0.304
Widowed/divorced/separated	2.3	(1.6–3.2)	0.001	2	(1.3–3.2)	0.01	3	(1.1–8.6)	0.05
<b>Ethnicity (ref: minority group)</b>									
Hausa	0.9	(0.7–1.2)	0.4	0.5	(0.4–0.8)	0.01	0.3	(0.1–0.8)	0.05
Igbo	0.9	(0.7–1.2)	4.96	0.7	(0.3–1.4)	0.276	1.1	(0.4–3.4)	0.812
Yoruba	0.6	(0.5–0.8)	0.001	0.4	(0.2–0.7)	0.01	0.6	(0.2–1.8)	0.385
<b>Region (ref: North West)</b>									
North Central	1.4	(1.1–1.9)	0.05	1.7	(1.1–2.7)	0.05	0.4	(0.2–0.8)	0.05
North East	1	(0.8–1.3)	0.94	1.4	(0.9–2.2)	0.094	0.5	(0.2–1.2)	0.114
South East	1.9	(1.3–2.7)	0.01	2.3	(1.0–5.0)	0.05	0.3	(0.1–1.2)	0.096
South Central	1.5	(1.1–2.0)	0.01	0.9	(0.6–1.6)	0.782	0.2	(0.1–0.6)	0.01
South West	1.4	(0.9–1.9)	0.05	1	(0.5–1.9)	0.937	0.4	(0.1–1.2)	0.096
<b>Religion (ref: Christian)</b>									
Muslim	0.6	(0.5–0.7)	0.001	0.5	(0.4–0.7)	0.001	0.5	(0.3–1.0)	0.06
Traditional	2.3	(1.6–3.4)	0.001	2.9	(1.8–4.5)	0.001	1.7	(0.5–5.6)	0.425
<b>Residence (ref: rural)</b>									

Continued

Table 3. Continued

Characteristics	Smoking			Smokeless			Dual use		
	AOR	(95%CI)	p	AOR	(95%CI)	p	AOR	(95%CI)	p
Urban	1.1	(0.9–1.3)	0.156	2.2	(1.7–2.9)	0.001	1.6	(0.9–2.9)	0.084
<b>Literacy (ref: literate)</b>									
Completely/semi-illiterate	1.6	(1.4–1.9)	0.001	1.7	(1.3–2.2)	0.001	1.8	(1.1–2.9)	0.05
<b>Employment status (ref: yes)</b>									
No	0.6	(0.5–0.7)	0.001	0.7	(0.5–1.0)	0.067	0.3	(0.1–0.9)	0.05
<b>Wealth index (ref: richer)</b>									
Lowest (poorest)	0.8	(0.6–1.1)	0.153	1.8	(1.2–2.7)	0.01	0.9	(0.4–2.3)	0.796
Second (poorer)	1.1	(0.8–1.3)	0.597	1.9	(1.4–2.8)	0.001	1.1	(0.5–2.5)	0.745
Middle (middle)	1	(0.9–1.2)	0.841	1.9	(1.4–2.6)	0.001	1.6	(0.9–3.2)	0.142
Highest (richest)	0.9	(0.7–1.1)	0.154	0.5	(0.3–0.7)	0.01	0.7	(0.4–1.5)	0.39

increase about 35 times (AOR=34.5, 95%CI: 27.4–43.5,  $p<0.001$ ), 14 times (AOR=13.6, 95%CI: 10.2–18.1,  $p<0.001$ ), respectively, in men compared to women. Also, the odds of smoking increase 4 times across all ages groups, compared to adults aged 15–24 years, while the odds of smokeless tobacco use increase with age. The odds of using both smoking and smokeless tobacco products increase 2 times (AOR=2.3, 95%CI: 1.6–3.2,  $p<0.001$ ) and (AOR=2.0, 95%CI: 1.3–3.2,  $p<0.01$ ) among adults who were widowed/divorced/separated compared to those who were married, respectively.

By region, adults who lived in the South West region were 2 times more likely to smoke (AOR=1.9, 95%CI: 1.3–2.7,  $p<0.01$ ) and use smokeless tobacco products (AOR=2.3, 95%CI: 1.0–5.0,  $p<0.05$ ). Among the different religious affiliations, those who practised traditional religion were 2 times (AOR=2.3, 95%CI: 1.6–3.4,  $p<0.001$ ) more likely to smoke and 3 times (AOR=2.9, 95%CI: 1.8–4.5,  $p<0.001$ ) more likely to use smokeless tobacco products compared to Christians. While Muslims had approximately half the odds of using smoking (AOR=0.6; 95%CI: 0.5–0.7,  $p<0.001$ ) and smokeless tobacco products (AOR=0.5, 95%CI: 0.4–0.7;  $p<0.001$ ) compared to Christians. Further, adults who were either completely or semi-literate were about 2 times more likely to smoke (AOR=1.6, 95%CI: 1.4–1.9,  $p<0.001$ ), use smokeless tobacco (AOR=1.7, 95%CI: 1.3–2.2,  $p<0.001$ ) or use both smoking and smokeless tobacco products (AOR=1.8, 95%CI: 1.1–2.9,  $p<0.05$ ), compared to those who were literate.

## DISCUSSION

Study results are consistent with previous research that shows low prevalence of tobacco use among Nigerian adults<sup>18,19,23</sup>. Our study results show a decrease in overall prevalence of tobacco use among adults aged 15–59 years, from 4.2% in 2008 DHS to 2.9% in 2013<sup>19</sup>. However, these findings are much lower than the overall prevalence rate of 5.6% obtained by GATS in 2012. This discrepancy is likely due to the study population, the DHS data only included adults aged 15–59 years, thus excluding a significant elderly population aged 60 years or older. Research shows that the proportion of current tobacco use increases with age among Nigerian adults<sup>18</sup>. Our results show a similar trend of increasing odds of tobacco use with age.

Also consistent with other studies is the higher prevalence in any tobacco use among men compared to women<sup>17–19,24</sup>. Our study also shows evidence of a decrease in the prevalence of any tobacco use among men, from 12.2% reported in 2008 to 8.3% and, women from 0.6% in 2008 to 0.4% in 2013<sup>19,22</sup>. The available literature shows a low social acceptance of smoking behavior in women compared to men in Nigeria<sup>25,26</sup>. Thus, social factors may explain the low prevalence of tobacco use in women.

Our study results show a higher prevalence of smoking tobacco use among men compared to women, but a reversal in patterns for smokeless tobacco. These findings are inconsistent with results obtained by previous research<sup>9,17,19,27</sup>, but similar to results by Caleyachetty et al.<sup>28</sup>, which show a higher

prevalence of smokeless tobacco use (0.5%, 95%CI: 0.2–0.9) compared to smoking tobacco (0.1%, 95%CI: 0.0–0.3) among pregnant women in Nigeria. Study findings may be indicative of changing patterns of tobacco consumption among women, particularly due to social intolerance of cigarette smoking. Very few nationally representative studies assess tobacco use among women due to low prevalence rates that may provide less reliable estimates<sup>22,23</sup>. Nevertheless, these results have important public health implications, highlighting the need for more gender specific interventions to create awareness.

Notable study results show a high prevalence of tobacco use among adults who are completely illiterate or semi-literate. These findings are critical for creating effective public health interventions to curb use. The anti-tobacco campaign in Nigeria embraces the MPOWER framework that advocates the use of effective media messages and pictorial health warnings on all tobacco products<sup>18</sup>. Currently, there is a text-only health warning requirement on cigarette packaging<sup>29</sup>, which for individuals who cannot read is futile. Moreover, available research shows that text-only health warnings on tobacco products are less effective in curbing use compared to pictorial warnings<sup>30</sup>. It is imperative that the Nigerian government fully implement the WHO FCTC requirements on labeling by including pictorial warnings on all tobacco products.

Further, evidence of high illiteracy rates, particularly among women, has important implications for the dissemination of information on health effects of tobacco use in the country. These findings highlight the need for anti-tobacco campaigns for all other types of tobacco products. Available research shows a decrease in the likelihood of tobacco use with mass media utilization<sup>31</sup>. In Nigeria, there is a high prevalence of knowledge of the health effects of tobacco, particularly cigarette smoking<sup>18,32</sup>. However, there are very limited data on knowledge and perceptions of the health hazards of smokeless tobacco used commonly by women. A previous study assessing tobacco use in sub-Saharan Africa shows that about 72% of women do not read printed media material at all<sup>31</sup>. Hence, while public health awareness campaigns to educate the public on the risks of tobacco use are imperative, there is the need to identify the appropriate form of media

campaign for specific groups in the population, particularly the rural population.

Consistent with previous studies, our study shows a high prevalence of tobacco use in rural areas. In Nigeria, 50.5% of this population is illiterate<sup>33</sup>, hence current practices of text-only health warnings on packaging and awareness campaigns on printed media maybe ineffective. More aggressive awareness campaigns, particularly via radio and town hall meetings in rural areas, are essential to educate this population on the health hazards of tobacco use. While available evidence shows a positive relationship between tobacco use and the use of radio, these findings were attributed to pro-tobacco promotional programs sponsored by the tobacco industry in the country<sup>19</sup>. Nevertheless, radio remains the most common source of information in Nigeria<sup>34</sup>; given its prevalence and accessibility, it is a specially effective tool for public education programs in the country.

Currently, there is no specific policy on smokeless tobacco Nigeria<sup>29</sup>. This gap in the country's tobacco control policy is a cause for concern and may sabotage current government's efforts to control tobacco use. In fact, a 2012 study by Euromonitor projected an estimated 77% increase in the use of smokeless tobacco in Nigeria<sup>35</sup>. There has been an influx of foreign made smokeless tobacco products in the Nigerian market since 2010, which further compounds the situation<sup>29</sup>. Our study results show that the use smokeless tobacco products are common among adults in Nigeria. A previous study showed that about 90% of respondents believed smokeless tobacco is not harmful to their health, an opinion based on the local belief that tobacco leaf has medicinal properties<sup>27</sup>. Further, most smokeless tobacco products used in the country are largely home-made<sup>36</sup>. These findings highlight the need for public health education campaigns, as well as a more comprehensive tobacco control policy covering all forms of tobacco use in the country.

### Limitations

Study findings demonstrate significant associations of tobacco use among Nigeria adults that have important implications for anti-tobacco policy in the country. However, the DHS data rely on self-reported use of tobacco products and thus subject

to recall bias. Also, study design is cross-sectional and unable to determine causality. Nevertheless, this study uses the most recent NDHS data that provide pertinent information on the continued surveillance of tobacco use and informs policy on tobacco control in Nigeria.

## CONCLUSIONS

Overall, the prevalence of any type of tobacco use is low among Nigerian adults aged 15-59 years, with 8.3% of men (95%CI: 7.8-8.8,  $p < 0.001$ ) and 0.4% of women (95%CI: 0.53-0.63,  $p < 0.001$ ) reporting using any tobacco product in 2013. Tobacco use is associated with age, marital status, ethnicity, region, religion and literacy. Notably, the highest prevalence of use is among adults who are completely illiterate or semi-literate, particularly among women. These findings highlight the need for anti-tobacco campaigns that mirror a population's literacy levels. Successful tobacco control measures in Nigeria require a more comprehensive tobacco control policy on both smoking and smokeless tobacco products, in addition to aggressive public education campaigns to create awareness on the health hazards of tobacco use.

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