

# Singlestick purchases: a comparative cross-country analysis in 10 African countries, Global Adult Tobacco Survey, 2012–21

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## Abstract

We utilized Global Adult Tobacco Survey data to examine singlestick purchases and related demographic characteristics in 10 African countries (Botswana, Cameroon, Ethiopia, Kenya, Nigeria, Mauritania, Senegal, South Africa, Uganda and Tanzania). Results show the weighted percentages and prevalence ratios with predicted marginal means to evaluate significant differences between groups ( $P < 0.05$ ). The prevalence of singlestick purchases among the 10 African countries ranged from 48.4% in South Africa to 92.0% in Tanzania. Across countries, the incidence of singlestick purchases was higher in urban areas than rural areas in Kenya; among those aged 15–24 years versus those aged 45 years and older in Botswana, Ethiopia, Mauritania, Nigeria and South Africa; and among those aged 25–44 years versus those aged 45 years and older in Botswana, South Africa and Tanzania. The incidence in Botswana was higher among adults with no formal or primary education than among those with secondary or higher education. In South Africa, the incidence was higher among adults in the middle or lower wealth index than among those in the high or highest wealth index. The findings suggest opportunities for strengthening efforts to prevent singlestick purchases through effective legislation and enforcement in line with Article 16 of the World Health Organization Framework Convention on Tobacco Control.

## Introduction

The sale of singlesticks, sometimes referred to as ‘loosies’ or ‘loose cigarettes’, is a common practice in many African countries [1–6]. This is despite many African countries being parties to the World Health Organization (WHO) Framework Convention on Tobacco Control (FCTC), which obligates countries to prohibit their sale [1]. Enforcement is often weak in places where the sale of singlesticks has been banned [3, 4, 7, 8]. The 10 African countries in our study are Botswana, Cameroon, Ethiopia, Kenya, Mauritania, Nigeria, Senegal, South Africa, Tanzania and Uganda. [Supplementary Table S1](#) shows that 4 of the

10 countries passed laws prohibiting the sale of singlesticks with one of the main goals being to reduce access to cigarettes by youth and other vulnerable populations. The sale of singlesticks undermines tobacco control efforts aimed at preventing tobacco use initiation, promoting tobacco use cessation, eliminating exposure to secondhand smoke and reducing tobacco-related disparities [9–11].

A few studies have examined the prevalence in Africa of singlestick purchases among adults who currently smoke with limited findings on related disparities to guide enactment and enforcement of effective policies that restrict the sale of singlesticks [2, 5, 6, 12]. In

a 2018 non-peer reviewed report on sales of singlesticks, the African Tobacco Control Alliance found that their sale was widely prevalent in 10 African capital cities (Ouagadougou, Burkina Faso; Yaoundé, Cameroon; Ndjamena, Chad; Abidjan, Cote d'Ivoire; Accra, Ghana; Nairobi, Kenya; Niamey, Niger; Lagos, Nigeria; Lomé, Togo; and Kampala, Uganda) [9]. The study authors found that the absence of laws regarding cigarette sales or the lack of enforcement of existing laws encouraged retailers to sell singlesticks. In another study, singlestick purchases were found to be common in Lesotho, Ethiopia, South Africa, Zambia and Zimbabwe [1]. Using June to August 2018 retail price data of tobacco products sold in various types of outlets in eight African countries, the authors showed that singlesticks made up more than 99% of all cigarette price data collected from Ethiopia and Lesotho and that the presence of singlesticks in other countries ranged from 0.80% in Namibia to 38.2% in Zimbabwe. The study by Chang *et al.* [1] provides a cross-sectional overview of retail prices including singlesticks in the eight countries. Importantly, the data used were not representative.

We examined the prevalence of cigarette smoking and of singlestick purchases among adults who smoked manufactured cigarettes in 10 African countries that represented over half (54.4%) of the African adult population [13] (the term 'adult' is used for all participants in the Global Adult Tobacco Survey (GATS) and refers to individuals aged 15 years and over). We also examined the distribution of singlestick purchases by sociodemographic characteristics among this population. Findings can help policymakers and public health practitioners understand potential differences in cigarette purchase behaviors as well as sociodemographic characteristics related to singlestick purchases.

## Materials and methods

### Data

We used 2012–21 GATS data from 10 African countries: Botswana (2017), Cameroon (2013), Ethiopia (2016), Kenya (2014), Mauritania (2021), Nigeria (2012), Senegal (2015), South Africa (2021), Tanzania (2018) and Uganda (2013). GATS was conducted separately as a nationally representative household survey of adults aged 15 years and older in each country using standard and consistent methodology for the questionnaire, sampling, data collection, management, weighting and analysis. GATS is designed to measure tobacco use and other key tobacco control indicators, including cigarette purchase behaviors among adults aged 15 years and older. GATS methodology, public use datasets and codebooks are published elsewhere [14].

### Measures

Current cigarette smoking was derived from the question, 'On average, how many of the following products do you currently smoke on each day? Also, let me know if you smoke the product, but not every day.' In all countries, the products assessed included manufactured cigarettes, hand-rolled cigarettes, pipes, cigars, shisha and others. Cigarette smoking was defined as smoking manufactured cigarettes, daily or less than daily. Singlestick purchases were derived from the question, 'The last time you bought cigarettes for yourself, did you buy loose cigarettes, packs, cartons, or something else?' with responses 'cigarettes', 'packs', 'cartons', 'other (specify)', and 'never bought cigarettes'. Those who responded saying they bought cigarettes were classified as having purchased singlesticks. Those who responded as 'packs' or 'cartons' were classified as having bought non-single cigarettes.

Demographic characteristics included sex (men/women), age group in years (15–24, 25–44, 45 years and older), residence (urban/rural), education (no formal education or primary education, secondary and higher education) and wealth index. The wealth index is based on household assets such as electricity, flush toilets, fixed telephones, cellular telephones, televisions, radios, refrigerators, cars, mopeds/scooters/motorcycles and washing machines. Respondents were divided into wealth quintiles ranking from one (lowest) to five (highest) based on the reported household assets [15]. Given the small sample sizes, we grouped the wealth index into two categories: [1] lowest, low or middle and [2] high or highest to preserve the reliability of estimates.

### Analysis

The analytical sample included adults who completed the GATS individual survey: 4643 (Botswana), 5271 (Cameroon), 10 150 (Ethiopia), 4408 (Kenya), 7569 (Mauritania), 4347 (Senegal), 6311 (South Africa), 4800 (Tanzania) and 8508 (Uganda). Further analysis on singlestick purchases was based on a sample of adults who smoked manufactured cigarettes and included 495 (Botswana), 373 (Cameroon), 522 (Ethiopia), 413 (Kenya), 417 (Mauritania), 192 (Nigeria), 405 (Senegal), 1412 (South Africa), 296 (Tanzania) and 296 (Uganda). Each country's data were weighted to be representative of the national population, and all analyses were conducted using SAS-callable SUDAAN version 11.03 (RTI International, Research Triangle Park, NC, USA) to account for the complex survey design. We estimated the weighted prevalence with a 95% confidence interval (CI) for singlesticks among adults who smoked manufactured cigarettes.

Country-specific multivariable logistic regression models with predicted marginal means were used to calculate adjusted prevalence ratios (aPRs) with 95% CIs. The logistic regression modeled the dependent variable, singlestick purchases (yes: 'adults who currently smoked manufactured cigarettes and purchased singlesticks' and no: 'rest of the adults who smoked manufactured cigarettes') from the independent (demographic) variables, including age, sex, residence, education and wealth (Table IV). In addition, a logistic regression analysis was conducted using pooled data from all 10 countries controlling for sociodemographic characteristics including country (Table III).

## Results

### Prevalence of manufactured cigarette smoking and purchase of singlesticks

The median prevalence of manufactured cigarette smoking among adults aged 15 years and older in the 10 countries assessed was 5.5%, and the prevalence ranged from 2.7% (Ethiopia) to 23.4% (South Africa) (Table I). Using the sample weights, the calculated adult populations who smoked manufactured cigarettes in the 10 countries had a total weight of 20 million, and those who purchased singlesticks had a total weight of 16.3 million.

Table II shows the prevalence of singlestick purchases in the 10 African countries overall and by demographic characteristics. In Botswana, overall, 82.2% of adults who smoked manufactured cigarettes purchased singlesticks. The prevalence of singlestick purchases across demographic characteristics among adults in Botswana was above 80.0% with the exception of those aged 45 years and older. The overall prevalence in Cameroun was 80.7%, and across the demographic characteristics, it ranged from 78.1% in rural areas to 87.5% among those aged 15–24 years. In Ethiopia, the overall prevalence was 61.4%, and across the demographic characteristics, it ranged from 39.6% among those aged 45 years and older to 83.7% among those aged 15–24 years. The overall prevalence in Kenya was 89.9%, and across demographic characteristics, it ranged from 76.5% among those aged 15–24 years to 96.8% in urban areas. In Mauritania, the overall prevalence was 56.5%, and across demographic characteristics, it ranged from 42.9% among women to 63.4% among those aged 15–24 years. In Nigeria, the overall prevalence was 70.8% and it ranged from 66.5% among those aged 45 years and older to 85.1% among those aged 15–24 years. The overall prevalence in Senegal was 83.2%, and across the demographic characteristics, it ranged from 75.7% among those aged 45 years and older to 87.8% among those aged 25–44 years. In South Africa, the overall prevalence was 48.4%, and across demographic characteristics, it ranged from

29.4% among those in the high and highest wealth index to 68.7% among those aged 15–24 years. The overall prevalence in Tanzania was 92.0%, and across the demographic characteristics, it ranged from 83.9% among those aged 45 years and older to 100% among those aged 15–24 years. In Uganda, the overall prevalence was 88.5% and it ranged from 82.0% among those aged 15–24 years to 90.0% in urban areas.

### Multivariable logistic regression analysis

The pooled analysis of data for all 10 countries is presented in Table III. The results showed that singlestick purchases were associated more with those aged 15–24 and 25–44 years than with those aged 45 years and older. The association was stronger among men than women and among adults with no formal education or primary education than those with secondary and higher education. Furthermore, singlestick purchases were associated with the lowest, low or middle wealth index than the high or highest wealth index.

Table IV shows the aPR of singlestick purchases in the 10 African countries from the multivariable logistic regression. Adults aged 15–24 years were more likely to purchase singlesticks than those aged 45 years or older in Botswana (aPR = 1.29, 95% CI 1.06–1.58), Nigeria (aPR = 1.30, 95% CI 1.05–1.62), Mauritania (aPR = 1.51, 95% CI 1.04–2.20), Ethiopia (aPR = 2.14, 95% CI 1.29–3.53) and South Africa (aPR = 1.94, 95% CI 1.58–2.39). Similarly, compared with those aged 45 years or older, adults aged 25–44 years were 21% more likely (aPR = 1.21, 95% CI 1.01–1.45) in Botswana and 50% more likely (aPR = 1.22, 95% CI 1.01–1.45) in South Africa to purchase singlesticks after adjusting for confounders.

In Kenya, after adjusting for confounders, adults living in urban areas were 13% more likely (aPR = 1.13, 95% CI 1.05–1.22) to purchase singlesticks as compared with those living in rural areas. In Botswana, compared with adults with secondary or higher education, persons with no formal or primary education were 12% more likely (aPR = 1.12 CI 1.00–1.26) to purchase singlesticks after adjusting for confounders. In South Africa, adults in the lowest, low and middle wealth index were 90% more likely (aPR = 1.90, 95% CI 1.50–2.40) to purchase singlesticks as compared with adults in the high or highest wealth index.

## Discussion

The total weighted number of adults who smoked manufactured cigarettes in the 10 African countries was 20 million. Among the adults who smoked manufactured cigarettes in these countries, an estimated median of 81.5% purchased singlesticks the last time they purchased cigarettes. The findings showed that singlestick purchases were associated with the younger age groups

**Table 1.** Prevalence of manufactured cigarette smoking among adults aged 15 years and older by selected demographic characteristics in 10 African countries, GATS, 2012–21

Variable	Botswana 2018	Cameroon 2013	Ethiopia 2017	Kenya 2014	Mauritania 2021	Nigeria 2012	Senegal 2015	South Africa 2021	Tanzania 2019	Uganda 2013
Overall	(n = 4643) % (95% CI)	(n = 5271) % (95% CI)	(n = 10 150) % (95% CI)	(n = 4408) % (95% CI)	(n = 7569) % (95% CI)	(n = 9765) % (95% CI)	(n = 4347) % (95% CI)	(n = 6311) % (95% CI)	(n = 4800) % (95% CI)	(n = 8508) % (95% CI)
Age (years)										
15–24	11.7 (10.4, 13.2)	5.7 (5.0, 6.5)	2.7 (2.1, 3.5)	6.9 (5.8, 8.2)	5.7 (4.9, 6.7)	3.7 (3.2, 4.2)	4.0 (3.2, 4.8)	23.4 (20.8, 26.2)	5.2 (4.5, 6.1)	3.8 (3.3, 4.4)
25–44	7.9 (5.6, 11.0)	2.1 (1.4, 3.1)	1.2 (0.6, 2.1)	2.1 (1.2, 3.6)	6.8 (5.1, 9.1)	1.3 (0.9, 1.9)	2.5 (1.6, 4.1)	18.1 (14.7, 22.1)	2.3 (1.5, 3.7)	1.0 (0.6, 1.7)
45+	15.7 (13.7, 18.0)	8.5 (7.1, 10.0)	3.9 (2.8, 5.4)	9.0 (7.3, 11.1)	6.4 (5.4, 7.6)	4.8 (4.0, 5.8)	5.4 (4.3, 6.7)	25.3 (21.7, 29.3)	6.9 (5.7, 8.4)	5.2 (4.4, 6.1)
Sex										
Men	9.3 (6.7, 12.6)	6.5 (5.1, 8.4)	4.2 (2.6, 6.9)	10.9 (8.3, 14.2)	3.2 (2.3, 4.3)	5.2 (4.0, 6.7)	3.5 (2.5, 4.9)	24.3 (21.5, 27.4)	6.5 (5.0, 8.5)	5.7 (4.5, 7.1)
Women	22.0 (19.4, 24.9)	11.3 (9.9, 12.9)	5.3 (4.1, 6.8)	13.5 (11.4, 15.9)	11.2 (9.5, 13.2)	7.1 (6.2, 8.2)	8.0 (6.5, 9.7)	38.3 (34.3, 42.5)	10.5 (8.9, 12.3)	7.7 (6.6, 8.9)
Residence										
Urban	2.2 (1.6, 3.0)	0.4 (0.2, 0.7)	0.2 (0.1, 0.4)	0.6 (0.3, 1.4)	0.6 (0.4, 1.0)	0.2 (0.1, 0.5)	0.2 (0.1, 0.5)	9.5 (7.5, 12.1)	0.4 (0.2, 0.7)	0.4 (0.2, 0.6)
Rural	10.8 (9.0, 12.8)	4.8 (4.0, 5.9)	3.2 (2.3, 4.3)	7.0 (5.7, 8.5)	7.8 (6.5, 9.3)	2.9 (2.3, 3.6)	4.8 (3.8, 6.1)	27.0 (22.8, 31.5)	5.9 (4.6, 7.6)	4.2 (3.5, 5.0)
Education										
No formal education or primary	12.6 (10.7, 14.8)	6.5 (5.4, 7.9)	2.6 (1.8, 3.6)	6.9 (5.4, 8.8)	3.1 (2.1, 4.4)	4.1 (3.4, 5.0)	3.1 (2.2, 4.4)	17.5 (14.2, 21.4)	4.9 (4.0, 6.0)	3.7 (3.0, 4.5)
Secondary and higher	13.1 (10.4, 16.3)	5.6 (4.8, 6.4)	2.7 (1.9, 3.9)	7.3 (6.0, 8.9)	4.3 (3.4, 5.3)	4.0 (3.3, 4.8)	3.9 (3.1, 4.9)	25.8 (22.9, 29.0)	5.8 (4.9, 6.8)	4.2 (3.6, 4.9)
Wealth index										
Lowest, low or middle	11.1 (9.6, 12.8)	6.7 (4.5, 9.8)	2.7 (1.7, 4.4)	6.0 (4.5, 7.9)	8.2 (6.7, 10.1)	3.4 (2.7, 4.2)	4.1 (2.7, 6.2)	20.5 (17.5, 24.0)	3.3 (2.2, 4.9)	2.0 (1.3, 3.0)
High or highest	13.1 (11.2, 15.2)	6.4 (5.5, 7.4)	2.6 (1.8, 3.6)	8.1 (6.5, 10.2)	3.5 (2.6, 4.7)	3.7 (3.2, 4.4)	4.0 (3.1, 5.2)	24.3 (21.3, 27.6)	5.9 (4.9, 7.1)	4.7 (4.0, 5.5)

Notes. The wealth index is based on household assets such as electricity, flush toilets, fixed telephones, cellular telephones, radios, refrigerators, cars, mopeds/scooters/motorcycles and washing machines. Respondents were divided into wealth quintiles ranking from one (lowest) to five (highest) based on the reported household assets.

**Table II.** Prevalence of purchases of singlesticks among adults aged 15 years and older who smoked manufactured cigarettes by demographic characteristics in 10 African countries—GATS, 2012–21

Variable	Botswana 2018	Cameroon 2013	Ethiopia 2017	Kenya 2014	Mauritania 2021	Nigeria 2012	Senegal 2015	South Africa 2021	Tanzania 2019	Uganda 2013
	(n = 495) % (95% CI)	(n = 373) % (95% CI)	(n = 522) % (95% CI)	(n = 413) % (95% CI)	(n = 417) % (95% CI)	(n = 192) % (95% CI)	(n = 405) % (95% CI)	(n = 1412) % (95% CI)	(n = 296) % (95% CI)	(n = 333) % (95% CI)
Overall	82.2 (76.7, 86.6)	80.7 (75.4, 85.2)	61.4 (47.1, 73.9)	89.9 (83.3, 94.0)	56.5 (48.5, 64.1)	70.8 (63.9, 76.9)	83.2 (76.8, 88.2)	48.4 (42.0, 54.8)	92.0 (87.6, 94.9)	88.5 (82.6, 92.6)
Age (years)										
15–24	88.2 (71.1, 95.8)	87.5 (68.7, 95.7)	83.7 (59.7, 94.7)	76.5 (43.2, 93.3)	63.4 (48.5, 76.2)	85.1 (67.5, 94.0)	78.9 (60.7, 90.1)	68.7 (57.7, 77.8)	100.0 N/A	82.0 (48.8, 95.6)
25–44	83.1 (76.4, 88.2)	80.8 (73.6, 86.5)	65.2 (48.5, 78.8)	93.9 (90.3, 96.2)	54.1 (44.2, 63.6)	70.1 (61.3, 77.6)	87.8 (79.8, 92.9)	51.9 (44.8, 58.9)	94.0 (88.5, 97.0)	89.6 (83.6, 93.6)
45+	73.2 (59.9, 83.3)	76.9 (64.9, 85.6)	39.6 (20.4, 62.7)	87.8 (75.2, 94.4)	43.8 (30.4, 58.1)	66.5 (52.5, 78.1)	75.7 (59.7, 86.7)	32.3 (25.4, 40.2)	83.9 (73.9, 90.5)	88.6 (76.0, 95.1)
Sex										
Men	81.7 (75.9, 86.3)	80.3 (74.8, 84.9)	61.9 (47.6, 74.4)	91.5 (85.4, 95.1)	57.3 (48.9, 65.3)	71.9 (64.8, 78.0)	83.1 (76.6, 88.0)	50.6 (44.7, 56.5)	92.2 (87.6, 95.1)	88.5 (82.4, 92.6)
Women	87.2 (74.0, 94.2)	–	47.5 (15.3, 81.9)	–	42.9 (24.4, 63.7)	–	–	40.1 (29.9, 51.1)	–	–
Residence										
Urban	84.8 (78.9, 89.4)	84.3 (76.2, 90.1)	60.5 (45.1, 74.0)	96.8 (94.1, 98.3)	59.6 (51.7, 67.0)	76.3 (67.2, 83.5)	85.0 (76.0, 91.1)	43.6 (35.5, 51.9)	86.7 (77.0, 92.7)	90.0 (79.0, 95.5)
Rural	80.2 (71.6, 86.7)	78.1 (70.6, 84.1)	61.7 (42.7, 77.7)	86.1 (76.6, 92.2)	46.2 (27.4, 66.2)	68.6 (59.4, 76.5)	80.4 (70.5, 87.5)	60.5 (54.8, 66.0)	95.3 (91.0, 97.6)	88.0 (80.4, 92.9)
Education										
No formal education	84.3 (74.5, 90.8)	80.7 (75.1, 85.4)	66.3 (49.3, 79.9)	89.6 (81.5, 94.4)	52.7 (41.8, 63.4)	70.1 (59.8, 78.7)	84.1 (77.5, 89.0)	54.5 (47.8, 61.1)	91.7 (86.8, 94.9)	88.6 (82.1, 92.9)
or primary	81.0 (73.9, 86.5)	80.7 (60.5, 91.9)	48.3 (26.9, 70.4)	90.7 (80.8, 95.7)	58.3 (47.9, 68.0)	71.7 (62.4, 79.5)	78.4 (56.7, 91.0)	39.3 (30.8, 48.4)	93.8 (81.2, 98.1)	87.8 (73.2, 95.0)
Secondary and higher										
Wealth index										
Lowest, low or middle	83.1 (75.5, 88.8)	78.5 (71.7, 84.0)	61.0 (42.6, 76.7)	88.3 (78.7, 93.9)	47.4 (32.2, 63.1)	71.9 (64.3, 78.5)	81.0 (72.9, 87.2)	63.6 (58.9, 68.0)	92.9 (87.8, 96.0)	89.1 (82.3, 93.5)
High or highest	80.5 (72.3, 86.6)	84.8 (75.5, 91.0)	62.4 (46.0, 76.4)	93.3 (89.9, 95.6)	60.5 (52.1, 68.4)	68.5 (53.7, 80.3)	86.1 (74.0, 93.1)	29.4 (22.5, 37.4)	90.1 (80.3, 95.3)	86.0 (75.0, 92.6)

Notes: The symbol indicates that estimate is suppressed due to an unweighted sample size of <25. The wealth index is based on household assets such as electricity, flush toilets, fixed telephones, cellular telephones, televisions, radios, refrigerators, cars, mopeds/scooters/motorcycles and washing machines. Respondents were divided into wealth quintiles ranking from one (lowest) to five (highest) based on the reported household assets.

**Table III.** Predictors of the purchase of singlesticks among adults who smoked manufactured cigarettes in 10 African countries by demographic characteristics—GATS, 2012–21

Demographic	All countries (N = 4858)	
	aPR (95% CI)	P-value
Countries		
Cameroon	1.56 (1.39, 1.75)	<0.001*
Kenya	1.77 (1.58, 1.98)	<0.001*
Uganda	1.71 (1.53, 1.92)	<0.001*
Nigeria	1.40 (1.24, 1.59)	<0.001*
Senegal	1.60 (1.42, 1.81)	<0.001*
Ethiopia	1.14 (0.91, 1.43)	0.27
Botswana	1.61 (1.44, 1.80)	<0.001*
Tanzania	1.80 (1.62, 2.00)	<0.001*
Mauritania	1.10 (0.90, 1.33)	0.37
South Africa <sup>a</sup>	—	—
Age (years)		
15–24	1.49 (1.34, 1.66)	<0.001*
25–44	1.27 (1.15, 1.41)	<0.001*
45+ <sup>a</sup>	—	—
Sex		
Men	1.13 (1.00, 1.27)	<0.05*
Women <sup>a</sup>	—	—
Residence		
Urban	1.02 (0.94, 1.12)	0.58
Rural <sup>a</sup>	—	—
Education		
No formal education or primary	1.10 (1.00, 1.20)	0.05*
Secondary and higher <sup>a</sup>	—	—
Wealth index		
Lowest, low or middle	1.28 (1.14, 1.43)	<0.001*
High or highest <sup>a</sup>	—	—

Notes. The symbol — indicates that estimate is suppressed due to an unweighted sample size of <25. The wealth index is based on household assets such as electricity, flush toilet, fixed telephone, cellular telephone, television, radio, refrigerator, car, moped/scooter/motorcycle, washing machine, and so forth. Respondents were divided into wealth quintiles ranking from one (lowest) to five (highest) based on the reported household assets.

<sup>a</sup>Reference column.

\* $P < 0.05$ .

(15–24 and 25–44 years) more than with the older age group (45 years and older age group). It was also more associated with men than women. The findings revealed that singlestick purchases were associated with the lower socioeconomic population defined by no formal or primary education and the lowest, low, or middle wealth index.

The prevalence was high among vulnerable groups, such as younger people in all 10 countries; those with lower education in Botswana; and those in the lowest, low or middle wealth index in South Africa. In Kenya, the prevalence of singlestick purchases was higher among men than women. In half of the countries, those aged 15–24 years had a higher prevalence than those aged 45 years and older.

Consistent with other studies [2, 4–7, 16], our findings indicate that the purchase of singlesticks is prevalent in African countries. The sale of singlesticks in African countries makes cigarettes more accessible, particularly for those unable to pay for a pack of cigarettes, including adults with fewer resources and young people [1, 12]. A study by the Africa Tobacco Control Alliance showed that tobacco companies support and encourage informal traders who sell singlesticks through the provision of branded kiosks and umbrellas [9]. It also showed that the tobacco industry mobilized the informal traders to lobby against regulations that would ban the sale of singlesticks [9]. A Kenyan study found a high prevalence of the sale of singlesticks, despite the prohibition against it [4]. Our pooled findings show that singlestick purchases were higher among adults with no formal or primary education and among adults in the lowest, low or middle wealth index. Our country-specific analysis showed that singlestick purchases were associated with no formal or primary education in Botswana and with the lowest, low or middle wealth index in South Africa, indicating the presence of tobacco-related disparities observed in other studies [17–19]. Studies from the USA have shown that those in low socioeconomic positions with little disposable income, including young people, were more likely to purchase singlesticks [17–19].

As observed in other studies, our findings indicated that singlestick purchases were common in some African countries due to the lack of regulations prohibiting the practice [2, 5, 9]. In some countries with regulations (such as Kenya in this study) and other African countries (such as Benin, Ethiopia, Niger, Nigeria and Senegal) [6, 8, 9, 12], singlestick purchases were common despite laws that prohibited it. This practice is exacerbated by tobacco industry tactics encouraging informal traders to sell singlesticks by providing them with branded kiosks and umbrellas and by efforts to mobilize them to lobby against regulations that would ban the sale of single cigarettes [1, 8, 16]. Making tobacco products more accessible and attractive to young people can contribute to smoking initiation among this population group [1, 8, 16]. Overall but particularly among young people and those who do not smoke or smoke daily, sales of singlesticks undermine the impact of health warning labels and may make it easier to trigger the desire to smoke and normalize smoking [9, 10].

The tobacco industry in African countries has made tobacco-related products more accessible through sales of singlesticks [9, 16], which eliminate the need for purchasing packs. Singlesticks are more accessible, particularly for vulnerable groups such as adults with limited income and youth. This approach may have contributed to the increased availability of tobacco

**Table IV.** Adjusted predictors of the purchase of singlesticks among adults aged  $\geq 15$  years who smoked manufactured cigarettes by selected demographic characteristics in 10 African countries, GATS, 2012–21

Demographic variables	Botswana 2018	Cameroon 2013	Ethiopia 2017	Kenya 2014	Mauritania 2021	Nigeria 2012	Senegal 2015	South Africa 2021	Tanzania 2019	Uganda 2013
	(n = 495)	(n = 373)	(n = 522)	(n = 413)	(n = 417)	(n = 192)	(n = 405)	(n = 1412)	(n = 296)	(n = 333)
	aPR (95% CI)	aPR (95% CI)	aPR (95% CI)	aPR (95% CI)	aPR (95% CI)	aPR (95% CI)	aPR (95% CI)	aPR (95% CI)	aPR (95% CI)	aPR (95% CI)
Age (years)										
15–24	1.29* (1.06, 1.58)	1.15 (0.95, 1.40)	2.14* (1.29, 3.53)	0.86 (0.60, 1.24)	1.51* (1.04, 2.20)	1.30* (1.05, 1.62)	1.03 (0.79, 1.35)	1.94* (1.58, 2.39)	N/A	0.93 (0.68, 1.26)
25–44	1.21* (1.01, 1.45)	1.05 (0.89, 1.25)	1.63 (1.00, 2.67)	1.02 (0.93, 1.12)	1.28 (0.87, 1.88)	1.06 (0.86, 1.31)	1.15 (0.95, 1.39)	1.50* (1.22, 1.85)	1.11* (1.00, 1.23)	1.01 (0.90, 1.13)
45+	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Sex										
Men	0.94 (0.82, 1.07)	0.87 (0.76, 1.00)	1.45 (0.66, 3.21)	1.54* (0.94, 2.54)	1.78 (0.98, 3.23)	2.03 (0.92, 4.50)	0.91 (0.73, 1.13)	1.07 (0.91, 1.26)	1.01 (0.77, 1.33)	0.98 (0.87, 1.11)
Women	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Residence										
Urban	1.07 (0.96, 1.20)	1.04 (0.89, 1.21)	0.94 (0.63, 1.39)	1.13* (1.05, 1.22)	1.11 (0.70, 1.75)	1.09 (0.91, 1.32)	1.03 (0.88, 1.20)	0.97 (0.83, 1.13)	0.92 (0.77, 1.09)	1.04 (0.93, 1.16)
Rural	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Education										
No formal education	1.12* (1.00, 1.26)	1.12 (0.83, 1.51)	1.40 (0.91, 2.15)	1.07 (0.88, 1.30)	0.98 (0.73, 1.30)	1.03 (0.84, 1.26)	1.14 (0.86, 1.52)	1.13 (0.96, 1.33)	1.00 (0.82, 1.23)	1.01 (0.88, 1.15)
or primary and higher	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Wealth index										
Lowest, low or middle	1.01 (0.90, 1.14)	0.92 (0.78, 1.08)	0.87 (0.60, 1.26)	0.96 (0.86, 1.07)	0.82 (0.58, 1.17)	1.04 (0.81, 1.33)	0.94 (0.80, 1.10)	1.90* (1.50, 2.40)	1.01 (0.84, 1.20)	1.04 (0.90, 1.21)
High or highest	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.

Notes. The wealth index is based on household assets such as electricity, flush toilet, fixed telephone, cellular telephone, television, radio, moped/scooter/motorcycle, washing machine, and so forth. Respondents were divided into wealth quintiles ranking from one (lowest) to five (highest) based on the reported household assets. Ref.—Reference group. \* means statistically significant at  $P < 0.05$ .

products in these countries, which are considered emerging markets.

To address the challenge of singlestick purchases on the continent, African countries could implement Article 16 of the WHO FCTC, which requires all parties to adopt policy measures that prohibit sales of tobacco products to minors, including banning the sale of singlesticks and of small cigarette packs; small cigarette packs are more accessible to youth than normal cigarette packs [1]. At the time of GATS implementation in each country, Kenya (2007) was the only country that had passed legislation banning sales of singlesticks [4]. The Africa Tobacco Control Alliance in a non-peer-reviewed study of 10 major cities in Africa found that countries that had passed legislation to ban the sale of singlesticks often failed to enforce the ban [9]. African countries that have laws banning the sale of singlesticks might consider adopting measures to effectively implement and enforce these laws with financial and technical resource support, as well as with educational and awareness-raising strategies to ensure public support [20].

African countries could also adopt and effectively implement comprehensive tobacco control policies and programs based on Article 16 of the WHO FCTC and MPOWER, a set of six cost-effective and high-impact measures introduced in 2008 to help them overcome demand for tobacco. The MPOWER package includes six main measures: (i) monitor tobacco use and prevention policies, (ii) protect people from tobacco smoke, (iii) offer help to quit tobacco use, (iv) warn people about the dangers of tobacco, (v) enforce bans on tobacco advertising, promotion and sponsorship and (vi) raise taxes on tobacco [16]. One key element of Article 16 of the WHO FCTC is the prohibition of sales of tobacco products to minors, including direct access at the point of sale, vending machine accessibility, tobacco-based toys, free distribution of tobacco products and individual or small packet cigarette sales [21]. Banning the sale of singlesticks and enforcing the ban are effective means to address the tobacco epidemic.

### Limitations

This study is subject to at least five limitations. First, we used self-reported data that may be subject to respondent bias, such as recall bias. Second, we used data collected at different times in the countries due to different GATS implementation schedules; this might affect the comparisons because tobacco control laws and measures were implemented in these countries at different times during the period of GATS implementation. Third, the use of a cross-sectional study design precludes us from establishing causation. Fourth, the wealth index was used as a proxy for income even

though the wealth index as applied in GATS has a limitation, urban bias, as pointed out by Rutstein [22] in its application in the Demographic Health Survey. Urban bias as a limitation captures the fact that the wealth index includes mostly assets and services such as electricity and flush toilets, which may not be available in many rural areas, and does not include most principal rural assets such as land holdings and animal herds. Finally, most of the countries analyzed in this study had a very small sample size of females who smoked tobacco. This might have affected the precision of the overall estimates in the regression models assessing gender differences.

### Conclusion

Across the 10 African countries, the incidence of singlestick purchases among those who smoked manufactured cigarettes ranged from 61.4% to 92.0%. The findings indicate that singlestick purchases were common in most countries. This suggests that the 10 African countries assessed might consider implementing or strengthening and enforcing tobacco control measures to prohibit the sale of singlesticks as recommended by Article 16 of the WHO FCTC. Countries implementing the ban might consider using an effective counseling strategy for retailers, developing and implementing a communication strategy for the public and retailers and having regulators hold retailers accountable [9].

### Supplementary data

Supplementary data are available at *HEAL* online

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### Conflict of interest statement

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### Data availability

Data are available at Centers for Disease Control and Prevention (CDC)—GTSSData: Datasets. GATS South



Africa and GATS Mauritania datasets will be added to the CDC—GTSSData: Datasets website once they are made publicly available as per the GATS Data Release Policy.

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