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# Smoke-free law compliance and predictive factors in Ethiopia: observational assessment of public places and workplaces

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## ABSTRACT

**Objectives** The primary objective of this observational study was to assess the status of public place and workplace compliance with smoke-free provisions in Ethiopia.

**Methods** This study was conducted in four regions of Ethiopia (Oromia; Sidama; Harari; and Southern Nations, Nationalities, and Peoples' Region) from September to October 2021. Data were collected using a standardised smoke-free checklist.  $\chi^2$  tests were used to assess the association between categorical variables and the smoke-free status. Multivariable binary logistic regression analysis was used to identify factors associated with the presence of at least one person actively smoking.

**Results** Approximately 97% (95% CI 93.1%, 98.8%) of government buildings, 92.5% (95% CI 85.7%, 96.2%) of educational institutions, 89.8% (95% CI 86.3%, 92.5%) of bars, restaurants and cafés, 88.4% (95% CI 82.9%, 92.3%) of food establishments and 84.0% of hotels (95% CI 79.5%, 87.6%) were non-compliant with the tobacco control law. Overall, only 12.3% of sites met the requirements of the current smoke-free law. The multivariable logistic regression models showed that transit facilities (adjusted OR (AOR)=26.66 (95% CI 7.53, 94.41)) and being located in the Harari region (AOR=4.14 (95% CI 2.30, 7.45)) were strongly associated with the presence of active smoking observed during the site visit.

**Conclusion** This study indicated that public place and workplace non-compliance level was very high in all sites. This calls for more effective implementation of complete smoke-free provisions across all government buildings and institutions in all regions, such as public educational campaigns about the laws and enforcement action for non-compliance. Furthermore, all regional states should adopt Federal Proclamation 1112/2019.

## INTRODUCTION

The Federal Democratic Republic of Ethiopia constitution states that every Ethiopian should enjoy a clean and healthy environment.<sup>1</sup> However, findings from the 2016 Global Adult Tobacco Survey (GATS) revealed secondhand smoke is prevalent in public places in Ethiopia with 60.4% of visitors to bars/nightclubs and 31.1% of visitors to restaurants exposed to secondhand smoke in these venues, while 29.3% of employees reported exposure in their workplace.<sup>2</sup> Another study by Defar *et al* estimated that approximately 10% and 12.6% of adults are exposed in their homes and workplaces, respectively.<sup>3</sup>

## WHAT IS ALREADY KNOWN ON THIS TOPIC

- ⇒ Secondhand smoke (SHS) exposure puts everyone at risk and there is no safe level. However, national surveys including the 2016 Global Adult Tobacco Survey and Non-Communicable Disease Stepwise Survey 2015 indicated that SHS exposure at various public places and workplaces is very high in Ethiopia.
- ⇒ Only one previous study has assessed the compliance level of smoke-free legislation among governmental hospitals in Addis Ababa in Ethiopia. However, this study used the repealed tobacco control bill to assess the compliance level.
- ⇒ There has been limited research into variations in smoke-free status in public places in Ethiopia, and no published evaluation of compliance with smoke-free provisions in public places after the tobacco control law. This comprehensive law, which requires 100% smoke-free public places and workplaces, was implemented in February 2019.

## WHAT THIS STUDY ADDS

- ⇒ This is the first study to evaluate the compliance of the smoke-free provisions in various public places and workplaces including hospitality and transit sites after the implementation of the tobacco control law in Ethiopia.
- ⇒ Overall, only 12.3% of sites were compliant with the new tobacco control bill. Transit sites and sites located in the Harari region were most likely to have active smoking present during the data collection.

## HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

- ⇒ The results indicate stronger enforcement of the smoke-free law in all public places and regions is required.

In response to concerns about secondhand smoke exposure, the government of Ethiopia passed tobacco control proclamation No 1112/2019, which implements WHO's Framework Convention on Tobacco Control (FCTC) requirements.<sup>4</sup> The new law that commenced in 2019 prohibits designated smoking areas (DSA) in public places (any part of any indoor workplaces, all indoor hospitality settings, all forms of public transport and all common areas within condominium housing) and



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smoking within any indoor and outdoor spaces within 10 m of any doorway, openable window or air-intake mechanism of any public place or workplace and in any outdoor part of health-care facilities, government institutions, facilities such as schools intended mainly for those under the age of 21, higher educational institutions, youth centres and amusement parks. The law also requires the owner or another person in charge of the management of a public site to ensure no one smokes, uses or sells any tobacco products in prohibited areas and to forbid the placement of an ashtray or other comparable devices intended for tobacco use in such places. Additionally, a no smoking sign and clear, conspicuous notices prohibiting tobacco use must be posted by the owner of the public place or another authorised person.<sup>4</sup>

The regulatory body or inspector has the power to take several administrative measures in response to non-compliance with the smoke-free requirements, including warning letters, suspending certifications for registration or competence, or other licences. Anyone selling tobacco goods in places where sales are banned may be liable for a maximum penalty of 6 months in jail or 5000 birr in fines. Smoking or using tobacco products in legislated smoke-free areas can incur a maximum fine of 1000 birr.<sup>4</sup> However, we are unaware of any fines being issued for non-compliance with these provisions.

The Ethiopian Food and Drug Authority (EFDA) has undertaken various tobacco control activities and supported regional regulatory bodies to execute their responsibility to control tobacco in their respective jurisdictions. As part of this effort, the EFDA received support from the Management Sciences for Health, a global non-profit advisory organisation, to expedite and strengthen the enforcement of smoke-free provisions in public places in the Oromia; Harari; Sidama; and Southern Nations, Nationalities, and Peoples' Region (SNNPR). Enforcement activities included posting 'no smoking' signs in public places, training owners and management of hospitality sites about the smoke-free provisions in selected cities, and media advocacy to raise community awareness. EFDA has worked collaboratively with three civil society organisations to achieve a smoke-free Addis Ababa since 2022.

To measure the impact of the smoke-free law implementation, a compliance assessment was undertaken in public places in 12 towns in the four regional states. Hence, this study aimed to assess the status of the implementation of smoke-free provisions, the level of compliance with smoke-free policies and associated factors in selected public places and workplaces in selected regions of Ethiopia.

## METHODOLOGY

### Study setting and data sources

This study was conducted from September to October 2021 in the 12 towns included in the smoke-free initiative pilot project in four regions of the country (Oromia, Sidama, Harari and SNNPR) (table 1). Public facilities such as food and beverage businesses (hotels, bars, restaurants, cafés, etc), schools, health facilities, government offices, youth centres, parks and transit facilities were assessed. Before data collection, lists of relevant sites were collected from government offices and town-level regulatory bodies. We followed a census approach and all public places and institutions in each town were included in the study. All identified sites consented (100% participation).

### Data collection

Data were collected using a standardised smoke-free checklist. The standardised checklist was adopted from the compliance

**Table 1** Summary list of study sites by area and role of respondents

Variable		Number of sites (n=1282)	%
<b>Region</b>	<b>Town name</b>		
Oromia	Jimma	154	12.0
	Adama	117	9.1
	Sebeta	100	7.8
	Shashemene	64	5.0
	Mojo	62	4.8
SNNPR	Alaba	99	7.7
	Wolaita Soda	98	7.6
	Arbaminch	94	7.3
	Hosanna	71	5.5
Sidama	Hawassa	200	15.6
	Bensa	51	4.0
Harar	Harer	172	13.4
<b>Respondent</b>	<b>Role or function</b>		
	Manager/director	999	77.9
	Assistant manager	15	1.2
	Owner	250	19.5
	Other	12	0.9
	Public relations	6	0.5
	Total	1282	100

SNNPR, Southern Nations, Nationalities, and Peoples' Region.

study guide<sup>5</sup> and the Ethiopian tobacco control proclamation No 1112/2019.<sup>4</sup> First, the smoke-free checklist (see online supplemental materials) was approved by EFDA tobacco control experts and tobacco control and coordinating committee members, and the English version was translated into two local languages: Amharic and Afan Oromo. The checklists were then translated back into English to verify their consistency. In addition, the survey checklist was piloted in public places and a government building in Addis Ababa's smoke-free initiative project before actual data collection commenced.

Before data collection, both field supervisors and data collectors were trained for 3 days on tobacco smoke-free initiatives, the smoke-free laws, data collection protocols using handheld devices or mobile devices, interviewing techniques and how to identify the smell of cigarettes, cigarette butt identification, signs of a DSA, which breaches the smoke-free law, presence of ashtray/lighters, the existence of non-smoking signage or stickers on noticeable areas and presence of a person smoking tobacco within a prohibited area. In addition, EFDA-approved samples of 'no smoking signage or stickers' were used as showcards during data collection to identify the availability of required stickers or signage. To ensure data quality, surveys with tobacco control experts and coordinators provided remote and in-person supervision to all teams across all four regions.

During the data collection, the observational assessment was carried out in all indoor places and locations within the venue that were covered by the smoke-free law, including hospitality venues such as hotels, restaurants and others up to a 10 m radius from the indoor place, and the remainder were government buildings, youth centres, educational settings and healthcare facilities. Data collection was conducted during peak hours for each establishment type. For instance, food and drinking establishments were assessed during dining hours, nightclubs and bars during the late afternoon and evening and other government buildings during working hours.

During the site assessment (table 1), the data collector contacted the owner, manager or other responsible people of the site to obtain permission to conduct the study. This person (the respondent) then guided the data collector at the site and explained smoke-free implementation at the site and responded to interview questions. When the data collectors faced ambiguity regarding validating indicators of compliance, such as cigarette odour and butt, they interviewed the respondent for the site to assist with identifying the origin of the tobacco smoke odour or butt.

### Study variables and smoke-free indicators

During the data cleaning, we created seven categories of public places and government buildings by merging similar types of institutions and public places. The first category included government-owned buildings and rented government offices. The second category, food and drink establishments, included various public places, such as recreational areas, youth centres, fast-food shops, traditional restaurants, grocery stores and other local drink houses (*Tella*, *Teji* and *Areki*—Ethiopian indigenous traditional fermented beverages). The third category was healthcare facilities that consisted of hospitals, health centres, dental clinics, specialty clinics, drugstores, pharmacies and health posts (both private and government owned). The fourth category was private and government educational facilities (all schools, training institutions and universities). The fifth category, transit facilities, included bus terminals, taxi ranks and transport stations. The sixth category included hotels (both rated star and non-star) and resorts. Finally, we labelled the seventh group by merging cafés, non-traditional restaurants and bars into one category.

To define smoke-free status, we used seven key variables developed from the 2019 tobacco control proclamation and directives. These included existence of DSA, presence of 'no smoking' signage or stickers, presence of an ashtray or lighter, presence of cigarette butt, presence of tobacco smell and at least one person found smoking during the visit. A public place was classed as smoke free when none of the indicators were violated.

### Data analysis

The data were analysed using Stata SE V.16.0. To describe the smoke-free status of public places, we calculated the frequency and unweighted percentages of the seven smoke-free indicator variables.  $\chi^2$  tests were used to assess the associations between categorical indicator variables and smoke-free status according to the service or institution type and region.

Variables with a *p* value <0.20 from bivariate binary logistic regression analysis were entered into the final multivariable

model.<sup>6</sup> After calculating the adjusted ORs (AOR) and 95% CIs, multivariable binary logistic regression analysis was used to identify factors associated with the presence of at least one person smoking in workplace or public places.

## RESULTS

### Distribution of sites

Table 2 presents the proportion and frequency of the types of service or businesses and their regions. Overall, 1282 sites were assessed for smoke-free status from four regions (table 2), including 374 bars, restaurants and cafés, 181 other food and drinking establishments, 318 hotels, 170 government buildings, 107 educational facilities, 120 healthcare facilities and 12 transit facilities.

### Status of smoke-free provisions compliance

We examined the distribution of sites with indicators of existing smoke-free legislation by type of sites and region (table 3). Among the regions that reported sites with an illegal DSA, one-quarter (25.5% (95% CI 20.5%, 31.3%)) were from Sidama and about 22.7% (95% CI 17.0%, 29.5%) were from Harari regional states. Approximately 28.4% of DSAs were in hotels (14% (95% CI 10.7%, 18.4%)), and bars, restaurants and cafés (14% (95% CI 11.0%, 18.1%)), followed by food and drinking establishments (9.9% (95% CI 6.4%, 15.2%)). Overall, approximately 1 in 10 sites (10.1% (95% CI 8.5%, 11.8%)) had DSAs in prohibited indoor places. Hotels (29.2% (95% CI 24.5%, 34.5%)) and healthcare facilities (30.8% (95% CI 23.2%, 39.7%)) had a relatively higher percentage of sites with no smoking signage. On a regional basis, Harari (28.5% (95% CI 22.2%, 35.7%)) and Oromia (25.4% (95% CI 21.7%, 29.4%)) had a higher percentage of sites with no smoking stickers/signage than the overall percentage (19.2% (95% CI 17.1%, 21.4%)). Among the regions that reported the presence of ashtrays or lighters, Harari had the highest proportion of sites with these present (14.0% (95% CI 9.5%, 20.0%)), followed by the Oromia region (11.3% (95% CI 8.8%, 14.4%)). Among service or business types, food and drinking establishments were most likely to have an ashtray displayed, with a proportion of 19.3% (95% CI 14.2%, 25.8%), followed by hotels (11.3% (95% CI 8.3%, 15.3%)). Transit facilities, food and drinking establishments and hotels had a higher proportion of cigarette butts present than other institutions: 58.3% (95% CI 30.7%, 81.5%), 30.8% (95% CI 26.0%, 36.1%) and 29.8% (95% CI 23.6%, 36.9%), respectively. Among regional states, Harari (39.5% (95% CI 32.5%, 47.0%)) and SNNPR (22.7% (95% CI 18.6%, 27.3%)) had a

**Table 2** Proportion and frequency of site type by region

Type of site (service or business)	Region									
	Harari		Oromia		SNNPR		Sidama		Total	
	n	%	n	%	n	%	n	%	n	%
Bar, restaurant and café	68	18.2	128	34.2	100	26.7	78	20.9	374	100
Transit facility	0	0.0	11	91.7	1	8.3	0	0.0	12	100
Educational facility	1	0.9	32	29.9	41	38.3	33	30.8	107	100
Food and drinking establishment	11	6.1	110	60.8	43	23.8	17	9.4	181	100
Government building	33	19.4	53	31.2	39	22.9	45	26.5	170	100
Healthcare facility	14	11.7	33	27.5	48	40.0	25	20.8	120	100
Hotel	45	14.2	130	40.9	90	28.3	53	16.7	318	100
Total	172	13.4	497	38.8	362	28.2	251	19.6	1282	100

SNNPR, Southern Nations, Nationalities, and Peoples' Region.

**Table 3** Proportion of sites that did not comply with the smoke-free law by region and type of service or business

Variables	Smoke-free status indicators											
	Presence of DSA		Presence of no smoking sticker		Presence of ashtray		Presence of butts		Cigarette smell		Presence of someone smoking	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Overall	10.1	(8.5, 11.8)	19.2	(17.1, 21.4)	9.1	(7.7, 10.8)	21.5	(19.4, 23.9)	11.6	(10.0, 13.5)	7.7	(6.4, 9.3)
Type of site												
Bar, restaurant and café	14.2	(11.0, 18.1)	17.1	(13.6, 21.3)	8.8	(6.3, 12.2)	21.4	(17.5, 25.8)	11.5	(8.6, 15.2)	7	(4.8, 10.0)
Transit facility	0		0		50.0	(24.4, 75.6)	58.3	(30.7, 81.5)	50.0	(24.4, 75.6)	58.3	(30.7, 81.5)
Educational facility	2.8	(0.9, 8.3)	7.5	(3.8, 14.3)	1.9	(0.5, 7.2)	9.3	(5.1, 16.5)	0.9	(0.1, 6.3)	0.9	(0.1, 6.3)
Other food and drinking establishment	9.9	(6.4, 15.2)	19.9	(14.7, 26.4)	19.3	(14.2, 25.8)	29.8	(23.6, 36.9)	20.4	(15.2, 26.9)	12.2	(8.1, 17.8)
Government building	4.1	(2.0, 8.4)	4.7	(2.4, 9.1)	1.8	(0.6, 5.3)	12.4	(8.2, 18.2)	5.3	(2.8, 9.9)	6.5	(3.6, 11.3)
Healthcare facility	2.5	(0.8, 7.5)	30.8	(23.2, 39.7)	1.7	(0.4, 6.4)	5	(2.3, 10.7)	0.8	(0.1, 5.7)	0.8	(0.1, 5.7)
Hotel	14.2	(10.7, 18.4)	29.2	(24.5, 34.5)	11.3	(8.3, 15.3)	30.8	(26.0, 36.1)	16.4	(12.7, 20.8)	9.7	(6.9, 13.5)
Region												
Harari	22.7	(17.0, 29.5)	28.5	(22.2, 35.7)	14.0	(9.5, 20.0)	39.5	(32.5, 47.0)	23.8	(18.1, 30.8)	19.8	(14.5, 26.4)
Oromia	3.8	(2.4, 5.9)	25.4	(21.7, 29.4)	11.3	(8.8, 14.4)	16.7	(13.7, 20.2)	11.7	(9.1, 14.8)	7.2	(5.3, 9.9)
SNNPR	1.9	(0.9, 4.0)	13.0	(9.9, 16.9)	6.1	(4.0, 9.1)	22.7	(18.6, 27.3)	7.7	(5.4, 11.0)	5.0	(3.2, 7.8)
Sidama	25.5	(20.5, 31.3)	9.6	(6.5, 13.9)	6.0	(3.6, 9.7)	17.1	(13.0, 22.3)	8.8	(5.8, 13.0)	4.4	(2.4, 7.7)

DSA, designated smoking area; SNNPR, Southern Nations, Nationalities, and Peoples' Region.

higher proportion of sites where cigarette butts were found than the overall average of 21.5% (95% CI 19.4%, 23.9%). Overall, the presence of cigarette smell and at least one person smoking was found in 11.6% (95% CI 10.0%, 13.5%) and 7.7% (95% CI 6.4%, 9.3%) of sites, respectively. Specifically, transit stations had a high proportion of sites with cigarette smell and active smoking, with proportions of 50% (95% CI 24.4%, 75.6%) and 58% (95% CI 30.7%, 81.5%), respectively. Harari had a higher proportion of sites with a cigarette smell (23.8% (95% CI 18.1%, 30.8%)) and at least one person smoking (19.8% (95% CI 14.5%, 26.4%)) during the assessment than the overall averages.

More than 80% of sites (n=1036) did not have signage or stickers warning people not to smoke within a prohibited area or describing the site as a smoke-free area. However, among the sites that had smoke-free signage (n=246), about 76% (n=188) posted stickers at appropriate places, and respondents reported that close to 96% (n=181) of the stickers were in languages that were understandable for their customers, clients and workers. However, 23.6% (n=58) of no smoking signage or stickers were posted in areas where the signage was not visible to customers, or service providers such as workers and visitors.

Table 4 shows the aggregated smoke-free status of the sites based on aggregation of the seven smoke-free indicators. Across all regions, the proportion of sites that were smoke-free was 12.3% (95% CI 10.6%, 14.2%). Oromia had the highest proportion of smoke-free sites (19.3% (95% CI 16.1%, 23.0%)) and Sidama, the lowest (5.6% (95% CI 3.3%, 9.2%)).

No transit facilities were smoke free and close to 97% (95% CI 93.1%, 98.8%) of government buildings were non-compliant. Fewer than one in three healthcare facilities (29.2% (95% CI 21.7%, 37.9%)) met the smoke-free policy (table 4). Among hospitality sites, hotels had better smoke-free compliance (16.0% (95% CI 12.4%, 20.5%)) than other sites. The remaining types of sites had lower than the overall smoke-free compliance rate.

#### Factors associated with the presence of a person smoking

To identify the factors associated with the presence of at least one person smoking in a prohibited area, variables including labelled DSA, no sticker/signage, region and type of site were analysed (table 5). The highest percentage was used as the reference category for each factor. Bivariate analyses indicated that region, type of site and labelled DSA were significantly associated with the presence of at least one person smoking at the site

**Table 4** Aggregated smoke-free status of the site type and region

Variables	Smoke-free compliance rate				
	Smoke free		Non-smoke free		Total
	%	95% CI	%	95% CI	
Overall	12.3	(10.6, 14.2)	87.7	(85.8, 89.4)	100
Region					
Harari	7.6	(4.4, 12.6)	92.4	(87.4, 95.6)	100
Oromia	19.3	(16.1, 23.0)	80.7	(77.0, 83.9)	100
SNNPR	9.7	(7.0, 13.2)	90.3	(86.8, 93.0)	100
Sidama	5.6	(3.3, 9.2)	94.4	(90.8, 96.7)	100
Type of institution					
Bar, restaurant and café	10.2	(7.5, 13.7)	89.8	(86.3, 92.5)	100
Transit facility	0		100		100
Educational facility	7.5	(3.8, 14.3)	92.5	(85.7, 96.2)	100
Food and drinking establishment	11.6	(7.7, 17.1)	88.4	(82.9, 92.3)	100
Government building	2.9	(1.2, 6.9)	97.1	(93.1, 98.8)	100
Healthcare facility	29.2	(21.7, 37.9)	70.8	(62.1, 78.3)	100
Hotel	16.0	(12.4, 20.5)	84.0	(79.5, 87.6)	100

SNNPR, Southern Nations, Nationalities, and Peoples' Region.



**Table 5** Multivariable logistic regression model of factors associated with active smoking in prohibited areas

Variables	Bivariate			Multivariate		
	COR	95% CI	P value	AOR	95% CI	P value
Region			<0.001			
Oromia (reference)	1.00			1.00		
Harari	3.15	(1.90, 5.23)	<0.001	<b>4.14</b>	<b>(2.30, 7.45)</b>	<b>&lt;0.001</b>
SNNPR	0.67	(0.37, 1.20)	0.178	0.90	(0.48, 1.66)	0.725
Sidama	0.59	(0.29, 1.17)	0.132	0.69	(0.31, 1.50)	0.344
Type of site			<0.001			
Bar, restaurant and café (reference)	1.00			1.00		
Transit facility	18.74	(5.56, 63.14)	<0.001	<b>26.66</b>	<b>(7.53, 94.41)</b>	<b>&lt;0.001</b>
Educational facility	0.13	(0.02, 0.94)	0.044	0.20	(0.03, 1.50)	0.116
Food and drinking establishment	1.85	(1.02, 3.27)	0.043	<b>2.49</b>	<b>(1.32, 4.72)</b>	<b>0.005</b>
Government building	0.93	(0.45, 1.92)	0.836	0.88	(0.41, 1.87)	0.736
Health facility	0.11	(0.02, 0.84)	0.033	0.14	(0.02, 1.07)	0.058
Hotel	1.45	(0.84, 2.49)	0.184	1.69	(0.96, 2.98)	0.07
Presence of labelled DSA	2.49	(1.47, 4.23)	<0.001	<b>1.99</b>	<b>(1.07, 3.70)</b>	<b>0.03</b>
Absence of 'No smoking signage'	1.48	(0.83, 2.65)	0.187	<b>2.02</b>	<b>(1.07, 3.79)</b>	<b>0.029</b>
Constant				0.03	(0.01, 0.06)	<0.001

Values in bold signifies p-value <0.05.

AOR, adjusted OR; COR, crude OR; DSA, designated smoking area; SNNPR, Southern Nations, Nationalities, and Peoples' Region.

( $p < 0.001$ ). Multivariable logistic regression models showed that the presence of labelled DSA, absence of 'No smoking signage' within prohibited areas, Harari region and all types of sites other than educational facilities, healthcare facilities and government buildings were associated with the presence of someone smoking at the site (table 5). The odds of active smoking were 27 times higher at transit sites compared with the reference category of 'bar, restaurant, and café' (AOR=26.66 (95% CI 7.53, 94.41)). Furthermore, the odds of at least one person smoking in a prohibited area was twofold higher in other food and drinking establishments (AOR=2.49 (95% CI 1.32, 4.72)) and hotels (AOR=1.69 (95% CI 0.96, 2.98)) than at the reference category sites. Moreover, sites with a labelled DSA and the absence of 'no smoking' signage had twofold higher odds of a person smoking than at sites without a labelled DSA and the presence of 'no smoking' signage (table 5).

## DISCUSSION

This study presents results from observational assessments and interviews with key site personnel at public places and workplaces in 12 towns selected for smoke-free initiative projects in four regions of Ethiopia. Newly legislated smoke-free provisions and tobacco control laws have not been implemented in all regions of Ethiopia. Hence, understanding the compliance level of smoke-free provisions, implementation and enforcement in the study sites provides useful information for implementing additional smoke-free provisions and other tobacco control regulations across the country. Our study used several indicators including existence of a DSA, smoking within 10 m of doorway or window, presence of smoke-free stickers/signage, presence of ashtrays/lighters in any indoor place, presence of cigarette butts within a prohibited area, presence of tobacco smell and active smoking within a prohibited area to assess compliance with smoke-free laws. The findings showed low compliance with smoke-free laws in the public places and workplaces of towns in the four regions, indicating the need for all regional governments to both adopt the national tobacco control regulations in their context and to enforce them to protect everyone from exposure to secondhand smoke in public places.

The Federal Democratic Republic of Ethiopia House of People passed one of the strongest African tobacco control bills in 2019,<sup>4</sup> which legislated 100% smoke-free government buildings, educational facilities and healthcare settings. However, our study showed that few healthcare facilities, educational institutions and other workplaces, including government buildings, and no transit facilities currently comply with the new smoke-free provisions. This low compliance with smoke-free provisions in government buildings, particularly in healthcare facilities, is consistent with a previous study conducted by Tadesse and Zawdie in Addis Ababa, Ethiopia, which also reported an absence of no smoking signage from a high proportion of hospital areas (97%), and most hospitals had low compliance with smoke-free provisions.<sup>7</sup> Another study in Ghana also found low compliance with smoke-free policies was linked to poor air quality in healthcare settings,<sup>8</sup> demonstrating the importance of achieving compliance with smoke-free laws. Hence, additional efforts are required to build on the current smoke-free initiative in Ethiopia to create healthy public places.

Similar to a previous research by Navas-Acien *et al*, which reported higher non-compliance with smoke-free laws in hospitality settings than in education and hospitals,<sup>9</sup> we also found hospitality settings had higher proportions of cigarette butts, active smoking and cigarette odour in prohibited indoor places than in other settings. For these settings, a relatively high number of sites had people smoking in a prohibited area within a 10 m radius of the indoor places. Further, the regression analysis indicated transit facilities, and food and drinking establishments were associated with the presence of active smoking, indicating these should be key locations for compliance activities. Our study findings found a comparable proportion of sites with active smoking in hospitality settings as reported by Gravelly *et al*, who observed active smoking at approximately 18% of hospitality venues in Kampala, Uganda.<sup>10</sup> The result is also consistent with the findings of the 2016 Ethiopian GATS, which found 60% of adults visiting bars and nightclubs reported being exposed to secondhand smoke.<sup>2</sup> These findings further strengthen the case for the accelerated implementation of Article 8 of the FCTC as well as the existing national tobacco control

regulations, such as banning smoke within a 10 m radius of all indoor public places and posting EFDA-approved no smoking signs at proper locations within the establishments. While we observed positive association between the existence of a DSA and absence of 'no smoking stickers/signage' and active smoking, a total ban on smoking in indoor areas is required to adequately protect patrons and staff. The previous study in Uganda showed that the levels of indoor fine particulate matter of 2.5  $\mu\text{m}$  or less (PM<sub>2.5</sub>) were at hazardous levels (concentration of 267.6  $\mu\text{g}/\text{m}^3$ ) in venues which allowed smoking to occur.<sup>10</sup>

Similar to our study, other research has also demonstrated a high correlation between the presence of cigarette butts and ashtrays and active smoking, including research in Greece,<sup>11</sup> and Turkey<sup>9</sup> demonstrating the utility of these measures as proxies for smoking on-site. Overall, we observed smoking in 99 sites during the data collection. Among the regions, Harari was predictive of the presence of active smoking. Numerous studies including GATS, Demographic and Health Survey, Guliani *et al* and Mengesha *et al* indicated that smoking was more prevalent in Harari than in any of these regions—Oromia, Sidama and SNNPR,<sup>2 12–14</sup> potentially explaining these results.

Legislating and enforcing 100% smoke-free laws in all indoor places can effectively protect non-smokers, improve air quality and support people who smoke to quit. After implementing the smoke-free law in England, Ireland and Scotland, salivary cotinine levels among adults who did not smoke reduced by ~80%.<sup>15–17</sup> Similarly, in New York, the concentration of PM<sub>2.5</sub>, a measure of indoor air quality, declined from 324 to 34  $\mu\text{g}/\text{m}^3$  after the smoke-free law took effect.<sup>18</sup> Reduction in indoor PM<sub>2.5</sub> levels and the number of people observed smoking in restaurants, cafeterias and coffee shops was also observed in Vietnam and Scotland 5 years after the introduction of a smoke-free law.<sup>19 20</sup> A study conducted in Georgia by Bakhturidze *et al* also indicated that, in addition to the tremendous improvement in indoor air quality, the implementation of comprehensive smoke-free provisions with a high compliance rate had positive effects on the reduction of secondhand smoke exposure, a decline in cardiovascular illness and enhanced demand for tobacco cessation services.<sup>21</sup> Hence, Ethiopia's smoke-free laws are an important step towards protecting the health of its citizens. However, our study found that public places and government buildings had low compliance rates with smoke-free provisions, regardless of the type of site and region, indicating that greater enforcement is needed.

### Strengths and limitations

The present study has limitations regarding the determination of cigarette smell because smell is subjective and may indicate smoking nearby rather than at the actual site. In addition, there were no prior measurements before the 2019 laws for comparison and the assessment did not include air quality measures, such as PM<sub>2.5</sub>. Because larger sites took slightly longer to assess than smaller sites, there was a greater chance of observing smoking at larger sites. Furthermore, sites were alerted to the study because consent and assistance from a site representative was obtained. Given the low smoke-free compliance rate observed, it is unlikely that this impacted the results. However, if smoke-free law enforcement activities increase, the use of covert methods may be required for future studies to avoid observer bias. Despite these limitations, our findings are the first of their kind for Ethiopia and provide baseline evidence for future smoke-free compliance assessment using prospective data. Our study's other strengths include the use

of a standardised checklist, trained data collectors and a census strategy followed in each town.

### CONCLUSION

This study indicated that the non-compliance level in public places and workplaces was very high, particularly in hospitality settings, workplaces and transit facilities. Only 12.5% of the establishments complied with the 2019 smoke-free policy. This calls for the effective implementation of comprehensive smoke-free provisions in all private establishments and government buildings. In addition, the adoption and full implementation of federal proclamation No 1112/2019 in all regions is urgently recommended.

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**Data availability statement** Data are available upon reasonable request. The data sets used in this study were part of the smoke-free initiative project, which is not publicly available. Data can be accessed by fulfilling the data-sharing policy of the Ethiopian Food and Drug Authority.

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### REFERENCES

- 1 Constitution of the federal democratic republic of ethiopia. 1994.
- 2 EPHI. Ethiopian global adult tobacco survey: executive summary 2016. Addis Ababa, Ethiopia Ethiopian Public Health Institute; 2016.
- 3 Defar A, Getachew T, Teklie H, *et al*. Tobacco use and its predictors among ethiopian adults: A further analysis of ethiopian NCD STEPS survey-2015. *Ethiopian Journal of Health Development* 2017;31:331–9.
- 4 FAO. A proclamation to provide for food and medicine administration, No. 1112/2019; 2019.
- 5 International Union Against Tuberculosis and Lung Disease. ASSESSING COMPLIANCE WITH SMOKE-FREE LAWS. Edinburgh, United Kingdom The Union, Roswell Park Cancer Institute, Bloomberg Initiative to Reduce Tobacco Use, Campaign for Tobacco-Free Kids, Institute for Global Tobacco Control, Johns Hopkins Bloomberg School of Public Health; 2014.

- 6 Hosmer DJ, Lemeshow S, Sturdivant RX. In: *Applied logistic regression*. John Wiley & Sons, 22 March 2013.
- 7 Tadesse T, Zawdie B. Non-Compliance and associated factors against smoke-free legislation among health care staffs in governmental hospitals in Addis ababa, Ethiopia: an observational cross-sectional study. *BMC Public Health* 2019;19:..91.
- 8 Singh A, Okello G, Semple S, *et al*. Exposure to secondhand smoke in hospitality settings in Ghana: evidence of changes since implementation of smoke-free legislation. *Tob Induc Dis* 2020;18:44.
- 9 Navas-Acien A, Çarkoğlu A, Ergör G, *et al*. Compliance with smoke-free legislation within public buildings: a cross-sectional study in turkey. *Bull World Health Organ* 2016;94:92–102.
- 10 Gravely S, Nyamurungi KN, Kabwama SN, *et al*. Knowledge, opinions and compliance related to the 100 % smoke-free law in hospitality venues in Kampala, Uganda: cross-sectional results from the KOMPLY project *BMJ Open* 2018;8:e017601.
- 11 Vardavas CI, Agaku I, Patelarou E, *et al*. Ashtrays and signage as determinants of a smoke-free legislation's success. *PLoS One* 2013;8:e72945.
- 12 CSA. *Demographic and health survey key findings*. Central Statistics Agency, 2016.
- 13 Guliani H, Gamtessa S, Çule M. Factors affecting tobacco smoking in Ethiopia: evidence from the demographic and health surveys. *BMC Public Health* 2019;19:938.
- 14 Mengesha SD, Teklu KT, Weldetinsae A, *et al*. Tobacco use prevalence and its determinate factor in ethiopia- finding of the 2016 ethiopian GATS. *BMC Public Health* 2022;22:555.
- 15 Sims M, Mindell JS, Jarvis MJ, *et al*. Did smokefree legislation in England reduce exposure to secondhand smoke among nonsmoking adults? cotinine analysis from the health survey for England. *Environ Health Perspect* 2012;120:425–30.
- 16 Allwright S, Paul G, Greiner B, *et al*. Legislation for smoke-free workplaces and health of bar workers in Ireland: before and after study. *BMJ* 2005;331:1117.
- 17 Semple S, Mueller W, Leyland AH, *et al*. Assessing progress in protecting non-smokers from secondhand smoke. *Tob Control* 2019;28:692–5.
- 18 Travers M, Cummings K, Hyland A, *et al*. Indoor air quality in hospitality venues before and after implementation of a clean indoor air law--western new york, 2003. *MMWR Morb Mortal Wkly Rep* 2004;53:1038–41.
- 19 Tran LK, Morawska L, Gartner CE, *et al*. Secondhand smoke in public places in Vietnam: an assessment 5 years after implementation of the tobacco control law. *Tob Control* 2021;30:553–9.
- 20 Apsley A, Semple S. Secondhand smoke levels in Scottish bars 5 years on from the introduction of smoke-free legislation. *Tob Control* 2012;21:511–3.
- 21 Bakhturidze G, Peikrishvili N, Gvinianidze K. Impact of comprehensive smoke-free policy compliance on shs exposure and health condition of the georgian population. *Tob Prev Cessat* 2021;7:70.

Supplementary materials

### Appendix 1: Assessment Checklists

<b>note</b>	Greetings!
<b>select_one YN</b>	Are you volunteer to participate in this study?
<b>select_one Q1</b>	Q1 Region?
<b>text</b>	Q2. Town Name
<b>text</b>	Q3. Name of institution
<b>text</b>	Q4. Type of Business or Service
<b>text</b>	Q5. the Name of the person who gives the interview
<b>select_one Q6</b>	Q6. What is your role or position within the organization?
<b>select_one YN</b>	Q7. Existence of DSA (N.B- A space labeled as DSA)-Observation
<b>select_one YN</b>	Q8. Are there people smoking a cigarette in any indoors or within ten meters radius outdoor of the establishment? (10-meter radius from window, door, or open gate of the indoor, other than the DSA)-Observation
<b>select_one YN</b>	Q9. Availability of No smoking signage or Stickers-observation
<b>select_one YN</b>	Q10. Are No smoking signages or Stickers placed appropriately and visibly? (At the gate, where people used to work or sit to entertain)-observation
<b>select_one YN</b>	Q11. Is the language used in the No smoking signage or sticker clear or understandable to the customer or employee?
<b>select_one YN</b>	Q12. Presence of an ashtray or lighter or other devices in any indoor section or within ten meters radius outdoor of the establishment? (10 meter radius from window, door, or open gate of the indoor)-observation
<b>select_one YN</b>	Q13. The presence of tobacco remains such as cigarette butt within the smoking prohibited section of the establishment-observation
<b>select_one YN</b>	Q14. Presence of tobacco smell within the smoking prohibited section of the establishment-observation
<b>select_one YN</b>	Q15. Presence of a person actually smoking tobacco within the smoking prohibited section of the establishment-observation
<b>select_one YN</b>	Q16. Presence of written regulation by the establishment to ban or prohibit smoking-observation
<b>select_one YN</b>	Q17. Mechanism set by the establishment to enforce smoke free provision (e.g measures to take when it found someone start smoking)
<b>select_one YN</b>	Q18. Do you know about tobacco smoke free law?
<b>select_multiple Q19</b>	Q19. Where do you get the information about smoke free law
<b>text</b>	Q20. What do you think about the implementation of SFE? Probe: Contribution of staff
<b>select_one YN</b>	Q21. Is there any challenge you faced to implement Smoke free law?



text	Q22. If Q21 is yeas, what mechanisms you have used to cope up with the challenges?
select_one YN	Q23. Is there a mechanism to regularly check that everyone respects the rule?
text	Q24. What do you do to stop a person who is found smoking?
text	Q25. What were the reasons behind for those who violated in spite of the existence of signage?
select_one YN	Q26. Do you think your establishment is implementing 100% smoke free law?
text	Q27. If Q 26 is yes, how do you achieve this result?
text	Please write a comment

## Appendix 2: CONSENT FORM (English version)

Greetings!

My name is \_\_\_\_\_. My colleagues and I are both from the Ethiopian Food and Drug Authority (EFDA).

Introduction: This informed consent form is for respondents who can provide adequate information about smoke-free environment implementation. This establishment was selected as a part of the smoke-free initiative in this study. Before you decide to participate, it is important to understand why the research is being conducted and what it will involve. Please take time to read the following information carefully and do not hesitate to ask our staff if there is anything that is unclear or if you would like more information.

Please take the time to decide whether you wish to participate.

Purpose: This research aims to understand the implementation of smoke-free laws in public places.

Type of research intervention: This research will involve collecting relevant information about smoke-free status in various public places, such as government buildings, schools, healthcare facilities, transport facilities, and hospitality settings.

Participant selection: All public places in the selected town were part of the study, and participants were preferably adults and those who knew the smoke-free environment implementation well, including owners, managers, and employers.

**Voluntary participation:** Your participation in this study is voluntary. It is your choice of whether to participate. You may change your mind later and stop participating even if you agree.

**Risks:** This study poses a minimum risk. The visits will take a small amount of time, but we will try to keep the observational assessment as short as possible and observe all the indoors and premises of the building.

**Benefits:** All participants will indirectly benefit from the data collected, as this will help us better understand the smoke-free law implementation status in Ethiopia. As tobacco kills secondhand smokers, the findings of this study will help directly nonsmokers from involuntary smoking exposure, because a 100% smoke-free environment is the only measure to prohibit smoking in any public place.

**Confidentiality:** The information that we collect during this study will be kept confidential. Information collected from you and your institution will be stored away, and only the researchers will be able to see it. In addition, only identifiers will be used during the data analysis, an aggregated form of data will be used, and no single type of data will be reported. The data will not be shared with or given to anyone except for the EFDA and regional regulatory offices.

**Who to contact?** If you have any questions, you may ask our staff about them now or later. If you wish to ask questions later, you may contact the research coordinators.

### **Annex 3: Field Checklist**

- I. Inform the appropriate government body such as town administration or health office in the selected town using the official support letters about the data collection and get support letter from them if needed.
- II. Get familiar with the city and determine the institution's real location in consultation with your field guide to design the route plan for smooth data collection
- III. Choose an appropriate time for data collection based on the nature of the workplace and hospitality settings (based on each type of institution's regular working hours).
- IV. Contact the appropriate person of the institution such as managers, directors, or owners, introduce yourself using official letters and a personal badge, and get informed consent using the printout consent form

- V. Determine the institution venue Including all areas within the compound and indoor area of the institution particularly, a toilet area near a dining area and the dining area, lobby area, a stairwell, bedrooms, offices, a waiting area, or common area, classrooms, wards, offices that were open to the public, corridors, and other indoor areas for your assessment.
- VI. Draw a standard itinerary to address all prohibited areas within the selected establishment and select the starting point purposely and follow a continuous path.
- VII. In hospitality venues' data collection, please enter the venue, sit as customers, visit the toilet area, and observed the other areas available in the venue.
- VIII. Record all information based on the study checklist using your tablet.
- IX. In each study location, please record the number of people smoking, the presence or absence of cigarette butts, cigarette sales, ashtrays, a label of DSA, the smell of tobacco within the prohibited area, and no-smoking signs, and the visibility of any no-smoking signs – compare with EFDA-approved signage using your show cards.
- X. Take pictures of a cigarette butt, lighter/ashtray, and no smoking signage/stickers within the prohibited area if possible, during the interviews.
- XI. Send your data regularly and keep your records securely
- XII. Contact your supervisors and coordinators and share your plan