Removal of point-of-sale tobacco displays in Bogor city, Indonesia: A spatial analysis

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ABSTRACT

INTRODUCTION Indonesia contributes over 61 million smokers to global tobacco users, and the smoking prevalence is increasing among young people. In October 2017, Bogor city started the ban on tobacco displays at point-of-sale (POS), starting with modern cigarette retailers. This study aims to assess compliance with the ban and the visibility of POS with tobacco displays around educational facilities.

METHODS We included 266 modern retailers surveyed throughout the city during November and December 2017. Compliance indicators included no tobacco product displays, advertisements, promotions, and sponsorship. We conducted spatial and quantitative analyses in ArcMap 10.6 and Stata 15.1, respectively.

RESULTS Immediately following the ban, the compliance with all four criteria was high (83%). However, POS in areas with higher population density and poverty rates had significantly lower compliance. We also found that the ban reduced the visibility of tobacco displays around schools and universities.

CONCLUSIONS Compliance with the ban was high, which helped to reduce the visibility of tobacco displays around educational facilities.

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KEYWORDS
spatial analysis, Indonesia, point-of-sale, educational facility, tobacco displays

Received: 10 December 2019
Revised: 15 February 2020
Accepted: 17 February 2020

INTRODUCTION

Indonesia has the second highest prevalence of adult male smoking in the world, however, it has not yet ratified the Framework Convention on Tobacco Control, together with another eight but relatively smaller countries in population[1,2]. With over 260 million people, Indonesia contributes 61.4 million smokers to the global number of tobacco users[1], and the situation is getting worse, particularly among young people. The latest national health survey showed that the overall smoking prevalence among those aged 10–18 years increased by 26%, from 7.2% in 2013 to 9.1% in 2018[3].

Comprehensive tobacco control efforts, particularly toward protecting young people, are needed but currently lacking in Indonesia. There is the 2012 Presidential Decree 109 that encourages districts to implement the smoke-free policy that bans smoking, advertising, promotion and sale within areas of selected public facilities such as schools. However,

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only 345 districts (67% of 514) adopted the policy by 2018, with considerable variation in compliance rates, from 17% in Jayapura city to 78% in Bogor city[4,5]. There are no national regulations to ban tobacco advertisements, promotion and sponsorship (TAPS) outdoors and at the point-of-sale (POS). In effect, only less than 10% of local governments (districts) adopted such bans by 2018[6], including Bogor city. The city, with a population of 1 million, has one of the most comprehensive tobacco controls in the country. It was among the early adopters of the smoke-free policy and the outdoor TAPS ban. The city introduced the ban on product displays and TAPS (henceforth, tobacco displays) at POS in October 2017.

Bogor city has a history of leading tobacco control in Indonesia. In 2008, the mayor made the commitment not to give new permits to outdoor TAPS, which was achieved in 2013[7]. In 2009, the mayor and local parliament enacted a bill ('perda') on smoke-free policy that banned indoor smoking and TAPS in eight types of facility that included public (e.g. modern and traditional retailers) and educational (e.g. schools and universities). Initially, the government focused on smoke-free policy and reached high compliance by 2014[8]. It enacted a regulation to ban new permits of outdoor TAPS in 2014–2015. During this period, the government also conducted activities to raise awareness on the ban of tobacco displays at POS, which led to the enactment on 5 October 2017. In the first phase (2017–2018), the ban was for modern chain retailers (e.g. Indomaret, Alfamart) and later traditional retailers. The ban includes all types of TAPS, such as banners and posters at POS.

The ban on tobacco displays at POS is essential, given evidence of their relationship with tobacco exposure among youth[9-15]. In Asia, Thailand was the first country to implement the ban in 2005, which has been shown to have reduced exposure to tobacco marketing at POS[12]. In Europe, implementation of the ban in Ireland (2009) and Norway (2010) showed that recall of displays dropped significantly after the legislation; also consumers believed that the ban could contribute to preventing smoking initiation among youth[13,14]. Given the lack of evidence from Indonesia, our study aims to assess compliance with the ban on tobacco displays at POS and to evaluate its impact on tobacco visibility around educational facilities in Bogor city.

METHODS

Study design and sampling

We assessed compliance with the ban on tobacco displays at POS (started in October 2017) by observation immediately afterwards (November–December 2017). Also, we assessed the visibility of tobacco displays at POS around educational facilities. We compared what would have happened without the ban in terms of hotspots and visibility around schools. To do this, and because we only had data immediately after the ban, we compared the hotspots and the visibility of all POS and those that were non-compliant. We use 'all POS' as a proxy for what would have happened without the ban. During the survey, all POS sold cigarettes, some openly (i.e. non-compliant with the ban) and some not (i.e. compliant). Because there has never been any ban on POS tobacco displays in Indonesia prior to this initiative in Bogor city, we assumed that all POS sold cigarettes openly before the ban. Non-compliance included selling cigarettes openly (with product displays) and/or having TAPS.

The city government planned two phases of the ban: the first phase (2017–2018) focused on modern chain retailer POS while the second phase will focus on traditional POS. Evaluating the first phase of the ban, our study assessed the compliance among modern cigarette POS, defined as retail franchises that sell cigarettes, including Indomaret, Alfamart, Alfamidi, Giant, Cicle K, and Yomart. They are similar to chain convenience stores such as Tesco Express and Sainsbury's Local in the United Kingdom.

In terms of sampling, the city government did not have listings of modern cigarette POS. However, they estimated about 300 modern retailers, selling not only cigarettes but also food and clothing. Because modern clothing retailers do not usually sell cigarettes, we expected the number of modern cigarette POS to be lower than 300. With this, we surveyed all modern cigarette POS in the city by walking, motorcycle and car. Also, we asked the sellers and community for any nearby modern cigarette POS. From the survey, we found 269 POS. Because the survey was paper-based, no geolocation data were collected. We then used the locations and addresses of each POS and converted them into geolocations (latitude and longitude) using Google Sheets and geocoding add-ons[16,17]. This conversion

resulted in geolocations for 266 POS (99%), which were used in our analysis.

Data collection

For cigarette POS data, we collected data on four compliance indicators as per the law, through observation. They included: a) no tobacco product displays, b) no tobacco advertisements, c) no tobacco promotions, and d) no tobacco sponsorship. Product displays include openly showing cigarettes over the counter. Advertisements include posters or banners that advertise cigarette products. Promotion may offer a lower price for specific products. Sponsorship may consist of receiving financial support from a tobacco company in exchange for changing the store layout. A sign 'Cigarettes available here' was allowed as per the regulation, which is similar to 'Tobacco on sale here' in stores in the United Kingdom. Six trained research assistants collected data during November–December 2017 using a study instrument in the Bahasa Indonesia language. For quality control, the survey was conducted collaboratively with the District Health Office as part of their monitoring of the ban.

For educational facility data, we collected a comprehensive list of primary schools, high schools and universities in the city. We obtained the school data from the city education office as of January 2019, which included variables such as school name, level (primary, junior high, and senior high), and address. We obtained the university data from the national higher education office as of January 2019, which included variables such as university name, ownership (public or private), and address. We converted the addresses into geolocations using Google Sheets and viewed a sample of facilities on Google Maps for accuracy check[16,17].

Data cleaning and analysis

We employed quantitative and spatial analyses. The former provided compliance rates and variations by chain and subdistrict and used STATA 15.1. The latter provided buffer and hotspot analyses and used ArcMap 10.6[18,19]. The buffer analysis compared the number of non-compliant POS within 250 m from educational facilities[20,21]. The hotspot analysis employed Getis-Ord Gi* spatial statistics and identified clusters with a significantly higher density of non-compliant POS[18]. The spatial analysis tools included: a) geoprocessing and buffer tools to generate 250 m buffer around a facility; b) spatial join tool to produce number of facilities with at least one POS with tobacco displays within buffer; c) spatial join and dissolve tools to produce number of advertisements around a facility; and d) optimized hotspot analysis tool to produce the hotspot areas and generate fishnet squares of 494 m. The size of the fishnet was determined by default in ArcMap given the distribution of the cigarette POS, which is also a reasonable walking distance (about a 10-minute walk). All significant results used the 95% level.

RESULTS

Table 1 shows the characteristics of all POS and educational facilities. There were 266 POS, including the two biggest national chains, Indomaret and Alfamart, with 74% market share in the city. By subdistrict, South, North and West Bogor had about two-thirds (66%) of all

Table 1. Characteristics of points-of-sale (POS) and education facilities, Indonesia 2017

Characteristics	n	%
POS by retailer chain		
Indomaret	122	46
Alfamart	74	28
Others	70	26
Total	266	
POS by subdistrict		
South Bogor	64	24
North Bogor	56	21
West Bogor	55	21
Central Bogor	31	12
Tanah Sareal	33	12
East Bogor	27	10
Total	266	
School by type		
Primary school (6–12 years)	329	49
Junior high school (13–15 years)	163	24
Senior high school (16–18 years)	177	26
Total	669	
School by ownership		
Government	251	38
Private	418	62
Total	669	
University by ownership		
Government	5	17
Private	25	83
Total	30	

a Other retailers included Alfamidi, Giant, Circle K, and Yomart. b Government university includes the four campuses of Bogor Institute of Agriculture (IPB). c Percentages are for each characteristic.

points-of-sale. There were 669 schools, including 49% primary schools and 62% private schools, as well as 30 universities, with 83% private universities.

Table 2 shows compliance with the ban on tobacco displays at POS. Of all 266 POS in our analysis, 82.7% complied with four criteria: no tobacco displays, adverts, promotions or sponsorships. The compliance rates ranged from 88.3% (no promotion) to 94.7% (no sponsorship). We provide sample pictures of the compliant and non-compliant POS in Figure 1. Among the POS chains, Alfamart retailers have the highest compliance rates of 90.5%, compared to Indomaret 84.4% and others 71.4%. Compared to other chains, the two big chains have significantly higher compliance rates (p=0.002 and p=0.021, for Alfamart and Indomaret, respectively). By subdistrict, East Bogor and North Bogor had the highest compliance rates of 96.3% and 89.3%, while Central Bogor and Tanah Sareal had the lowest of 74.2% and 72.7%, respectively. The two latter areas had the highest population density and poverty rates (Supplementary file). Compared to those in Central Bogor, the POS in East Bogor had significantly higher compliance rates (p=0.026).

Thus far, the results are spatially limited. Figure 2 shows the school buffer and hotspots of all POS and non-compliant POS with tobacco displays. As previously mentioned, we use 'all POS' as a proxy for what would have happened without the ban. Panel a, shows all POS (red dots) and 250 m dissolved buffers around schools (grey lines); Panel b, shows all non-compliant POS with displays (red dots) and subdistrict boundary (black lines); Panels c and d, show hot spots with significantly higher density of POS (red squares/cells). All the 266 POS were distributed throughout the city, of which many were within the 250 m school buffer. Hotspot analysis shows 66 red cells/squares, or hotspot area of about 32600 m^2, particularly in the central city area (Panels a and c). Because of high compliance with the ban, the number of POS with tobacco displays decreased to 46 from 266, an 83% reduction . Hotspot analysis shows only 36 red cells/squares, or hotspot area of about 17800 m^2, a 45% reduction (Panels b and d).

Table 3 shows all POS and non-compliant POS with tobacco displays around educational facilities (Panels a and b). Again, we use 'all POS' as a proxy for what would have happened without the ban.

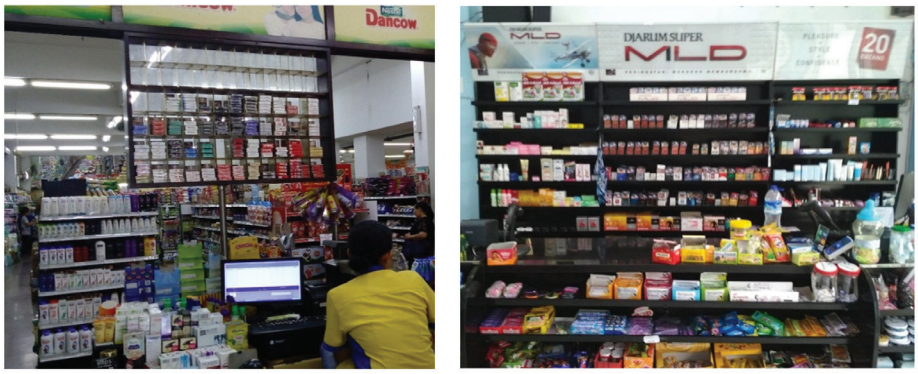
Table 2. Compliance with ban on tobacco displays at point-of-sale (POS), Indonesia 2017

Compliance	All POS	Compliant POS			
		n	%	Diff	p[a]
Compliance for each criterion					
No display of tobacco products	266	241	90.6	n/a	n/a
No tobacco adverts	266	240	90.2	n/a	n/a
No tobacco promotion	266	235	88.3	n/a	n/a
No tobacco sponsorship	266	252	94.7	n/a	n/a
Total compliance	266	220	82.7	n/a	n/a
Total compliance by POS brand					
Others	70	50	71.4	(Ref.)	
Indomaret	122	103	84.4	13.0	**0.021**
Alfamart	74	67	90.5	19.1	**0.002**
Total compliance by subdistrict					
Central Bogor	31	23	74.2	(Ref.)	
South Bogor	64	50	78.1	3.9	0.632
North Bogor	56	50	89.3	15.1	0.073
West Bogor	55	47	85.5	11.3	0.182
East Bogor	27	26	96.3	22.1	**0.026**
Tanah Sareal	33	24	72.7	-1.5	0.876

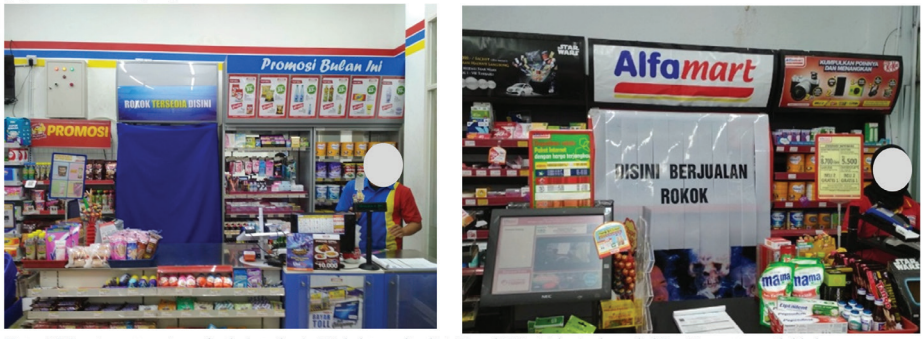
Diff: difference. n/a: not available. Tobacco displays include product display and TAPS (tobacco adverts, promotion, and sponsorship). a p-value was from simple OLS regression of total compliance on POS brand and subdistrict, using other brands and Central Bogor as references, respectively. Bold shows 95% statistical significance. Central Bogor was chosen as reference for having the highest poverty rates (Supplementary file).

Figure 1. Samples of POS with and without tobacco product displays

(a) With displays



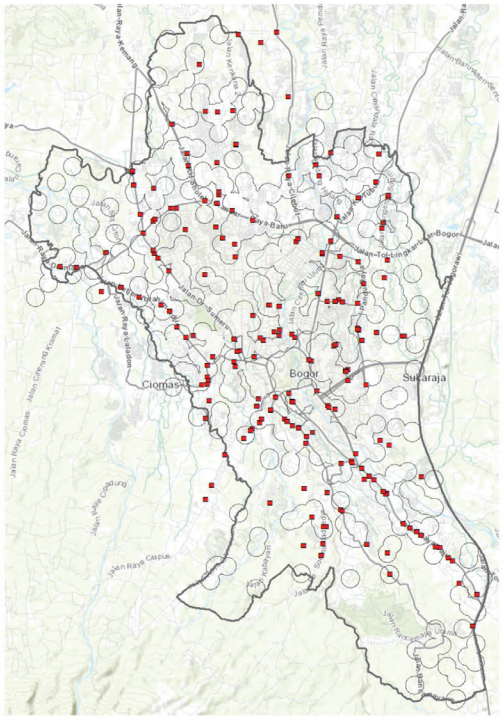
(b) Without displays



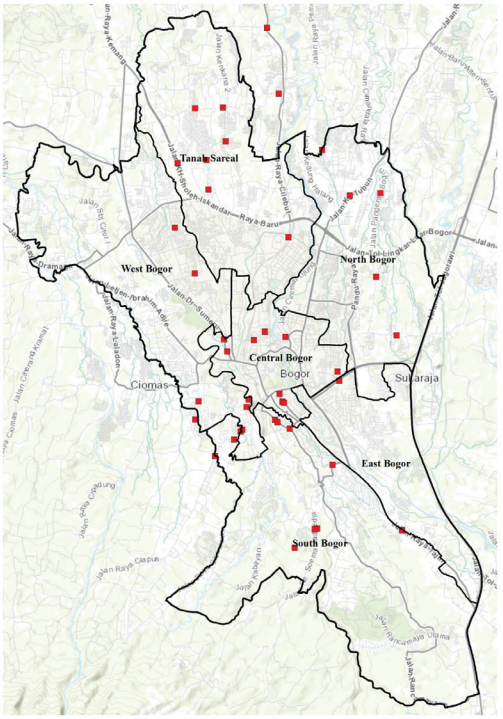
Note: POS = cigarette points-of-sale (retailers). "Rokok tersedia disini" and "Di sini berjualan rokok" = Cigarette available here.

Figure 2. School buffer and hotspots of all and non–compliant POS with tobacco displays in Bogor, 2017

(a) School buffer and all POS



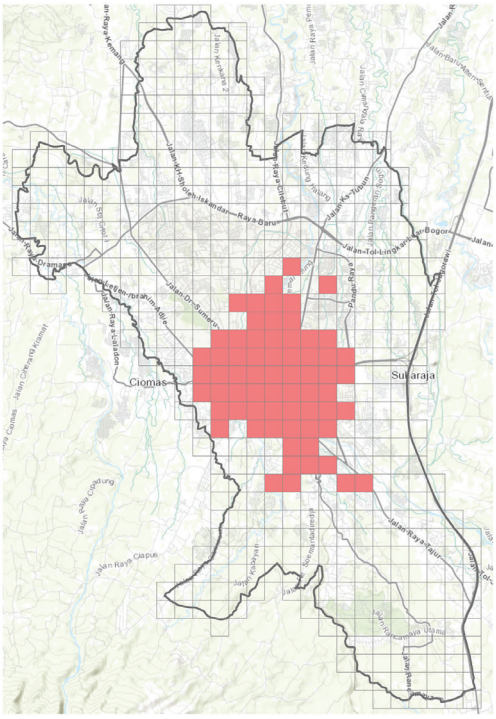
(b) Non-compliant POS with displays



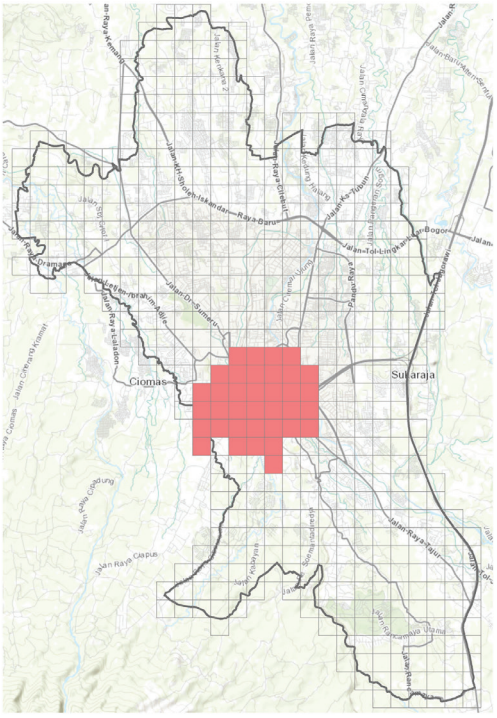
Continued

Figure 2. Continued

(c) Hotspots analysis of all POS



(d) Hotspot analysis of non-compliant POS with displays



Note: POS=Points-of-sale, defined here as modern cigarette retailers such as Indomaret and Alfamidi. Tobacco displays includes product displays and TAPS (Tobacco advertisement, promotion, and sponsorship). Panel a shows all POS (red dots) and 250 meter dissolved buffers around schools (grey lines); Panel b shows all non-compliant POS with displays (red dots) and subdistrict boundary (black lines); Panels c and d show red squares/cells of hot spots (areas with significantly higher density of POS with displays, 95% level of significance); each cell size=494 meters. Analyses were conducted in ArcMap.

Columns 1–3 show the number/proportion of facilities with at least one POS inside a 250 m buffer; columns 4–6 show the number/proportion of POS inside the buffer; columns 7–9 show the number/proportion of facilities inside POS hotspots. Out of 699 schools, there were 235 (35% of total) that had at least one POS within the buffer and 171 (26%) inside a POS hotspot (Panel a). With the high

Table 3. All POS and non-compliant POS with displays around educational facility, Indonesia 2017

Points-of-sale	*Facility with at least one POS inside 250 m buffer*			*POS inside 250 m facility buffer*			*Facility inside hotspot of POS*		
	Total	*n*	*%*	*Total*	*n*	*%*	*Total*	*n*	*%*
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
All POS									
All School	669	235	35	266	163	61	669	171	26
Government	251	75	30	266	81	30	251	66	26
Private	418	160	38	266	139	52	418	105	25
Primary	329	99	30	266	108	41	329	82	25
Junior high	163	58	36	266	97	36	163	45	28
Senior high	177	78	44	266	97	36	177	44	25
All University	30	15	50	266	23	9	30	14	47
Government	5	0	0	266	0	0	5	5	100
Private	25	15	60	266	23	9	25	9	36

Continued

Table 3. Continued

Points-of-sale	Facility with at least one POS inside 250 m buffer			POS inside 250 m facility buffer			Facility inside hotspot of POS		
	Total	n	%	Total	n	%	Total	n	%
Non-compliant POS with displays									
All School	669	69	10	266	29	11	669	79	12
Government	251	25	10	266	20	8	251	31	12
Private	418	44	11	266	23	9	418	48	11
Primary	329	32	10	266	25	9	329	42	13
Junior high	163	15	9	266	14	5	163	17	10
Senior high	177	22	12	266	13	5	177	20	11
All University	30	6	20	266	5	2	30	5	17
Government	5	0	0	266	0	0	5	2	40
Private	25	6	24	266	5	2	25	3	12

POS: points-of-sale, refers here to modern cigarette retailers such as Indomaret and Alfamidi. Tobacco displays include product display and TAPS (tobacco adverts, promotion, and sponsorship). Buffer and hotspot analyses were conducted in ArcMap. Hotspot analysis used Getis-Ord Gi* statistics and shows significant cluster (95%) of higher number of POS with tobacco displays.

compliance, there were 69 (10% of total schools) that had at least one POS with tobacco displays within the buffer, a 71% reduction, and 79 (12%) inside a POS hotspot, a 54% reduction. Also, of the 266 POS, there were 163 (61% of total) within the school buffer (Panel a), while with high compliance there were only 29 (11%), an 82% reduction (Panel b). Results are similar for universities.

DISCUSSION

Bogor city introduced the ban on tobacco displays at POS (modern retailers) in October 2017. Immediately following the ban, we found a total compliance of 83% with all four criteria (product displays, advertisements, promotion, and sponsorship). We found an even higher compliance rate of 91% for product displays only. The high compliance rates were similar in other countries. Studies found very high compliance rates of 97% immediately following the implementation of the ban in Ireland (July 2009) and Norway (January 2010)[13,14]. Similarly, a study that compared Thailand with the ban, started in 2005, and Malaysia without the ban, showed that the reported exposure to product displays at POS was 17% and 83% in 2006, respectively[12]. A study on 96 retailers in Scotland just before the ban in 2013 showed high visibility of tobacco displays within outlets and from the public footway outside[9].

We also found higher compliance rates among larger retail chains such as Indomaret and Alfamart, compared to the other brands. The higher compliance might be because of better internal communication of the circular distributed one week prior, including a potential shop closure penalty among larger chains. This evidence could provide lessons learned for other districts and countries to start the ban with modern retailers before traditional ones. However, traditional retailers tend to be more prevalent in low- and middle-income countries such as Indonesia. Given the aggressive marketing strategy of the tobacco industry toward youth[22-24], the government should expand the ban beyond modern retailers. Furthermore, we found lower compliance with the ban among POS in areas that are more densely populated and impoverished. The possible reasons for non-compliance include not knowing about or not supporting the regulation ban. This may contribute to increased inequality in smoking prevalence among poorer youth[21].

We found that the ban decreased the visibility and hotspots of POS with tobacco displays around educational facilities. The number of schools inside hotspots of POS with tobacco displays decreased by 54% and the number of POS with tobacco displays within school buffers decreased by 82%. This evidence is highly relevant because of higher

exposure to tobacco displays among youth without the ban. A Scottish study just before the ban in 2013 showed 80% of 1482 students recalled seeing tobacco displays at POS[9]. Other studies have shown that such exposure is associated with youth smoking behavior. A survey of 1401 British youth showed that noticing tobacco displays was associated with higher levels of future intentions to smoke (susceptibility)[11]. Also, an experimental study among US adolescents showed that hiding tobacco displays significantly reduced susceptibility compared to leaving it exposed[10].

For policy, our results provide evidence for initiating a ban on tobacco displays at POS in low- and middle-income country settings. Ideally, the ban covers the entire country or city, but at least near educational facilities to help stem the increasing trend of youth smoking[20,25,26]. In Indonesia, there are only a few districts that currently have some regulation for the ban. Concerted efforts are needed to increase policy adoption in 514 districts. However, reducing tobacco displays at POS is just one element of many MPOWER strategies such as increasing tobacco taxes, protecting from secondhand smoke, offering help to quit tobacco use, and warning about the dangers of tobacco[27]. Many of these strategies are beyond the power of a district government in Indonesia. Young people in Bogor and other districts continue to have access to radio, television and social media advertising tobacco products[28]. All this may contribute in diluting the effectiveness of the ban or other local tobacco control initiatives.

Limitations

Our study has some limitations. First, our study was conducted together with the local health authority one week after the circular was distributed, which included potential penalties for non-compliance. This may have made POS agree to comply. Thus, there is a need for a study to see whether the compliance would have decreased otherwise. Second, our POS sample was limited to modern retailers. While the visibility and hotspots of tobacco displays at modern retailers around educational facilities decreased with the ban, they may remain high at traditional retailers. Third, while geocoding really helped in our analysis, we could not find some cigarette POS. Further study should use a data collection app for smartphone or tablet to collect geolocations in the survey. Despite these limitations, our findings have important policy implications for Indonesia and beyond.

CONCLUSIONS

Immediately following the ban on tobacco displays at POS in Bogor city, the compliance was very high. However, POS in areas with higher population density and poverty rates had lower compliance. We also found evidence that the ban reduced the visibility and hotspots of tobacco displays at POS around schools and universities. All this provides evidence for policymakers to introduce and effectively implement the ban on tobacco displays at POS.

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CONFLICTS OF INTEREST
The authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none was reported.

FUNDING
This research was funded by the International Union against Tuberculosis and Lung Disease.

PROVENANCE AND PEER REVIEW
Not commissioned; externally peer reviewed.