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High visibility of outdoor tobacco advertisements around health facilities in East Java, Indonesia: a geospatial analysis

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ABSTRACT

BACKGROUND Indonesian tobacco control initiatives are minimal despite having the second-highest adult male smoking prevalence in the world, with less than 10% of districts/cities banning outdoor tobacco advertisements. This research aimed to provide evidence on the presence of outdoor tobacco advertisements near health facilities in Surabaya where there is no outdoor advertising ban.

METHODS Data collection was carried out in Surabaya from October to November 2018. Data of government (public) and private health facilities were obtained from the city health office. Two spatial data analyses were carried out: a buffer analysis near the healthcare facilities and an advertisement hotspot analysis using ArcMap 10.6.

RESULTS From 308 tobacco advertisements that were identified, there were billboards (63%), banners (31%), and videoboards (7%). Of 142 public and 1,242 private health facilities in Surabaya, 26% and 31% had advertisements within 300 m and 63% and 70% were within advertisement hotspots, respectively. Furthermore, 5% of advertisements were within 300 m from public health facilities and 21% of them were within 300 m from private health facilities.

CONCLUSIONS Outdoor tobacco advertisements were widespread throughout the city, prominently around public and private health facilities.

KEYWORDS geospatial analysis, health facilities, Indonesia, tobacco advertisement, visibility

The Indonesian government has not signed and ratified the Framework Convention on Tobacco Control despite having the second-highest prevalence of adult male smoking in the world. Andorra, the Dominican Republic, Eritrea, Liechtenstein, Malawi, Monaco, Somalia, and South Sudan are the other eight countries that have not signed and ratified the treaty. Although the other eight countries have smaller populations (with Malawi having the largest population at 19 million), Indonesia has more than 260 million inhabitants and has contributed to about 61.4 million current tobacco users worldwide.¹ There is no

improvement in this situation according to the latest national health survey. A survey showed that the total smoking prevalence among people aged 10 years old and above remained at 29% and increased by 26% (7.2% to 9.1%) among people aged 10-18 years old from 2013-2018.²

National and local tobacco control efforts are limited compared with the World Health Organization's comprehensive six MPOWER initiatives.³ Less than 10% of the 514 districts/cities have issued outdoor tobacco advertisement bans with varying degrees of enforcement.⁴ Although advertisements are found in

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10% of the districts that ban tobacco advertisements (e.g., Banyuwangi),⁴ the remaining 90% of the districts do not present the implementation of tobacco advertisement bans. Surabaya is the capital of the province of East Java and the second-largest city in Indonesia with a population of over 3 million in 2017. It was among the first in the country to implement smoke-free areas in selected facilities, including health facilities that ban indoor smoking since 2008.⁵ Unfortunately, effective tobacco control initiatives are currently falling behind. This research aimed to provide evidence of outdoor tobacco advertisements near government (public) and private health facilities in Surabaya.

METHODS

A spatial analysis was performed on the presence and clustering of outdoor tobacco advertisements near public and private health facilities in Surabaya. Advertisement and facility are the two main parameters. Over 250 registered roads and streets (according to mayor's Regulation Number 70/2010)⁶ were visited by motorcycles and cars from October to November to collect advertisement data. The following variables were used for the advertisement parameter: advertisement geographical coordinates (latitude and longitude), advertisement type (videoboard, billboard, and banner), product information (brand and product name), and picture. The geographical coordinates were obtained using Samsung Galaxy Note A6's (Samsung, South Korea) My Location feature.

Data for the facility parameter were obtained from the city health office (per January 2019) for both public and private facilities. The public health facilities were as follows: provincial health office (East Java), district health office (Surabaya), hospitals, public health centers (*puskesmas*), and *puskesmas* subclinics (*pustu*). On the other hand, private health facilities included the following: hospitals, primary clinics, specialty clinics, beauty clinics, pharmacies, drugstores, and laboratories. A pharmacy has a pharmacist whereas drugstores do not have one. The variables used were facility name, sector (public/private), and address. Google Sheets (Google, United States) with geocoding add-ons and ArcGIS (ESRI, United States) online were used to convert address details to geographic coordinates.

The analysis was carried using ArcMap 10.6 software (ESRI) with Open Street Map as the baseline map. The following ArcMap tools had been used: (a) a geoprocessing/buffering tool to create buffers around the health facilities (100 m, 200 m, and 300 m); (b) a spatial join tool to determine the number of facilities with at least one tobacco advertisement within the facility buffers; (c) spatial join and dissolve tools to determine the number of advertisements near the health facilities; and (d) optimized hotspot analysis tool to determine the hotspots with significant levels of 99%, 95%, and 90%. Hotspot analysis using Getis-Ord G_i^* statistics to identify clusters⁷ is more common in infectious disease epidemiology than in tobacco control studies.^{8,9} The fishnet approach (dividing areas into squares) was used in the hotspot analysis

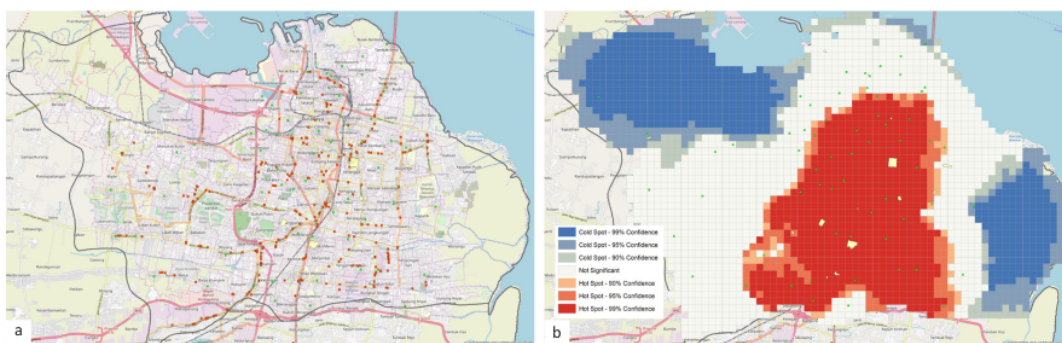


Figure 1. The presence of outdoor tobacco advertisement around health facilities in Surabaya (2018). (a) Buffers around the health facilities; (b) health facilities within outdoor tobacco advertisements hotspots. Yellow polygons are public hospitals; the green squares are public health centers (*puskesmas*); the circles around them are facility buffers at 100 m, 200 m, and 300 m; the red squares are outdoor tobacco advertisements. Cold spots/hotspots are areas with a significantly higher density of outdoor tobacco advertisements. Buffers were drawn, and hotspot analysis was conducted using ArcMap

because of the absence of a smaller boundary, such as the census area.

Most of the health facilities in our research were represented as a point on the map. The provincial health offices, city health offices, and hospitals were depicted as building polygons and had larger areas. We manually drew the polygon in ArcMap using Google Maps (Google) satellite view (see Figure 1 for public hospitals). The buffers were 100 m, 200 m, and 300 m from each polygon boundary.

RESULTS

Of 142 public health and 1,242 private health facilities, around 308 advertisements were identified: billboards (63%), banners (31%), and video boards (7%). Most of the public health facilities were composed of hospitals (16 or 11%) and public health centers (124 or 87%) whereas the private facilities were mainly composed of pharmacies (761 or 61%) and primary clinics (156 or 13%).

The presence and clustering of outdoor tobacco advertisements around health facilities are shown

in Figure 1. The yellow polygons represent the public hospitals, and the green squares are the public health centers (*puskesmas*). The buffers at 100 m, 200 m, and 300 m are represented by the circles around the facilities. The results show that medium and large outdoor tobacco advertisements (represented as red squares on the map) were common across the city as shown in Figure 1a, with certain areas having a higher number of advertisements (indicative of clustering). The hotspot analysis results indicate that the middle section of the city has a significant number of advertisements as shown in Figure 1b, represented as red hotspot areas.

The number of health facilities with at least one tobacco advertisement within 100 m, 200 m, and 300 m around each facility is displayed in Table 1. A total of 37 public health facilities had advertisements within 300 m, ranging from one provincial/city health office to 16 health centers. In comparison, 388 private health facilities had advertisements within 300 m, ranging from 17 hospitals to 229 pharmacies. In terms of proportion of total facilities, 26% of public health facilities are near advertisements within 300 m, ranging

Table 1. Number of health facilities with at least one advertisement within the buffers

Health facility	Total facility	Number of facility with at least one advertisement, n (% of total)			Number of facility in hotspot* n (% of total)	
		100-m buffer	200-m buffer	300-m buffer	99% confidence	95% confidence
Government/Public						
Provincial health office	1	0 (0)	1 (100)	1 (100)	1 (100)	1 (100)
City health office	1	1 (100)	1 (100)	1 (100)	1 (100)	1 (100)
Hospitals	16	2 (13)	6 (38)	8 (50)	10 (63)	13 (81)
<i>Puskesmas</i>	63	1 (2)	7 (11)	16 (25)	32 (51)	37 (59)
<i>Pustu</i>	61	1 (2)	4 (7)	11 (18)	34 (56)	37 (61)
Total	142	5 (4)	19 (13)	37 (26)	78 (55)	89 (63)
Private						
Hospitals	43	2 (5)	7 (16)	17 (40)	24 (56)	27 (63)
Primary clinics	156	7 (5)	22 (14)	38 (24)	97 (62)	106 (68)
Specialist clinics	86	4 (5)	17 (20)	30 (35)	62 (72)	64 (74)
Beauty clinics	92	12 (13)	17 (19)	26 (28)	61 (66)	67 (73)
Pharmacy [†]	761	69 (9)	151 (20)	229 (30)	466 (61)	524 (69)
Drugstore [†]	59	7 (12)	19 (32)	30 (51)	44 (75)	47 (80)
Lab	45	5 (11)	14 (31)	18 (40)	29 (64)	33 (73)
Total	1,242	106 (9)	247 (20)	388 (31)	783 (63)	868 (70)

Puskesmas=public health centers, *pustu*=*puskesmas* subclinics

Hotspot analysis uses Getis-Ord G_i^ statistics in ArcMap. Hot spots/red spots show a significant cluster of a higher number of tobacco advertisements; [†]a pharmacy has pharmacists and drugstores do not have one. Confidence levels of 99% and 95% show spatial statistical significance. Buffer and calculation were conducted using ArcMap

from 18% of auxiliary health centers (*pustu*) to 100% of provincial/city health offices. Similarly, almost 31% of private health facilities had advertisements within 300 m, ranging from 24% of primary clinics to 51% of drugstores.

The number of health facilities within the advertisement hotspots shown in Figure 1 is displayed in Table 1. These hotspots or red spots show a significant number of tobacco advertisements clustering at 95% and 99% confidence levels. Eighty-nine public health facilities within hotspot areas ranging from one provincial/city health office to 37 *puskesmas/pustu* were identified using a 95% confidence level, whereas 868 private health facilities were identified within hotspot areas ranging from 27 hospitals to 524 pharmacies. In terms of proportion of total facilities, 63% of public health facilities were within the hotspot areas, ranging from 59% of *puskesmas* to 100% of provincial/city health offices, whereas 70% of private health facilities were within hotspot areas, ranging from 63% of hospitals to 80% of drugstores.

We also calculated the number of advertisements around each health facility (the results are not shown but are available upon request). There were 16 advertisements within 300 m of public health facilities, ranging from two advertisements around city health offices to 34 around all *puskesmas*, whereas there were 65 advertisements within 300 m of private health facilities, ranging from 24 advertisements near hospitals to 208 near pharmacies. In terms of proportion of total advertisements, 5% of advertisements were within 300 m of all public health facilities, ranging from 1% of advertisements around city health offices to 11% around all *puskesmas*, whereas 21% of advertisements were within 300 m of all private health facilities, ranging from 8% around all hospitals to 68% around all pharmacies.

DISCUSSION

This research provides empirical evidence on the significant presence of outdoor tobacco advertisements around health facilities in Surabaya that are lack of comprehensive tobacco controls, such as advertisement bans. Our findings show that although the presence of advertisements was similarly high for both public and private health facilities in terms of proportion (e.g., 26% versus 31% of facilities had at least one advertisement within 300 m), the presence of advertisements was considerably higher around

private health facilities in terms of number (e.g., 37 versus 388 facilities had at least one advertisement within 300 m). The number of young people being exposed to advertisements increases as the number of health facilities joining the national health insurance (*Jaminan Kesehatan Nasional*) also increases.

There is a significant presence of advertisements for both public and private hospitals and clinics based on the results of the study. Residents and visitors are exposed to tobacco advertisements across the city because the majority of public and large private hospitals also provide services to the neighboring districts. Patients and customers in almost 500 health centers and clinics (including health centers, private clinics, specialty clinics, and beauty clinics) are also exposed to tobacco advertisements (with many facilities within the hotspot areas). Tobacco advertisements have a significant presence in over 800 pharmacies and drugstores across the city, with about 40% of facilities having at least one advertisement within 300 m and 80% of both facilities within the hotspot areas. These results indicate a possible effect on health behaviors and outcomes. Smoking prevalence was relatively high in Surabaya according to the latest Basic Health Research (*RISKESDAS*) 2018. Around 9.6% of boys and 1.8% of girls are smoking among youths (13 and 14 years old) compared with the 10.2% and 0.2% national averages; among adults (15+ years), 53.7% of men and 0.4% of women are smoking compared with the 61.4% and 2.3% of national averages.¹⁰ Data from *RISKESDAS* also indicate that the burden of clinical risk factors and smoking-related illnesses was also comparatively high in Surabaya. The prevalence of adults (15+ years) with hypertension (systolic blood pressure of at least 140 mmHg or diastolic blood pressure of 90 mmHg) was 30.2% in Surabaya compared with the national average of 29.8%. Also, the prevalence of adults with diabetes mellitus (reported diagnosis by a doctor) was 4.4% in Surabaya compared with the national average of 1.8%.^{11,12}

These data prove that Surabaya and other districts/cities without advertisement ban policies should have laws to limit the presence of tobacco advertisements. Otherwise, adult and children who will access these health facilities will be exposed to outdoor tobacco advertisements. This would weaken public health programs, such as tobacco control measures. Further research should be conducted on small- and medium-

sized outdoor and point-of-sales advertisements because our study is limited to medium to large outdoor tobacco advertisements.⁴

In conclusion, the results of this research show a significant presence of outdoor tobacco advertisements in the city of Surabaya, with high visibility of advertisements around public and private health facilities including provincial and city health offices, hospitals, and clinics. This can influence the government's policy to reduce smoking in public areas.

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Conflict of Interest

The authors affirm no conflict of interest in this study.

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