

# Are retailers compliant with zoning regulations that ban tobacco sales near schools in Changsha, China?

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## ABSTRACT

**Background** Tobacco retail sales are prohibited within 100 m of schools in many large cities in China.

However, little is known about the enforcement of this zoning regulation. The objectives of this study were to estimate tobacco retailers' compliance with the regulation, examine the density of tobacco retail stores, describe the types of tobacco products sold in stores and how they are marketed, and determine if there are displays of warning messages in retail stores around schools and in neighbourhoods in Changsha, China.

**Methods** Tobacco retail stores located within 200 m of 36 schools and 36 residential neighbourhoods were audited by trained students with a validated audit form.

**Results** On average, there were about 3 tobacco retail stores within 100 m of the front entrance of schools.

The density of the stores and the types of tobacco products sold in the stores were similar near schools and in neighbourhoods. Over one-fourth of the stores had exterior tobacco advertisements. Interior advertising was slightly less prevalent, and it was most prevalent among tobacco shops (62.5%). Tobacco displays that target children were pervasive, with about 83% of tobacco retail stores displaying cigarettes within 1 m of the floor and 59% displaying cigarettes within 0.3 m of toys and candy. About 40% of stores within 100 m of a school had a visible retail licence. Only 19.6% of the stores had a 'smoke-free' sign and 22.2% had a 'no sales to minors' sign.

**Conclusions** We observed low enforcement of the regulation that bans tobacco retail sales near schools and high prevalence of tobacco displays that target children in Changsha, China. Chinese officials should act to effectively enforce the regulation bans of tobacco sales near schools. In addition, regulations are urgently needed to limit tobacco marketing practices at the point of sale, especially those targeting youth.

## INTRODUCTION

According to the 2014 Global Youth Tobacco Survey (GYTS), 30% of Chinese boys and 9% of girls in middle-school (13–15 years old) reported ever using tobacco, which translates into 9.4 million middle-school students, with one-third of them already current smokers.<sup>1</sup> Easy access to tobacco retail stores may be one of the major contributing factors to a high prevalence of smoking among Chinese youth.<sup>1</sup> In the 2014 GYTS, two-thirds of current middle-school tobacco users reported being able to purchase tobacco products in stores near schools and over 80% reported that a retailer had never refused to sell them tobacco products.<sup>1</sup>

Early initiation of tobacco use is related to becoming a regular smoker in adulthood.<sup>2</sup> The majority of adult tobacco users tried their first cigarette before the age of 18.<sup>2</sup> In China, among ever daily smokers aged 20–34 years, about 53% started daily smoking before the age of 20.<sup>3</sup> Protecting youth from the tobacco retail environment represents a critical approach to reducing smoking rates among adults.

The Tobacco Monopoly Bureau (TMB) in Changsha, China is responsible for the implementation and enforcement of tobacco regulations. In 2013, the TMB issued regulations that prohibit tobacco sales within 100 m of the front entrance of schools and require tobacco retailers to place a 'no sales to minors' sign in their stores.<sup>4</sup> In addition, the Chinese Youth Protection Law prohibits selling tobacco products to people under the age of 18 and tobacco retailers are required to display a 'no sales to minors' sign that can easily be seen by customers.<sup>5</sup> Although a 2010 study documented a high density of tobacco retailers near schools and low compliance with regulations in Hangzhou, compliance with these regulations has rarely been assessed in China.<sup>6</sup> Building on this previous research, we evaluated compliance and monitored point-of-sale advertising in Changsha, China. Specifically, we estimated tobacco retailers' compliance with the regulations, examined density of tobacco retail stores, described the types of tobacco products sold in stores and how they are marketed, and determined if there are displays of warning messages in retail stores around schools and in neighbourhoods in Changsha, China. We hypothesised that the residential neighbourhoods outside of the restricted areas would have a higher density of tobacco retail stores than the restricted areas near schools.

## METHODS

### Study setting

This study was conducted in the city of Changsha in December 2014 and January 2015. As the capital city of Hunan province in south-central China, Changsha is a typical medium-sized city in terms of municipality area, population size and economic development in China.<sup>7–11</sup> Tobacco production is one of Changsha's main industries, earning 2.4 billion RMB (US\$384 million) and generating 60.2 billion RMB (US\$9.6 billion) in tax revenue in 2014, accounting for 42.3% of the tax revenues of Changsha city.<sup>12</sup>

### Sample selection

A complete list of schools in Changsha urban areas was obtained from the local government website



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(<http://www.changsha.gov.cn>). In total, there were 344 schools. Two-stage cluster sampling was performed to select the schools. A total of 36 schools were sampled.

A residential neighbourhood ('Xiao qu' or 'Lou pan') was defined as an area where the residential buildings were built in a similar style by the same construction company and were under the same property management, with or without gates to access the neighbourhood. A list of residential neighbourhoods in the city of Changsha was obtained from the largest and most comprehensive Chinese property information website (<http://www1.fang.com/>). Multistage sampling was performed and 36 neighbourhoods were sampled.

### Data collection protocol

Tobacco retail stores located within 200 m from the front entrance of the selected schools or neighbourhoods were audited. A 200 m distance was selected to allow comparisons of the density of tobacco retailers around schools by distance to the front entrance of schools (0–100 m vs 101–200 m), and the same distance (200 m) was used for neighbourhoods to allow comparisons between schools and neighbourhoods.

Printed maps with distance marks (100 m and 200 m radius marks) were used to assist the auditor in identifying the stores located within 200 m of a school or a neighbourhood. The auditor walked through all streets within the 200 m radius of schools and neighbourhoods between 09:00 and 18:00 during December 2014 and January 2015. All stores that sold tobacco products were observed and recorded using a validated audit tool on an iPhone with the iSurvey application.

### Measures

The audit form was designed to capture information on the following items: (1) store demographics (eg, store name and store type); (2) availability and characteristics of tobacco products; (3) tobacco advertising, promotion and display; (4) display of a display tobacco retail licence and (5) tobacco control signs (eg, a 'smoke-free' sign and a 'no sales to minors' sign) posted in tobacco retail stores.

#### Store measures

Stores were classified into the following seven categories: (1) convenience store; (2) small supermarket; (3) supermarket; (4) tobacco and alcohol shop; (5) fruit store; (6) nuts, dry fruits and seeds store and (7) other store types (including newsstands).

#### Availability and characteristics of tobacco products

Types of tobacco products available in stores were recorded, including: (1) regular cigarettes; (2) menthol cigarettes; (3) female-targeted cigarettes; (4) cigarillos or little cigars; (5) large cigars; (6) e-cigarettes and (7) other tobacco products. We also collected information on whether the stores sold flavoured tobacco products and/or single tobacco products. The female-targeted cigarettes were defined as those that had strong feminine characteristics such as being long and slim, flavoured to taste like fruit or roses, or contained other feminine design elements on the package.

#### Tobacco retail store density

The density of tobacco retail stores around a school or a residential neighbourhood was calculated by dividing the number of tobacco retail stores at a location (school or neighbourhood) by the study area (km<sup>2</sup>) at the location.

#### Exterior and interior tobacco advertising and promotion

The presence of tobacco advertisements outside a store was recorded. Data were collected on whether the advertisement was for a certain tobacco brand and the number of tobacco advertisements that were of small (<1 m in any dimensions) or large (≥1 m in any dimensions) size. The overall impression of exterior advertising was measured and classified into four categories: no ads, discreet, moderate or obvious. 'Discreet' was defined as tobacco advertisements that could barely be seen at first glance outside a store. 'Moderate' was defined as tobacco advertisements that could easily be seen: (1) one advertisement >0.3 m in any dimension or (2) two advertisements, all of which were <1 m in any dimension. 'Obvious' was defined as more than one tobacco advertisement, one of which was more than 1 m in any dimension. We also measured the availability of tobacco promotions and types of promotions (eg, regular price advertised, special price on 1 product and multi-buy) outside and inside of tobacco retail stores. For interior advertisement, the presence of branded signs, branded shelving units and branded displays was recorded.

#### Tobacco product displays

The auditor first assessed tobacco product displays according to where products were visible and where the majority of products were displayed. For both items, multiple responses were possible: (1) on, above, behind or in a cabinet at a primary check-out counter; (2) on, above, behind or in a cabinet at another counter; (3) on, above or in a separate display cabinet in the front of the store; (4) visible from the outside of the store or (5) visible elsewhere in the store.

For each type of tobacco product (eg, cigarettes in general, menthol cigarettes, female-targeted cigarettes and large cigars), we further measured whether the product was displayed within 1 m of the floor and/or within 0.3 m of toys, candy or gum, slushy/soda machines or ice cream and whether there were self-service displays.

#### Tobacco retail licence and tobacco control signs

Data were also collected on whether a tobacco retail licence or tobacco control signs were visibly displayed in a store. Tobacco control signs included 'smoke-free' and 'no sales to minors' signs.

#### Statistical analyses

Descriptive analyses were performed to estimate the density of tobacco retail stores, availability of different types of tobacco products, and the display of tobacco retail licence and tobacco control signs in tobacco retail stores around schools and in neighbourhoods. Student's t-tests and  $\chi^2$  tests were performed to test variations in density of tobacco retail stores and other related tobacco retail characteristics by location type (school or neighbourhood) and by distance to school (0–100 m vs 101–200 m from a school).

Survey weights and design features (clustering and stratification) were taken into account in the analyses. Survey weights were calculated for each location (school or neighbourhood) based on the sampling design. Since school and neighbourhood samples were randomly selected, sampled tobacco retail stores within 200 m of the selected schools and neighbourhoods were representative of all the stores within 200 m of schools and neighbourhoods in the city, with appropriate weighting. The analysis was performed using the SAS software, V.9.3 (SAS Institute, Inc, Cary, North Carolina).

## RESULTS

In total, 739 stores were audited, with 308 around schools and 431 in residential neighbourhoods. Data in table 1 indicate that tobacco retail stores were prevalent within 100 m of schools. On average, 3 tobacco retail stores were located within 100 m of a school, and 6.7 tobacco retail stores within 101 to 200 m of a school. About 98% of the schools had at least one tobacco retail store within 100 m. With regard to the density of tobacco retail stores, we observed a significantly higher density within 100 m of a school than that within 101–200 m ( $p=0.0406$ ). In neighbourhoods, the density of tobacco retail stores was 99.7/km<sup>2</sup>. Compared with neighbourhoods, the total number of tobacco retail stores (unweighted) was significantly lower near schools ( $p<0.0001$ ); however, the weighted average number and density of tobacco retail stores within 200 m was not significantly different from that in the neighbourhoods. The tobacco retail stores were mainly convenience stores, small supermarkets or supermarkets, with about 15% categorised as tobacco/alcohol shops (table 1). Store type did not significantly differ by school and neighbourhood.

The types of tobacco products sold near schools were similar to those sold in residential neighbourhoods (table 2). Menthol cigarettes were available in over half of the tobacco retail stores around schools and in neighbourhoods. Within 200 m of a school, the availability of menthol cigarettes did not significantly differ by the distance to a school. The availability and patterns of female-targeted cigarettes were similar to those of menthol cigarettes. Cigarillo and little cigars were available in 26% of tobacco retail stores, with no significant variations by location type (school or neighbourhood) or distance to school. The prevalence of selling large cigars in neighbourhoods was significantly higher than around schools ( $p=0.02$ ). Few stores sold e-cigarettes (0.1%).

About one in four tobacco retail stores had at least one outdoor tobacco advertisement, and outdoor advertisements were more prevalent in neighbourhoods than near schools ( $p=0.0015$ ) (table 3). Sizes of exterior tobacco advertisements were similar near schools and in neighbourhoods. The overall impression of outdoor tobacco advertising near schools was similar to that in neighbourhoods. Indoor tobacco advertising was less prevalent than outdoor advertising. Almost 16% of tobacco retail stores had at least one tobacco advertisement in

the store (table 3), ranging from 7.2% in food stores to 62.5% in tobacco shops. The most commonly advertised cigarette brands in the stores were Furongwang (20.8%), Baisha (20.1%) and Hetianxia (23%), which are the most popular local brands in Changsha. Few stores had branded units or branded displays.

A ‘small’ advertisement was defined as a tobacco advertisement that was <1 m in any dimension. A ‘large’ advertisement was defined as a tobacco advertisement that was >1 m in any dimension.

With regard to tobacco product displays, over 70% of stores showed tobacco products at the primary checkout counter, and almost half (44%) displayed products in a way that was visible from the outside of the store (table 4). We found that marketing strategies targeting children were pervasive in Changsha, where 83% of stores displayed cigarettes within 1 m of the floor and almost 60% of stores displayed cigarettes within 12 inches of toys, candy, gum and similar products (table 5). Moreover, these strategies were more prevalent in stores near schools compared with those in neighbourhoods, and the display of cigarettes within 0.3 m of toys, candy, gum, etc, was significantly more prevalent in stores within a 100 m radius of schools compared with stores located within the wider radius.

Less than half of the tobacco retail stores had a tobacco retail licence visibly displayed, with no difference by location (see online supplementary appendix A). About one in five tobacco retail stores had a visible ‘smoke-free’ sign, with a significantly lower percentage of stores displaying such a sign around schools compared with those in neighbourhoods ( $p=0.0026$ ). In neighbourhoods, tobacco shops and other types of stores had significantly lower rates of having a ‘smoke-free’ sign than food stores ( $p=0.0008$ ). ‘No sales to minors’ signs were observed in 22.2% of the stores, with no significant difference between schools and neighbourhoods. Around schools, tobacco shops had a significantly higher percentage of stores that had a ‘no sales to minors’ sign than other types of stores.

## DISCUSSION

To the best of our knowledge, this is the first study that has assessed tobacco promotions and displays in retail stores in China. We found that tobacco displays targeting children were pervasive, especially near schools, even though tobacco retail sales in this area are prohibited. Our findings suggest low

**Table 1** Density of tobacco retail stores and distribution of store types by location

Density	Total	School			p Value†	Neighbourhood	p Value*
		Subtotal	100 m	200 m			
Number of store	739	308	85	223	<0.0001	431	<0.0001
Weighted average number of stores	12.2	9.1	3.1	6.7	0.04	12.5	0.37
Density (per km <sup>2</sup> )	97.7	75.9	196.9	64.7	0.04	99.7	0.43
Store type	Total (%)	School (%)		Neighbourhood (%)		p Value	
Food store	59.0	67.5		58.4		0.02	
Tobacco shop	15.3	12.2		15.5		0.25	
Fruit store	8.0	7.1		8.1		0.60	
Kiosk	5.4	2.0		5.6		0.18	
Other	12.3	10.8		12.4		0.30	

The sampling was performed to avoid overlap between schools and neighbourhoods. When there was a sampled neighbourhood overlapping with a sampled school, the neighbourhood was excluded and replaced by another neighbourhood through random sampling. Food stores include convenient stores, small markets, and supermarkets (the same below).

\*p Value for comparison by locations (schools/neighbourhoods).

†p Value for comparison by distance from a school.

**Table 2** Percentage of tobacco products sold near schools and in neighbourhoods by tobacco type

Tobacco type	Total (%)	School (%)			p Value†	Neighbourhoods (%)	p Value*
		Subtotal	0–100 m	101–200 m			
Menthol	54.4	51.1	45	54.2	0.04	54.6	0.6
Female targeted	54.3	47.6	42.5	50.5	0.18	54.7	0.1
Cigarillo/little cigars	26	20.8	21.5	20.8	0.85	26.3	0.19
Large cigars	39.1	31.6	28.7	32.2	0.46	39.6	0.02

\*p Value for comparison by locations (schools/neighbourhoods).

†p Value for comparison by distance from a school.

compliance and little enforcement of tobacco retail zoning regulations, indicating an urgent need for regulation of point-of-sale tobacco displays and advertising in Changsha, China.

In 2010, Gong *et al*<sup>6</sup> conducted a study in the city of Hangzhou in east China and found an average of 20.6 tobacco retail stores within a 400 m radius of schools and over 80% of schools had at least one tobacco retail store within a 100 m radius. In the USA, one study reported an average of 11.1 tobacco retail stores in a 1-mile (1609 m) radius of schools in California.<sup>13</sup> A study by Luke *et al*<sup>14</sup> in Missouri and New York State showed that the average numbers of tobacco retailers within 1000 feet of a school were about 0.4 and 1.5 retailers per school, respectively. In Canada, an average of 2.68 tobacco retail stores within a 1 km buffer of schools was reported.<sup>15</sup> In New Zealand, about half of all secondary schools had at least one tobacco retailer within a 500 m walk.<sup>16</sup>

Our results indicate that Changsha, China has a higher tobacco retail outlet density near schools than cities in other countries. However, since China, overall, has a higher population density than other countries,<sup>17</sup> the high tobacco retail outlet density may be partially due to the high population density. In India, a study conducted in Mumbai showed that there were about 8.5 tobacco retail outlets within 100 m of a school,<sup>18</sup> which is much higher than what we found (about 3 tobacco outlets within 100 m of a school). This difference may be also partially due to the higher population density in India.

A high density of tobacco retail stores was also found in neighbourhoods (12.5 stores within 200 m), which may be similar to the findings in a study conducted in Hangzhou (12.2

stores per neighbourhood),<sup>6</sup> though the definition of a neighbourhood and the study area for each neighbourhood was different from those used in our study. Compared with western countries, the density is most likely much higher in China. In Canada, an average of about six tobacco retail stores was reported within a six-block radius.<sup>19</sup> In the USA, a study reported an average of 1.5 tobacco retail stores in 500 m buffers in neighbourhoods.<sup>19</sup> Youth are likely to be exposed to tobacco retail stores and advertisements in neighbourhoods.<sup>20</sup> Thus, one possible implication of the current research is to promote zoning regulations in residential areas in addition to the ones that are in place near schools. Of course, as the current research suggests, regulations may be in place but enforcement remains a challenge.

The overall high density of tobacco retail stores near schools and in neighbourhoods may be partially due to the widespread lack of enforcement of regulations and policies, as well as the high threshold set by the TMB. Gong *et al*<sup>6</sup> found that the density of tobacco retail stores in neighbourhoods was lower than the standards set by the local TMB in Hangzhou in 2010 and they mentioned that the limits set by TMB were too high for public health. While the TMB is responsible for monitoring and enforcing these regulations, our findings indicate that the TMB has failed to do so. For example, 40% of tobacco retail stores located within 100 m of the front entrance of schools were issued a tobacco retail licence, though tobacco retail sales are prohibited in this area. Moreover, various types of stores can sell tobacco products in China, including convenience stores, grocery stores, fruit

**Table 3** Exterior and interior advertising features, by location

Exterior advertising	Total (%)	School (%)	Neighbourhood (%)	p Value
Availability	25.2	23.2	25.3	0.48
Tobacco advertisement in general	20.5	16.1	20.8	0.0015
Cigarette brand advertisement	0.37	0.39	0.37	0.97
Zijing advertisement	4.8	6.6	4.7	0.97
Size				
Small (<1 m)	7.2	4.1	7.4	0.045
Large (≥1 m)	21.2	20.0	21.3	0.79
Overall advertisement impression				0.60
Discreet	3.5	4.9	3.4	
Moderate	10.3	6.3	10.6	
Obvious	10.1	11.2	10.0	
Interior advertising				
Branded shelving units	2.0	3.2	1.9	0.55
Branded signs	15.5	8.3	15.9	<0.0001
Branded displays	0.17	0	0.18	–

p Value for comparison between schools and neighbourhoods.



**Table 4** Interior tobacco displays, by location

	Total (%)	Schools (%)	Neighbourhoods (%)	p Value
Tobacco product display				
At primary checkout counter	73.3	73.4	73.3	0.92
At another counter	21.6	19.1	21.8	0.53
Separate cabinet in the front	19.1	19.6	19.1	0.91
Display visible from outside	43.6	45.2	43.5	0.65
Majority tobacco product display				
At primary checkout counter	73.0	73.0	73.0	0.99
At another counter	15.5	14.8	15.5	0.84
Separate cabinet in the front	18.9	18.3	19.0	0.87
Display visible from outside	41.9	43.2	41.8	0.74

p Value for comparison between schools and neighbourhoods.

stores, stationery stores, hardware stores, kiosks and construction material stores. This may greatly increase the density of tobacco retail sales as well.

Tobacco displays that target youth were prevalent and they were most prominent near schools compared with neighbourhoods. In addition, almost half (44%) of the tobacco retail stores displayed tobacco products that were publicly visible from the outside of the store, which substantially increases the general public's exposure to tobacco product displays. Point-of-sale tobacco display bans reduce exposure to tobacco marketing and impulse purchasing of cigarettes.<sup>21 22</sup> Australia and Canada have implemented such bans in recent years as studies found that extensive in-store tobacco displays alongside everyday items such as candy, soft drinks and magazines help to develop a sense of familiarity with tobacco products, reduce awareness of the serious health consequences of tobacco use, and increase perceived access to tobacco products among youth.<sup>1</sup> Regardless of whether Chinese tobacco companies intentionally target youth at the point of sale, the findings underscore the importance of implementing strategies to reduce the quantity and impact of tobacco displays to protect youth and adults from such a high exposure to this marketing practice.

The prevalence of tobacco advertising in tobacco retail stores was moderate in Changsha (exterior: 25%; interior: 16%), which is similar to what was reported in Hangzhou (exterior: 28%; interior: 12.4%).<sup>6</sup> Restricting point-of-sale advertising and promotion has been shown to reduce brand awareness among youth, smoking initiation and smoking prevalence.<sup>21</sup> Therefore, many countries have adopted restrictions to limit point-of-sale

advertising and promotion in the past few decades. For example, New Zealand banned point-of-sale tobacco advertising in 1998.<sup>23</sup> In the USA, outdoor tobacco advertisements can be no more than 14 ft<sup>2</sup> (1.3 m<sup>2</sup>) and are not allowed to include cartoons.<sup>24</sup> In the UK, most forms of tobacco advertising and marketing at the point of sale were prohibited by the 2002 Tobacco Promotion and Advertising Act.<sup>25</sup> Unfortunately, as the largest tobacco consumer and producer in the world, China has no restriction on point-of-sale marketing practices. Given the substantial impact of point-of-sale advertising and promotion on smoking, restrictions should become part of efforts to protect youth from harmful exposures to tobacco marketing.

A good licencing system enables effective and efficient monitoring of tobacco sales. Although retail stores are required to have a tobacco retail licence to sell tobacco products in China, we found that <50% had a licence visibly displayed in the store. Given that a large proportion of stores did not have a tobacco retail licence (or had one that was not exhibited), there is the suggestion of a lack of monitoring and inspection of tobacco retail stores. Similarly, even though all tobacco retail stores are required to post a sign indicating 'no sales to minors' visible to customers, Gong *et al*<sup>6</sup> found that only 1% of tobacco retail stores exhibited such a sign in Hangzhou in 2010. Although we found a higher prevalence of stores that exhibited a visible 'no sales to minors' sign in Changsha, it was still low, which also suggests low implementation and enforcement of Article 16 of the Framework Convention on Tobacco Control (FCTC), Chinese Youth Protection Law and the local regulation of the tobacco retail environment.

**Table 5** Cigarette displays in tobacco retail stores, by cigarette type and location

	Total (%)	Schools (%)		p Value†	Neighbourhoods (%)	p Value*	
		Subtotal	0–100 m				101–200 m
Cigarettes in general							
Within 1 m of the floor	82.9	88.2	91.3	87.2	0.27	82.6	0.04
Within 0.3 m of toys and candy, etc	58.9	69.6	75.0	66.4	0.04	58.2	0.0003
Menthol cigarettes							
Within 1 m of the floor	44.2	46.7	43.5	47.9	0.47	44	0.66
Within 0.3 m of toys and candy, etc	30.5	35.4	34.9	34.4	0.96	30.2	0.22
Female-targeted cigarettes							
Within 1 m of the floor	44.2	42.6	39.7	44.1	0.50	44.3	0.70
Within 0.3 m of toys and candy, etc	31	33.3	32.3	32.7	0.97	30.8	0.56

\*p Value for comparison by locations (schools/neighbourhoods).

†p Value for comparison by distance from a school.

The State Tobacco Monopoly Administration (STMA) takes the lead in implementing tobacco control policies in China and has responsibility for the China National Tobacco Corporation (CNTC), which creates a conflict of interest that could undermine tobacco control efforts.<sup>26</sup> Our findings support the recommendation to eradicate this fundamental and irreconcilable conflict between the tobacco industry's interests and public health policy interests to allow better enforcement of tobacco control policies in China.

One limitation of this study is that data were collected by observation, which may result in an underestimate of some measures. For example, to count as having a tobacco retail licence, the store had to have a tobacco retail licence visibly displayed in the store. However, owing to little monitoring and inspection by the TMB, it is possible that some licenced stores did not display their licence. This study is also limited by the fact that we did not have a complete list of tobacco retail stores in the city. Consequently, we had to identify tobacco retail stores by walking through all streets in the study area. Thus, we might have missed tobacco retail stores that were in hidden places or temporarily closed. We acknowledge that a minor measurement error may have been introduced by using the 'Measure Distance' function in Baidu Maps (<http://map.baidu.com/>).

## CONCLUSION

The tobacco retail store density near schools was high in Changsha, China, suggesting low compliance and little enforcement of the tobacco retail zoning regulation. Tobacco displays targeting youth were pervasive in tobacco retail stores in China, especially near schools. Since Chinese tobacco companies are focusing more on tobacco retail stores in recent years and capitalising on increasing tobacco use among youth, it is critical to enforce regulations that protect youth from the risk associated with tobacco retail environments and to identify effective approaches to better regulate tobacco retail stores (including their tobacco marketing practices) in Changsha, China.

### What this paper adds

- ▶ Tobacco retail sales are prohibited within 100 m of schools in many large cities in China. However, little is known about the enforcement of tobacco retail zoning regulations. In addition, no regulations restrict tobacco marketing in tobacco retail stores and little is known of the extent to which tobacco marketing strategies are used in China.
- ▶ This study observed a high density of tobacco retail stores within 100 m of the front entrance of schools where tobacco sales are prohibited. Almost all schools had at least one tobacco retail store in this area and, surprisingly, about 40% of these tobacco retail stores had a visible tobacco retail licence. We also found that tobacco advertising was common and that displays targeting children were pervasive, especially near schools.
- ▶ These findings suggest low compliance and little enforcement of tobacco retail zoning regulations in Changsha, China. Effective enforcement of such regulations is needed to protect youth. Additionally, regulations of point-of-sale tobacco displays and tobacco advertising are urgently needed in China.

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