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Designated Smoking Areas in Streets Where Outdoor Smoking is Banned

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ABSTRACT

Although Japan has been a signatory to the Framework Convention on Tobacco Control since 2004, progress in translating the recommendations into national policy has been limited. Globally, outdoor smoking bans cover outdoor dining areas, beaches, public parks, schools, etc. In Japan, most of existing outdoor smoking bans allow designated smoking areas (DSAs) in the no-smoking zones, thus limiting protection from second-hand smoke (SHS). We examined the impact of DSAs on air quality in the areas of Kobe City where such ordinance is in force. Air quality measurements were conducted near two DSAs in August 2012 by using personal aerosol monitors. Three measurements were performed, each for 15 minutes, by four investigators: a line-up measurement, a vertical and horizontal measurement, and a circle measurement. In the line-up measurement, over 150 μg/m^3 of $PM_{2.5}$ was detected by the monitor four metres from the ashtray, gradually reducing as the distance increased. In the vertical and horizontal measurement, 80–110 μg/m^3 of $PM_{2.5}$ was detected at 4, 11, 18 and 25 metres. In the circle measurement, similar concentrations of $PM_{2.5}$ were detected at all testing points (mean concentration 94 μg/m^3). The study indicates that DSAs are sources of SHS in zones where a street smoking ban is in force, since SHS spreads widely, both vertically and horizontally. Street smoking bans that permit DSAs strongly limit protection from SHS and should be eliminated if protection against SHS is to be effective where such bans are in force.

INTRODUCTION

The Framework Convention on Tobacco Control (FCTC) became a key landmark in protecting people from the damage of tobacco when it entered into force in 2005. Japan has been a signatory to the FCTC since 2004, and as of December 2012 there were 176 Parties to the Convention. [1] However, progress in translating the FCTC recommendations into comprehensive regulations and laws has been slow. Protection against second-hand smoke (SHS) has wide public and political support in an increasing number of countries and has

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paved the way for the adoption of indoor smoking bans as major tools of tobacco control [2]. In order fully to protect people against SHS, the scope of a smoking ban must widen to include not only indoor spaces but also outdoor areas, following the clear recommendation of the World Health Organization (WHO) that “under some circumstances, the principle of universal, effective protection may require specific quasi-outdoor and outdoor workplaces to be smoke-free” [3]. Increasing numbers of cities worldwide have enacted regulations and legislation banning smoking in outdoor areas, often for reasons not explicitly related to health – such as ensuring safety (to limit the risk of fire), and maintaining a clean and attractive environment (to control littering) [4].

Although completely smoke-free cities remain an exception (like the city of Calabasas in the USA which enacted an ordinance banning smoking in the entire city in 2006), outdoor smoking bans cover outdoor dining and drinking areas (e.g. in Canada and the USA), beaches (e.g. in Hong Kong), public parks (e.g. in Australia, Bhutan, India, Italy and Thailand), schools and playgrounds (e.g. in Finland, the Republic of Korea, Singapore and the Philippines), sports facilities (e.g. in South Africa), and hospital grounds (e.g. in the United Kingdom)[5]. However, streets have seldom been covered although outdoor smoking bans are becoming increasingly common.

In Japan, streets adjacent to shopping areas have been the focus of outdoor smoking bans [6]. However, these bans remain very limited in scope and, more importantly, in their protection of health. As such, they are weak policy instruments for restricting exposure to SHS as they are usually implemented for environmental reasons.

Ueda et al (2011) reported that 6% of all municipalities in Japan implement ordinances that ban street smoking, the reasons for which were “unrelated to consideration of the smoking issue as a health matter”. Street smoking bans by themselves are very limited as tobacco control measures. Moreover, since these bans allow designated smoking areas (DSAs) to be located within the non-smoking streets, the protection from SHS is very limited.

DSAs are a common feature of street smoking bans in municipalities of Japan. For instance, although the Kobe City ordinance indicates that smoking is prohibited, smoking areas are in fact designated within the zone that has street smoking bans [7]. The DSAs are either constructed with public money [8] or provided by the tobacco industry [9]. For example, Japan Tobacco Inc. (JT) reported that they often give both financial and technical assistance to local governments for the installation of DSAs [9], and Kobe is no exception [7]. As of April 2011, JT stated that it had provided 943 DSAs in collaboration with 212 different municipalities in Japan [9]. In the case of the special wards of Tokyo, each ward consults with JT to identify a suitable location, taking into account the accessibility, visibility and negative health impacts of the installation of a DSA [10].

In some cases, community complaints about DSAs have been reported. For instance, Shibuya ward of Tokyo implemented an ordinance banning street smoking in 1998 in order to prevent littering or to “keep the city beautiful” and, as a part of this ordinance, the littering of cigarette butts is prohibited. In this same ward, a total of 21 DSAs were provided in the past; however, two of them have now been removed due to the large number of complaints from the public [11]. In anticipation of such public discontent with SHS generated by DSAs, a new approach has been introduced by a private Japanese company named General Fundex. In this new approach, the designated smoking rooms are installed in former shops, namely ippuku, to which passers-by can gain admission for a fee of ¥500 per week [12]. The officially declared purpose of this kind of smoking room is to provide an opportunity for smokers to smoke in a relaxed environment [13]. General Fundex raised concerns that, as a result of widely implemented street smoking bans, the numbers of places where people are allowed to smoke has been reduced [13]. As of October 2012, there were three designated smoking rooms (DSRs) in the streets of metropolitan Tokyo [12].

BACKGROUND

The impact of DSRs in indoor areas on exposure to SHS has been extensively documented.

Since the early 1990s, where DSRs were encouraged as an alternative to reduce exposure to SHS, it was already documented that, owing to several factors, the smoke leaked to areas where a ban was in force [14], and spillovers were inevitable – specifically particulate matters of less than 2.5 µm, which are “a major source of respirable suspended particles (in) cigarette smoke” [15].

As early as 1993, nicotine vapor measurement showed that, in the hospitality industry, nicotine concentrations were as high in nonsmoking sections as in the DSR [16]. In response to such clear evidence of the ineffectiveness of partial bans, the tobacco industry promoted heavily the use of ventilation and filtration systems as a way to clean the air and protect nonsmokers from SHS while at the same time allowing smokers to smoke in as many facilities as possible.

Further studies conducted since 2000 showed that, comparatively, restaurants with a DSR had poorer air quality than restaurants applying a complete smoking ban, despite all technical advances in ventilation, pressurization and filtration systems [17][18]. Indeed, unless the DSR is completely sealed off from the outside world, leakage will always happen, even simply when the access or exit door is opened [19]. All types of facilities have been the subject of similar studies (restaurants, airports, office buildings, medical facilities, and games rooms, to cite a few) with similar findings.

The leakage of environmental tobacco smoke (ETS) has been widely studied [20] [21] and it has been confirmed that DSRs, whether ventilated or nor and whether equipped with filtration systems or not, do not protect from exposure to SHS.

In addition to air quality considerations, partial bans could legitimize smoking and may prevent people from quitting, as has been shown in Canada where smoking areas were permitted in some schools [22]. Moreover, as Winickoff et al. point out [23] [24], even when absolute no-smoking policies are implemented, nonsmokers may still be exposed to harmful levels of toxins from “off-gasing from smoker’s clothing, through open windows and doors and from exhaled toxins for several minutes after the cigarette is extinguished”.

Whereas, as illustrated above, ample evidence has been provided on the ineffectiveness of DSRs to fully protect people from the negative effects of SHS in indoor areas, little vetted data is available on DSAs in outdoor areas. Thus there is a need to document the impact of DSAs where partial bans are implemented. This study aims to assess the impact of DSAs where a street smoking ban is enforced using data from one of the cities where such a regulation has been implemented.

Kobe City, the capital of Hyogo Prefecture, has a total population of 1.5 million (estimated as of November 2011) and is the fifth most populous city in Japan. In Kobe, *Kobe-shi poiste oyobi rojo-kitsuen no boshi ni kansuru jorei* (the Kobe City ordinance on prevention of littering and street smoking), which prohibits smoking in certain streets, came into force on 1 April 2008. The ordinance was intended to make the city cleaner and to prevent brush-by burns resulting from street smoking. The Bureau of the Environment is in charge of the ordinance, not the Bureau of Health. Articles 4, 8, and 9 of the ordinance focus on smoking, stating that people must try not to smoke in any street of the city and prohibiting smoking within the area designated by the mayor. However, the reality is that four DSAs are provided within the no-smoking areas.

A characteristic of urban areas in Japan is the presence of pedestrian walkways called “pedways”. These are common structures that can be seen connecting urban high-rise buildings to each other, particularly around the public transport hubs where many people pass every day. Pedways provide quick and comfortable movement from building to building, away from the traffic and sheltered from inclement weather. In Kobe, two of the DSAs are in fact installed under the stairs attached to a pedway. The DSAs are delineated by physical partitions and are equipped with ashtrays; some have a roof over the ashtrays as a means of keeping people smoking inside the DSA. The sign indicating “Smoking Area” can be seen clearly just outside the train station, directing smokers to the place where they are authorized to smoke while in the no-smoking zone.

Since 2008, soon after the implementation of the ordinance, a fine of ¥ 1000 was applied to illegal smokers in the red-shaded area in Figure 1. The total area of the street smoking ban zone is 500 metres from north to south and 800 metres from east to west, and only public streets are covered by the ordinance [25].

OBJECTIVE

The objective of this study was to determine the impact of DSAs on air quality in the areas of Kobe City where the municipal ordinance banning street smoking is in force. The study was carried out as part of a broader study to assess compliance with the street smoking ban in Kobe.

MATERIALS AND METHODS

In order to measure the air quality, we selected two different DSAs (out of four), DSA1 and DSA2, located near the central train station in Kobe where the street smoking ban is enforced, as shown in Figure 1a and 1b. DSA1 (N34 41.587 – E135 11.693) is located under an overpass linking several shopping Centres to a nearby street. It is also a resting area nearby the taxi station located at the South entrance of the main train station in the centre of Kobe City. The overpass which is above DSA1 provides passengers, a connection between two public transportation systems (a train station and an automated shuttle to Kobe airport) and a pathway to the major shopping street on the South side of the station. There is important pedestrian traffic as it is a central nod in Kobe for public transportation and shopping (a bus station is located nearby, as well as the three main train companies and the subway). DSA2 (N34 41.569 – E135 11.652) is located West of DSA1, on the opposite side of a main road linking the North and South ends of the city. DSA2 sits under the stairs of an overpass that connects the exits of two main train stations to the shopping street below (arrows in the maps of DSA1 in Figure 2a and DSA2 in Figure 2b indicate 20 m). The two locations were selected as a result of an earlier pilot study. Air quality measurements of the two DSAs were conducted in August 2012 (August 7th and August 9th) by means of a SIDEPAK™ AM510 Personal Aerosol Monitor manufactured by TSI Inc. [1] The concentrations of fine particulate matter of $PM_{2.5}$ were measured. $PM_{2.5}$ particles pose the greatest health risks because they have the ability to penetrate deeply into the lungs, where they may reach the peripheral regions of the lungs [24]. The monitor determines the mass concentration by the intensity of scattered laser light. As the light-scattering properties of

[1] See: http://www.tsi.com/sidepak-personal-aerosol-monitor-am510/.

particles differ according to their size and composition, it is necessary to calibrate the measurement results of the monitor [18]. The monitor was set to record $PM_{2.5}$ concentration every 10 seconds. An impactor for 2.5 μm particles attached to the inlet of the monitor removed particles greater than 2.5 μm at a flow rate of 1.7 litres [26]. We used 0.295 as a correlation factor for measurements following the method described by Lee [26].

Fig. 1a. Street smoking ban zone and DSAs

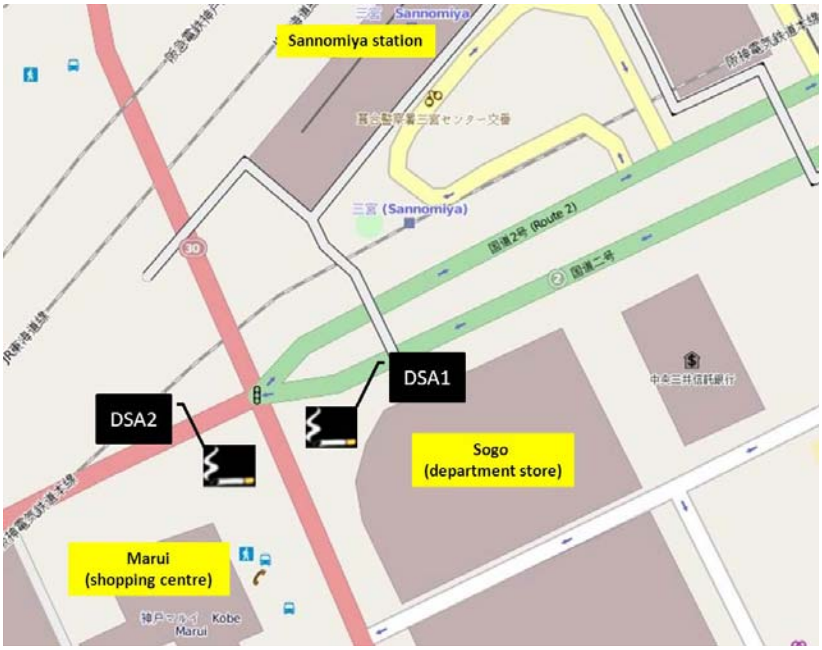


Fig. 1b. Magnified view of DSA1 and DSA2

Three different measurements were collected on two different days in August 2012. The three different measurements were: 1) line-up (horizontal) measurement; 2) vertical and horizontal measurement of DSA1; and 3) circle measurement of DSA2. Each measurement lasted approximately 15 minutes. The monitoring was conducted from 8 to 9 a.m. to monitor people smoking in the DSAs on their way to work. The data were downloaded to a computer for calibration.

1) Line-up (horizontal) measurement

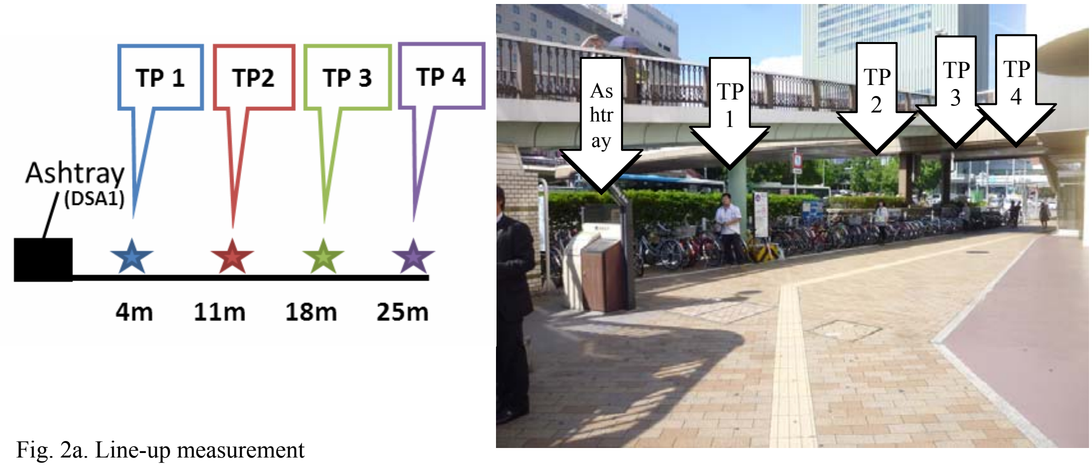


Fig. 2a. Line-up measurement
Each of the four investigators lined up with a monitor as shown in Figure 2a. The closest testing point (TP) was 4 metres away from DSA1 and the most distant TP was 25 metres away.

2) Vertical and horizontal measurement

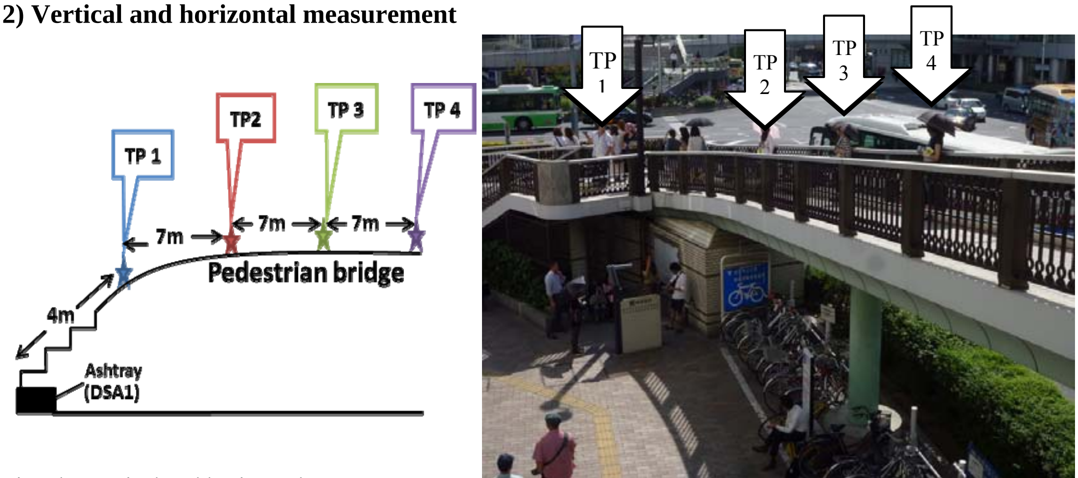


Fig. 2b. Vertical and horizontal measurement
The four investigators lined up horizontally on the pedway above the DSA1 with a monitor, as shown in Figure 2b. The concentration of SHS was measured both vertically and horizontally with this method.

3) Circle measurement

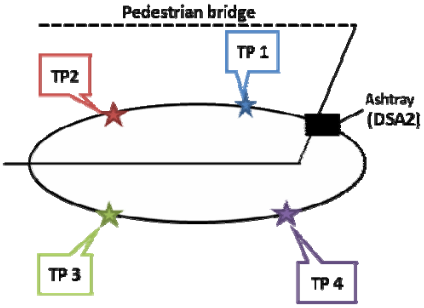


Fig. 2c. Circle measurement

The four investigators formed a circle with a monitor in hand, as shown in Figure 2c. There was a pedestrian walkway located just above the DSA2.

RESULTS

Line-up measurement

In the line-up measurement, the monitor at testing point 1 (TP1), which was nearest to the ashtray point, detected more than 150 µg/m³ (Figure 3-1) and 120 µg/m³ (Figure 3-2) which represent higher concentrations of $PM_{2.5}$ than the other testing points. The concentration of $PM_{2.5}$ gradually decreased with the distance. However, at the end of the line-up measurement in Figure 2, TP4, which was 25 metres from the ashtrays, recorded the lowest concentration of $PM_{2.5}$.

Figure 3.1 Line-up Measurement 07 Aug 2012

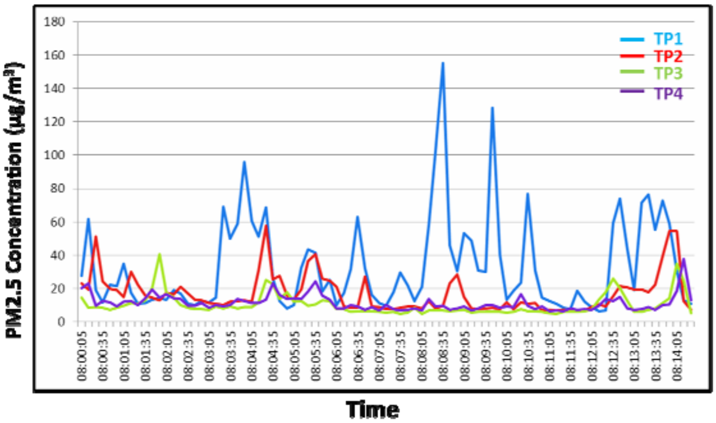
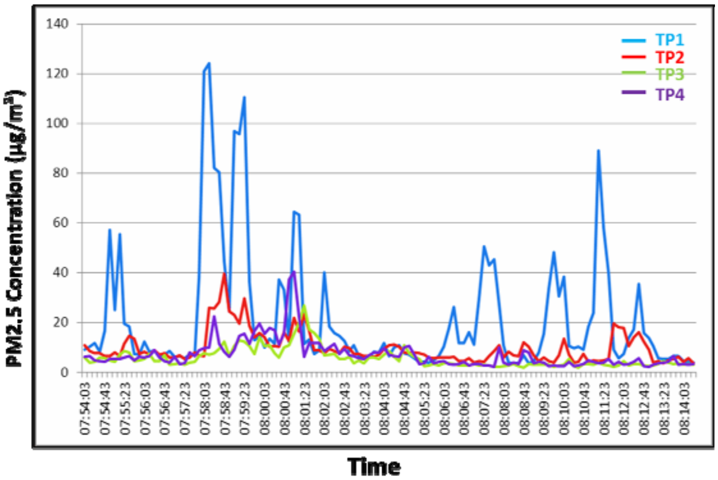


Figure 3.2 Line-up Measurement 09 Aug 2012



Vertical and horizontal measurements (Pedestrian Bridge with a DSA below)

On day 1, the monitors closest to the ashtrays, TP1 and TP2, recorded around 120 μg/m³ and 94 μg/m³ respectively. That represents more concentration of $PM_{2.5}$ than at TP3 and TP4 (Figure 4-1). However, at the end of measurement period, a high level of $PM_{2.5}$ was recorded at each of the four testing points (Figure 4-1). On day 2, under the same measurement conditions (Figure 4-2), the concentration of $PM_{2.5}$ detected was higher at TP2 than at the other testing points.

Figure 4.1 Vertical and horizontal measurement 07 Aug 2012

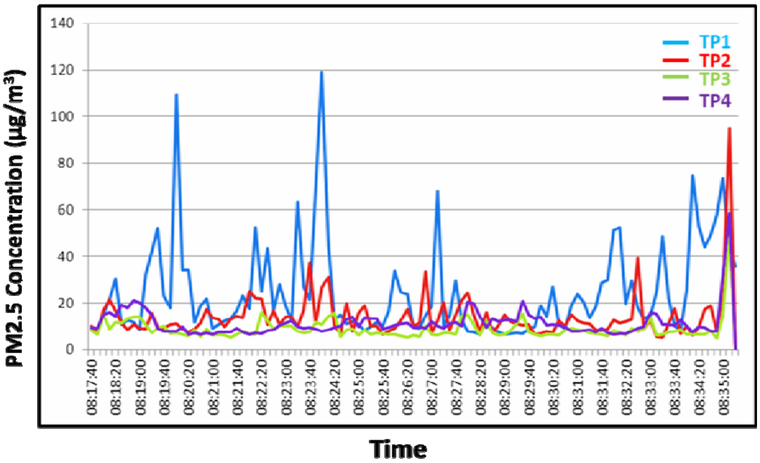
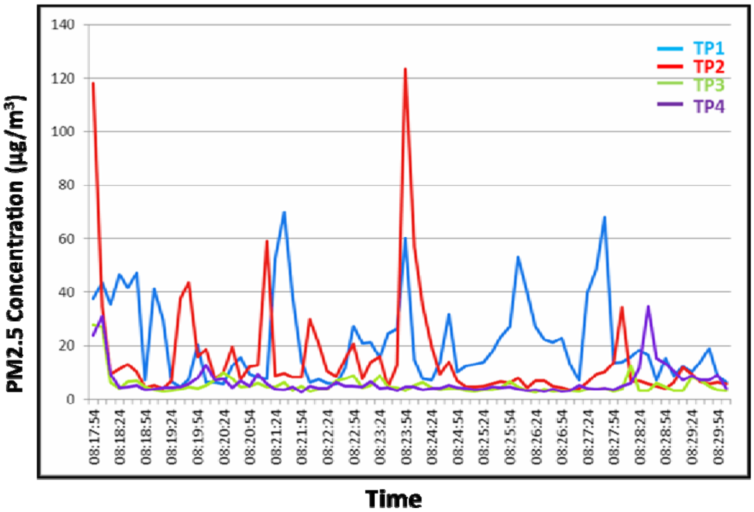


Figure 4.2 Vertical and horizontal measurement 09 Aug 2012



Circle measurement

On day 1, a high-level concentration of $PM_{2.5}$ was detected at TP1, TP3 and TP4, with approximately 80–110 μg/m³ (Figure 5-1). On day 2, under the same measurement conditions, at the beginning of the measurement period, $PM_{2.5}$ concentration peaks were detected at all testing points (Figure 5-2).

Figure 5.1 Circle measurement 07 Aug 2012

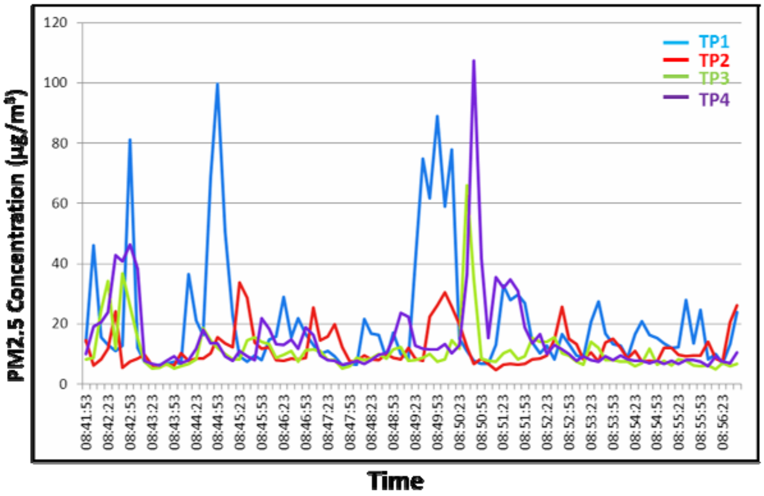
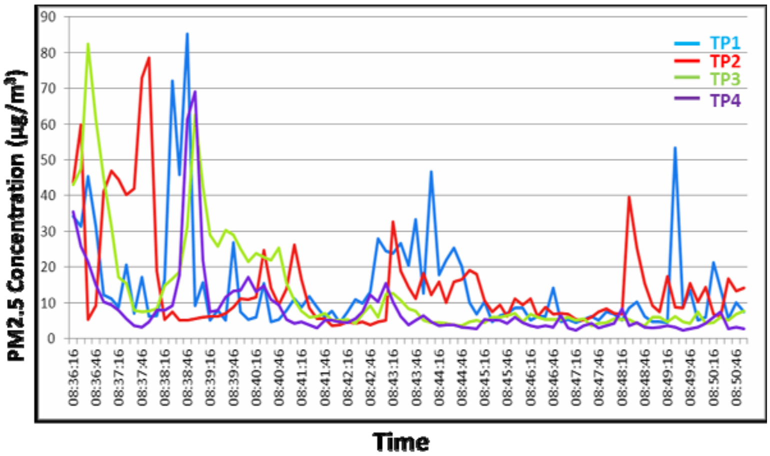


Figure 5.2 Circle measurement 09 Aug 2012



DISCUSSION

The results point towards the existence of release of SHS from the DSAs into the street where a smoking ban is in force. Although the concentration of SHS gradually decreases as the distance from the ashtray of the line-up and vertical and horizontal measurements increases, the furthest testing points (TP4) still detected concentrations of particulate matter as high as 30 μg/m^3. As shown in the figures, there is a gradual delay in detecting SHS by both line-up and vertical and horizontal measurements as one moves away from the ashtrays from TP1 towards TP4. The weather of the measurement was typical mid-summer pattern, mild wind coming from south or south west (sea-side) to north or north west (mountain-side). The flow of SHS is highly dependent on the direction and velocity of the wind; it can reach further than 25 metres or it may remain with a high concentration for a longer period of time in certain areas [27]. However, it should be emphasized that all the pedestrians were exposed to high concentration of SHS at the TP1 and TP2 in the vertical and horizontal measurements because those points are located just above the ashtray.

The circle measurement, on the other hand, constantly shows a high level of SHS concentration at each of the four testing points. In this case, the situation is made worse by the fact that the DSA is installed under the stairs attached to a pedway which serves as a roof for the DSA.

The presence of a DSA can weaken the strength of an ordinance banning smoking in the street as the DSA is a source of SHS. The dispersion of the smoke indicates that there are no safe levels of exposure to SHS in the presence of DSAs. Moreover, there are additional health concerns, such as occupational health issues for cleaners of the DSA who will be exposed to SHS; and also that DSA contribute to the social acceptability of smoking in areas where there is a street smoking ban, as shown in Canada [22].

LIMITATIONS

A first potential limitation is that since we did not measure the wind speed and direction on the day of the measurements, variations in the dissemination of the SHS due to weather conditions could not be reported. However, the measurements were done in relatively stable weather conditions. In those mid-summer days, the wind is not strong and relatively constant seasonal south wind (from seaside to mountain side) is observed because of the difference of the temperature between the seawater and heated land. It has been reported that, in the absence of wind, the cigarette plume will rise if the temperature of the smoke plume is hotter than the surrounding air and will rapidly cool and lose its upward momentum. If there is wind, the amount of rise of the thermally-induced plume is inversely proportional to the wind velocity. A strong wind will create a more horizontal but wider cone. Therefore as the wind direction changes, SHS pollution will be spread in various directions, affecting downwind nonsmokers [28]. Secondly, Personal Aerosol Monitor also detects combustible diesel exhaust of vehicles as its particulate matter is smaller than 2.5 μm. Since two of the DSAs are located beside a busy main road, or near bus terminals, it is possible that the monitor has detected diesel exhaust. In October 2004, Hyogo prefecture implemented the ordinance called "Creation of the preservation of the environment", and this ordinance limits vehicles with diesel engines in certain areas of Hyogo [29]. However, the ordinance does not include the area in which the study was carried out. Therefore, the contamination of $PM_{2.5}$ cannot be ruled out. The baseline standard of the collected data was nevertheless clean as it was lower than the air quality standard set by the Ministry of the Environment [30] and lower than the WHO standard. Third, the concentration of the SHS is highly dependent on the number, distribution, and density of the smokers. Although we targeted the time when smokers were likely to be present, the number of smokers may vary from day to day. With regard to the distribution of the smokers, the source of SHS cannot be defined since the border between the DSA and the zone where there is a ban on smoking in the street remains unclear. We should also note that the monitor may have detected SHS from sources such as illegal smokers in the no-smoking zones, or from smokers inside cars or on motorcycles passing along the road. Fourth, since there is currently no ordinance restricting indoor smoking in Hyogo, it is possible that SHS is leaking out from retail premises such as coffee shops, or entertainment facilities such as amusement arcades in the neighbourhood of the DSA in the circle measurement.

CONCLUSION AND RECOMMENDATIONS

The study suggests that Designated smoking areas are a potential source of Second-hand smoke where a street smoking ban is in force, since Second-hand smoke spreads widely, both vertically and horizontally, from the Designated smoking area. Even when there are no smokers in the area where there is a street smoking ban, Second-hand smoke could be present. Therefore, street smoking bans that permit Designated smoking areas do not provide effective protection from Second-hand smoke.

To contribute to prevent exposure to Second-hand smoke, Designated smoking areas should not be allowed. Moreover, only comprehensive policies that follow the WHO FCTC agreements and guidelines, further emphasized in the MPOWER report [31], will achieve an effective and positive impact on health.

Although it would be reasonable to extrapolate the existing evidence on indoor smoking areas to the outdoor equivalents, and the results of this study point in that direction, further research on this topic could provide complementary evidence – including accounting for other potential sources of Second-hand smoke such as diesel, the effect of variations in the number of smokers, and the influence of the built environment on the Designated smoking areas.

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DISCLAIMER

The views presented in this article are those of the authors and do not necessarily reflect the decisions, policies, or views of the World Health Organization.

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