

Availability and promotion of alcohol across different outlets typologies and under different area-level socio-economic status

Disponibilidad y promoción de alcohol según la tipología de los locales y las condiciones socioeconómicas del área

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Abstract

We aimed to characterise the availability and promotion of alcohol at alcohol outlets in Madrid and to compare them according to type of outlet and area-level socioeconomic status. We used the OHCITIES instrument to characterize the alcohol outlets in 42 census tracts of Madrid in 2016. We specified alcohol availability as the density of alcohol outlets and the number of alcohol outlets with extended opening hours (12 or more). We registered any type of promotion associated to alcohol outlets that could be perceived from outside the outlet. We calculated and compared proportions of availability and promotion by alcohol outlet (on- and off-premise) using chi-squared and Fisher Exact tests. We estimated the availability and promotion of alcohol densities per census tract according to area-level socioeconomic status. To assess statistical significance, we used Kruskal-Wallis tests. We recorded 324 alcohol outlets, 241 on-premise and 83 off-premise. Most of the outlets had extended opening hours (73.77%) and at least one sign promoting alcohol (89.51%). More on-premise outlets had extended opening hours and higher presence of alcohol promotion than off-premise (p values < 0.001). Higher density of alcohol outlets, extended opening hours and presence of alcohol promotion were found in higher socioeconomic areas (all p values < 0.001). These results were also observed for on-premise alcohol outlets. Alcohol availability and promotion were associated with alcohol outlets in Madrid. Future alcohol policies regulating the availability and promotion of alcohol should consider outlet types and area-level socioeconomic status.
Key Words: Alcohol availability; alcohol outlet; alcohol promotion; socioeconomic status; inequalities.

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Resumen

El objetivo es caracterizar la disponibilidad y promoción de alcohol asociados a los locales de venta y consumo de alcohol en Madrid, así como explorar las diferencias en su distribución en función de la tipología del local y las características socioeconómicas del área. Se utilizó el instrumento OHCITIES para caracterizar locales situados en 42 secciones censales de Madrid durante 2016. Se registró la densidad de locales y el número de locales con amplios horarios de apertura (12 o más horas). Se registró cualquier tipo de promoción asociada al local visible desde el exterior. Se comparó los porcentajes de características de disponibilidad y promoción asociada a los locales de consumo y venta de alcohol utilizando el test de chi cuadrado y la prueba exacta de Fisher. Se estimó la densidad de disponibilidad y promoción por sección censal y se exploró su distribución en función de las características socioeconómicas del área mediante el test de Kruskal-Wallis. Se registraron 324 locales, 241 de consumo y 83 de venta. La mayoría tenía un horario amplio de apertura (73,77%) y algún elemento promocional (89,51%). Los locales de consumo tenían horarios más amplios de apertura y más elementos promocionales que los de venta (valor p < 0,001). Se encontró mayor densidad de locales, amplitud de horarios y elementos promocionales en áreas de nivel socioeconómico alto (todos p < 0,001). La disponibilidad y promoción estuvieron asociadas con los locales de venta y consumo de alcohol en Madrid. Futuras políticas cuyo objetivo sea el control del consumo de alcohol deben tener en cuenta la influencia de los tipos de locales y las características socioeconómicas del área en la distribución de la disponibilidad y promoción de alcohol.
Palabras clave: Disponibilidad de alcohol; locales de venta de alcohol; promoción de alcohol; nivel socioeconómico; desigualdades.

Alcohol is one of the leading factors associated with disability and death worldwide (World Health Organization, 2018). Harmful use of alcohol has been associated with adverse health effects (Galán, Valencia-Martín, Guallar-Castillón & Rodríguez-Artalejo, 2014; Griswold et al., 2018), socioeconomic disadvantages (Waller & Iritani, 2013) and social problems (Cunradi, 2010; Mair, Gruenewald, Ponicki & Remer, 2013). Worldwide, alcohol-related problems have increased during the last twenty years (World Health Organization, 2018).

In Spain, alcohol consumption is accepted as part of the culture (Sureda, Villalbí, Espelt & Franco, 2017a). Although the prevalence of heavy daily drinking and alcohol attributable mortality have declined, the prevalence rate of binge drinking remained high among men between 25 and 29 years old (30%) and women between 20 and 24 years old (20%), according to data obtained in 2017 (National Drugs Plan, 2017).

Features of the physical environment, such as alcohol availability and alcohol promotion, have been described as part of urban settings and may influence alcohol consumption (Bryden, Roberts, Petticrew & McKee, 2013; Sureda et al., 2018a). Alcohol availability have been usually specified as the density of or proximity to alcohol outlets (Popova, Giesbrecht, Bekmuradov & Patra, 2009). Some studies have demonstrated positive associations between the availability of alcohol outlets and alcohol consumption (Sherk et al., 2018). For instance, one study conducted in Australia on adolescent found a 17% of increase in alcohol use per 10% of increase in overall density of alcohol outlets (Rowland et al., 2016). Alcohol outlets have been usually classified into on-premise (such as bars and restaurants) and off-premise (including supermarkets or convenience stores) (Rowland et al., 2014; Shortt et al., 2015). Studies that compared on- and off- premise alcohol outlets availability found different effects on alcohol behaviours (Giesbrecht et al., 2015; Young, Macdonald & Ellaway, 2013). For example, a study exploring the associations in on- and off-premise outlets availability on adolescent alcohol consumption found an increase of 5.30% risk for every 10% of off-premise outlets density, but only an increase of 1.68% for on-premise alcohol outlets (Rowland et al., 2014). Other studies have also reported stronger associations between the density of off-premise alcohol outlets and hazard drinking patterns, as binge drinking, in young people than in on-premise alcohol outlets (Halonen et al., 2013; Young et al., 2013).

Similarly, higher availability of alcohol outlets may increase the opportunities for alcohol promotion (Bryden et al., 2013; Sureda et al., 2017b). Previous studies had mainly focused on alcohol advertisements and its role on sponsorship (Anderson, De Bruijn, Angus, Gordon & Hastings, 2009a; Westberg, Stavros, Smith, Munro & Argus, 2018). However, other promotion elements typically located

on alcohol outlets have been overlooked. Therefore, alcohol promotion might have been underestimated in the existing literature. Despite the lightly approach of alcohol promotion, previous studies have suggested hazardous alcohol drinking patterns associated with it, especially in children and young people (Bosque-Prous et al., 2014; Esser, Waters, Smart & Jernigan, 2016).

In addition to alcohol outlet types, area-level socioeconomic status (SES) may influence the distribution of availability and promotion of alcohol within the city (Bryden et al., 2013; Morrison, Gruenewald & Ponicki, 2015). Evidence suggests that there is greater availability of alcohol outlets in lower SES areas than in high SES ones (Hay, Whigham, Kypri & Langley, 2009; Major et al., 2014; Sudhinaraset, Wigglesworth & Takeuchi, 2015). However, this relation is less clear when considering alcohol outlets types (Angus et al., 2017; Rhew, Kosterman & Lee, 2017). The distribution of alcohol promotion according the SES have been less explored. However, few studies have found more alcohol promotion in SES deprived areas than in less deprived ones (Gentry et al., 2018; Hackbarth, Silvestri & Cosper, 1995; Lee & Callcott, 1994).

Different methodologies have been used to describe alcohol availability and promotion of alcohol in urban environment settings. Some of the studies have used secondary databases (Richardson, Hill, Mitchell, Pearce & Shortt, 2015; Shortt et al., 2015) while others have relied on self-reported information (Scribner, Cohen & Fisher, 2000; Wechsler, Lee, Hall, Wagenaar & Lee, 2002). However, both approaches provide limited information for availability and promotion and are not exempt of biases. For this study, we proposed the use of the instrument OHCITIES, based on on-street social systematic observation (Sureda et al., 2017b). This methodology would allow us to define characteristics of the neighbourhoods at street view through direct observation (Costa et al., 2017; Raudenbush & Sampson, 1999) that would be difficult or even impossible to capture using other methodologies. Therefore, and using this instrument, we aim to characterize alcohol availability and promotion at alcohol outlets in the city of Madrid, Spain. Moreover, we compare the differences in alcohol availability and promotion according to outlet type (on- and off-premise outlets) and area-level SES.

Materials and Methods

Study design and sample size

This cross-sectional and observational study was conducted in Madrid, Spain, during 2016. Madrid is divided in 21 districts and further sub-divided in 128 neighborhoods and 2,412 census tracts. Census tract were considered for this study. Census tracts are the smallest administrative areas, with a median population of 1,500 inhabitants and defined by limits easily identifiable.

We used a multistage sampling design to select the study areas for observation and ensure the representativeness of the social characteristics of the whole city. First, two neighbourhoods were selected using a non-probabilistic sampling design for each district (42 neighborhoods in total) representing the following socio-economic characteristics: unemployment, precarious work, occupational class, educational level and immigration. Second, we selected the median census tract in each neighborhood (n=42) based on population density, business density, education level, immigration, and population aging. The procedure to select the census tracts has been described elsewhere (Sureda et al., 2018b).

Social systematic observation: alcohol availability and promotion associated with on-premise and off-premise outlets

OHCITIES instrument and data collection procedure

We used the OHCITIES instrument, a valid and reliable tool to capture systematically alcohol elements in the environment (Sureda et al., 2017b) as the availability and promotion of alcohol. The instrument psychometric showed more than 80% for percent-agreement values for variables of alcohol exposure related to on- and off- premise alcohol outlets as well as greater than 0.80 inter-rater and test-retest reliability values (Sureda et al., 2017b). We characterized all on- and off-premise alcohol outlets within the 42 selected census tracts using social systematic observation.

On-premise alcohol outlets were classified in: 1) bars or similar (including cafes, breweries or bodegas (where mostly unbranded wine is served); 2) restaurants (including sit-in, take-away and fast food); 3) night clubs (including musical pub, cocktail bars, night clubs or discotheques) and 4) other types of on-premise outlets (book-stores, wine-tasting establishment, etc.). *Off-premise alcohol outlets* were classified into: 1) supermarkets; 2) convenience or small grocery stores; 3) specialty food stores (including greengrocers, butchers, fishmongers, and bakeries); and 4) wine or liquor stores.

Data collection was carried out by three trained observers between May and November 2016, on weekdays between 4PM to 9PM to capture all alcohol outlets opened (on- and off-premise). They completed the OHCITIES questionnaire walking along all sides of the street located within the chosen census tract. The route in each census tract was previously defined using a map that the observer followed the day of the data collection. Each census tract was completed by one observer. The observer registered all the on-premise and off-premise alcohol outlets within each selected census tract.

Alcohol environment variables

The variables related to the availability of alcohol included the absolute number of alcohol outlets per

census tract and the number of alcohol outlets with extended opening hours. Outlet opening hours were derived from signage outside each outlet. For outlets that this information was not visible, we inputted the mode of the hours of sales of the outlets within the same census tract for the same type of outlets. Based on those data we divided outlet into two categories: (1) outlets opening 12 hours or less; (2) outlets opening more than 12 hours.

To assess the distribution of availability according to types of alcohol outlets, we computed the percent of outlets opened more than 12 hours. Besides, we estimated the absolute number of alcohol outlets and the number of alcohol outlets opened more than 12 hours per 10,000 population for each census tract to explore the distribution according to area SES.

Variables related to alcohol promotion included the presence of: i) advertisements and sponsorship in shop windows or visible windows; ii) structural elements such as awnings, label, and/or specific alcohol beverage menu associated with alcohol products or an alcoholic brand; iii) furnitures such as barrels, alcohol boxes, tables, chairs, umbrellas, napkin holder or ashtray associated with alcohol products or an alcoholic brand (this variable applies to on-premise alcohol outlets); iv) the presence of alcohol products (alcohol bottles, cans, and beer, cider or wine tap) inside the venue that could be perceived from outdoors; and v) presence of alcohol bottles and/or cans exhibited in shop windows. We derived a promotion overall variable by considering the presence of at least one sign of alcohol promotion mentioned above.

To assess the distribution of promotion according to types of alcohol outlets, we computed the percent of outlets with signs. We also estimated the number of alcohol outlets with at least one sign of alcohol promotion per 10,000 population for each census tract to explore the distribution according to area SES.

Socioeconomic status

We used a composite SES index (Gullón et al., 2017) based on 7 indicators obtained by several databases. Madrid municipal registry of population (Padrón), a continuous and universal census collected for administrative purposes (http://www-2.munimadrid.es/CSE6/jsps/menu_BancoDatos.jsp), was used to obtain the data on: (1) low education (defined as percent of people above 25 years of age with primary studies or below) and (2) high education (defined as percent of people above 25 years of age with university education or above). Social security registry (http://www.seg-social.es/Internet_1/Estadistica/Est/index.htm) was used to obtain the data about: (3) part-time employment (percent of workers in part-time jobs), (4) temporary employment (percent of workers in temporary jobs), (5) manual occupational class (percent of workers in manual or unqualified jobs). Finally, 'Idealista' (<https://www.idealista.com/informes-precio>)

vivienda), a report from a large real-estate corporation in Spain on housing, and employment service registry (http://www.sepe.es/contenidos/que_es_el_sepe/estadisticas/datos_estadisticos/empleo/index.html) was used to obtain the indicators of (6) the average housing prices (per sq. m) and (7) the unemployment rate, respectively. Data for all the indicators were obtained at census tract level for the year 2015.

The SES index was operationalized as tertiles (low, medium and high) based on all census tracts in Madrid.

Statistical analysis

Descriptive statistics were calculated for alcohol availability and promotion in the environment according to on- and off-premise alcohol outlets. We compared alcohol availability and promotion associated to on-premise outlets using chi-square test while for off-premise outlets we used Fisher's exact test due to this small sample. Kruskal-Wallis test for non-normally distributed continuous data was used to examine the densities of alcohol related variables (availability and promotion) differences between on- and off-premise among area SES tertiles. These tests were used with a significance level of 95%. The analyses were conducted using STATA v.12.0 software.

Results

Description of the sample

A total of 324 alcohol outlets (241 on-premises and 83 off-premises alcohol outlets) were observed within the 42 census tracts (Table 1). Cafes and bars were the most prevalent type of alcohol outlet (74.38%) followed by convenience stores (19.14%). The number of on-premise

Table 1. Description of the study sample by type of alcohol outlets in 42 census tracts in the city of Madrid, 2016.

Types of alcohol outlets within 42 census tracts sampled	N	%
ALCOHOL OUTLETS	324	
On-premise	241	74.38
Bar or similar	176	54.32
Restaurant	50	15.43
Night clubs	13	4.01
Others on-premise outlets	2	0.62
Off-premise	83	25.62
Supermarkets	11	3.39
Convenience stores	62	19.14
Specialty stores	8	2.47
Wine or liquor stores	2	0.62

alcohol outlets ranged from 0 to 37 per census tract while for off-premise alcohol outlets the range was from 0 to 7 per census tract. Most on-premise (75.93%) and off-premise (85.54%) alcohol outlets were open at time of the data collection.

Alcohol-related variables associated to alcohol outlets

Table 2 shows alcohol exposure characteristics related with availability and promotion of alcohol associated with on- and off-premise alcohol outlets. Overall, 73.77% of the alcohol outlets had extended opening hours (more than 12 hours), and 89.51% had at least one sign of alcohol promotion associated to the outlet.

For alcohol promotion, 32.41% of alcohol outlets had advertisements and/or sponsorship in shop windows or

Table 2. Alcohol-related variables associated to on and off-premise alcohol outlet in 42 census tracts in the city of Madrid, 2016.

	ALCOHOL OUTLET TYPOLOGY				p-value *
	Overall (n=324 outlets)		On premise (n = 241)	Off premise (n = 83)	
	N	%	%	%	
AVAILABILITY					
Hours of sale					<0.001
More than 12 hours	239	73.77	78.84	59.04	
PROMOTION					<0.001
With promotion	290	89.51	92.95	79.52	
Advertisements and sponsorship in shop window or visible windows					0.053
Present	105	32.41	29.46	40.96	
Structural elements associated with alcohol products					<0.001
Present	119	36.73	47.72	4.82	
Bottles and/or cans in shop windows					0.039
Yes	35	10.80	8.71	16.87	
Bottles, cans and/or alcohol taps inside the venue					0.155
None	87	26.85	28.22	22.89	
Between 1 to 15	67	20.68	22.41	15.66	
More than 16	170	52.47	49.38	61.45	

Note. * p-value were estimated with chi-square test between on- and off-premise outlets.



Note. Panel a) Bar (on-premise alcohol outlet) where they promoted different types of drinks and alcohol brands in shop windows. Alcohol products (bottles and alcohol taps) inside the venue were visible from outdoors.

Note. Panel b) Convenience store (off-premise alcohol outlet) where the owners exhibited alcohol products in the shop window (there were more than 16 alcohol beverages visible from outdoors).

Figure 1. Examples of availability and promotion associated to alcohol retail outlets in Madrid, 2016. Photographs: Victor G. Carreño.

visible windows; 36.73% had at least one structural element associated with alcohol products or an alcoholic brand; 10.80% had alcohol bottles and/or cans in shop windows; and 50.47% exhibited more than sixteen alcoholic beverages (bottles, cans or alcohol taps) inside the outlet but visible from outdoors. When compared with off-premise, on-premise alcohol outlets were more likely to have extended opening hours ($p < 0.001$); at least one sign of alcohol promotion associated to the outlet ($p = 0.001$); and at least one structural element associated with alcohol

products or an alcoholic brand ($p < 0.001$). More off-premise alcohol outlets had bottles and/or cans exhibited in shop windows ($p = 0.039$); and advertisements and/or sponsorship in shop window than on-premise ones. Presence of alcohol products inside the venue visible from outside did not differ between on- and off-premise alcohol outlets. In Figure 1, we show some examples of alcohol exposure associated to on- and off-premise alcohol outlets.

We explored differences in alcohol exposure according to types of on-premise alcohol outlets (Table 3). We

Table 3. Alcohol-related variables by typology of on-premise alcohol outlet (bars, restaurants or night clubs) in 42 census tracts in the city of Madrid, 2016.

	ON-PREMISE ALCOHOL OUTLETS				p-value*	
	Overall (n=239 on-premise)	Bars (n = 176)	Restaurants (n = 50)	Night Club (n = 13)		
	N	%	%	%		
AVAILABILITY						
Hours of sale						
More than 12 hours	188	78.66	88.64	44.00	76.92	<0.001
PROMOTION						
With promotion	222	92.89	96.59	90.00	53.85	<0.001
Advertisements and sponsorship in shop window or visible windows						
Present	71	29.71	30.68	32.00	7.69	0.200
Structural elements associated with alcohol products						
Present	113	47.28	54.55	24.00	38.46	0.001
Furniture elements associated with alcohol products						
Present	76	31.80	37.50	20.00	–	0.003
Bottles and/or cans in shop windows						
Yes	21	8.79	8.52	12.00	–	0.384
Bottles, cans and/or alcohol taps inside the venue						
None	68	28.45	20.45	40.00	92.31	<0.001
Between 1 to 15	54	22.59	24.43	22.00	–	
More than 16	117	48.95	55.11	38.00	7.69	

Note. *p-value were estimated with chi-square test between bars or similar, restaurants and night clubs of on-premise outlets.

excluded “other type of on-premise alcohol outlets” from the analysis because we recorded only two outlets in that category (one library, and one tasting establishment). Finally, we explored 239 on-premise outlets. More bars than restaurants and night clubs had extended opening hours ($p < 0.001$); had at least one sign of alcohol promotion associated to the outlet ($p < 0.001$); at least one structural element associated with alcohol products or an alcoholic brand ($p < 0.001$); at least one furniture element associated

with alcohol products or an alcoholic brand ($p = 0.003$); and more alcohol products inside the venue that could be perceived from outdoors ($p < 0.001$). The presence of advertisement or sponsorship in shop windows or visible windows, and bottles and/or cans in shop window did not vary significantly for type of on-premise alcohol outlets.

When we compared differences between types of off-premise alcohol outlets (including supermarkets and convenience stores), we did not find differences in

Table 4. Alcohol-related variables by typology of off-premise alcohol outlet (supermarkets and convenience stores) in 42 census tracts in the city of Madrid, 2016.

	OFF-PREMISE ALCOHOL OUTLETS				p-value*
	Overall (n=73 off-premise)		Supermarkets (n=11)	Convenience stores (n=62)	
	N	%	%	%	
AVAILABILITY					0.562
More than 12 hours	48	65.75	63.64	66.13	
PROMOTION					0.353
With presence	59	80.82	72.73	82.26	

Note. *p-value were estimated with Fisher’s exact test between supermarkets and convenience stores of off-premise outlets.

alcohol exposure characteristics related to availability and promotion of alcohol (Table 4).

Alcohol exposure associated to alcohol outlets by socioeconomic characteristics of the area

Overall, the median density of alcohol outlet within the 42 census tracts was 56.17 alcohol outlets per 10,000 population (including both on- and off-premise). When we explored its distribution according to area-level SES

(Table 5), the median density of alcohol outlets per 10,000 population increased from 64.01 in areas with low SES to 94.11 in areas with high SES ($p < 0.001$). Similar pattern was observed for the rest of the alcohol exposure variables. The density of outlets with extended opening hours was higher in areas with medium and high SES than in areas with low SES ($p < 0.001$). The highest density of outlets with at least one signs of promotion was observed in areas with the highest SES ($p < 0.001$).

Table 5. Alcohol-related variables per 10,000 population associated to alcohol outlets according to area-level socioeconomic status in 42 census tracts in the city of Madrid, 2016.

	Socioeconomic Status						p-value*
	Low (n=77)		Medium (n = 138)		High (n=109)		
	Median	Range	Median	Range	Median	Range	
TOTAL ALCOHOL OUTLETS	64.01	41.39-73.91	88.44	51.81-319.30	94.11	72.78-140.85	<0.001
AVAILABILITY							
Hours of sale							
More than 12 hours	38.58	25.44-62.53	68.03	45.78-203.19	60.31	43.67-92.20	<0.001
PROMOTION							
With presence	62.54	22.83-66.15	82.19	51.81-253.99	94.12	72.78-133.43	<0.001
Advertisements and sponsorship in shop window or visible window							
Present	16.54	16.54-17.06	43.84	20.06-145.14	30.67	14.56-59.30	<0.001
Structural elements associated with alcohol products							
Present	18.28	17.06-33.08	30.09	22.21-87.08	32.89	14.56-51.89	<0.001
Bottles and/or cans in shop windows							
Yes	0.00	0.00-11.03	5.02	0.00-43.54	30.67	7.28-37.06	<0.001
Bottles, cans and/or alcohol taps inside the venue							
More than 16	18.28	9.13-44.10	38.36	31.81-181.42	49.34	35.29-81.54	<0.001

Note. *p-value were estimated with Kruskal-Wallis tests for continuous data.

Table 6. Alcohol-related variables per 10,000 population associated to on-premise outlets according to area-level socioeconomic status in 42 census tracts in the city of Madrid, 2016.

	Socioeconomic Status						p-value*
	Low (n = 50)		Medium (n = 105)		High (n = 86)		
	Median	Range	Median	Range	Median	Range	
TOTAL ON-PREMISE ALCOHOL OUTLETS	44.10	22.83-56.85	93.15	49.65-268.51	82.35	49.34-118.60	<0.001
AVAILABILITY							
Hours of sale							
More than 12 hours	34.32	22.83-45.48	71.23	49.65-174.17	58.82	32.89-92.02	<0.001
PROMOTION							
With presence	37.17	22.83-51.17	76.71	49.65-210.45	82.35	49.34-111.19	<0.001

Note. * p-value were estimated with Kruskal-Wallis tests for continuous data.

Table 7. Alcohol-related variables per 10,000 population associated to off-premise outlets according to area-level socioeconomic status in 42 census tracts in the city of Madrid, 2016.

	Socioeconomic Status						p-value*
	Low (n = 27)		Medium (n = 33)		High (n = 23)		
	Median	Range	Median	Range	Median	Range	
TOTAL OFF-PREMISE ALCOHOL OUTLETS	25.87	17.06-28.45	25.07	15.58-29.61	22.24	15.34-32.89	0.776
AVAILABILITY							
Hours of sale							
More than 12 hours	8.48	5.17-21.34	10.03	6.80-29.03	7.41	6.22-27.41	0.448
PROMOTION							
With presence	16.96	7.53-28.45	20.41	9.16-29.61	22.24	12.35-27.41	0.726

Note. * p-value were estimated with Kruskal-Wallis tests for continuous data.

The median density of on-premise alcohol outlets per 10,000 population were higher in areas with medium and high SES than in more deprived areas (93.15 and 82.35 vs 44.10 on-premise outlets per 10,000 population, respectively, $p < 0.001$). The same patterns were observed for density of on-premise outlets with extended opening hours and with any type of promotion ($p < 0.001$; Table 6). In contrast, we did not observe differences in the distribution of off-premise alcohol outlets according to area-level SES ($p = 0.776$; Table 7). Similarly, there was not variation in the density of off-premise alcohol outlets with extended opening hours and with any type of promotion according to area-level SES ($p = 0.448$ and 0.726 , respectively).

Discussion

In this study, we investigated the availability and promotion of alcohol at alcohol outlets in the city of Madrid, Spain. Our findings showed differences in their distribution according to types of alcohol outlets and area-level SES. Specifically, we found that 1) more on-premise outlets had extended opening hours and higher presence of alcohol promotion than off-premise; and 2) higher

density of alcohol outlets, extended hours of sale and presence of alcohol promotion were found in higher SES areas.

Alcohol exposure associated to on- and off-premise alcohol outlets

Our findings showed high availability of alcohol in the city of Madrid. The median alcohol outlet density in Madrid (56.17 alcohol outlets per 10,000 population) was higher than those obtained in other places as Scotland, UK (Shortt et al., 2015), Victoria, Australia (Livingston, 2012) or Tallinn, Estonia (Orro, Martens, Lepane, Josing & Reinman, 2017). However, it was lower than the density of alcohol outlets obtained in a study conducted in the city of Barcelona (Spain) that used the same instrument explained in this study (Villalbí et al., 2019).

We also found that most alcohol outlets in Madrid had extended opening hours (more than 12 hours), especially on-premise outlets. Among on-premises, bars or similar had the most extended opening hours. Recently, an European Union Directive liberalized the opening hours of outlets (Anderson & Room, 2011; Villalbí, Bosque-Prous, Gili-Miner, Espelt & Brugal, 2014), thereby other countries

such as Austria or Finland have extended their opening hours (World Health Organisation, 2014). This policy should be reconsidered since easier access to alcohol, including extended alcohol sales hours, stimulate alcohol consumption (Lu, Zhang, Holt, Kanny & Croft, 2018; Trapp, Knuiman, Hooper & Foster, 2018). The regulations of alcohol availability are the most cost-effective to control alcohol consumption (Anderson, Chisholm & Fuhr, 2009b). Thus, certain interventions should be considered for the alcohol control agenda, such as define minimum distances between alcohol outlets (proximity between outlets); limit the number of licenses of alcohol outlets or restrict the access of alcohol to exclusive stores (Valiente et al., 2018); increase alcohol taxes; or decrease the opening hours.

Additionally, we observed that most alcohol outlets had at least one sign of promotion. Specifically, on-premise alcohol outlets were the ones with more presence, specifically the bars. High density of advertisement had been associated with an increase in the consumption of the promoted alcohol brand (Kwate & Meyer, 2009; Sillero-Rejon, Maynard & Ibáñez-Zapata, 2020; Westberg et al., 2018), and identified women and young people as the most vulnerable population (Kypri, Maclennan, Cousins & Connor, 2018; Ross et al., 2014). European Union policies regulate alcohol promotion in specific supports (i.e. TV, printed media, cinema, billboard, internet and social media) (European Alcohol Policy Alliance, 2016). However, the alcohol industry circumvents these policies using alcohol outlets to promote its brands. This alcohol promotion at alcohol outlets is unnoticed for many people and has been incorporated as another urban element in cities (Sureda et al., 2017a). The continuous visibility of alcohol beverages may increase the acceptance and normalisation of alcohol consumption (Petticrew et al., 2017) promoting hazard alcohol patterns, especially among young people (Barry et al., 2016). The World Health Organization had identified social acceptance as one of the new challenges for alcohol-control (World Health Organization, 2018), because this acceptance is related with alcohol patterns such as binge drinking or alcohol consumption initiation among young people (Jernigan, Noel, Landon, Thornton & Lobstein, 2017; Lobstein, Landon, Thornton & Jernigan, 2017). There is enough evidence to support the enforcement and extension of current alcohol promotion regulations. One alternative to improve the effectiveness of these regulations could be implementing interventions to control the content of the alcohol promotion (usually related with success, sports or musical events), or the place of the alcohol promotion prohibiting any type of promotion that could be seen or perceived from street view (Burton et al., 2017; Chambers et al., 2019).

Previous studies found differences in how on- and off-premise alcohol outlets influence on alcohol-related

outcomes (Rossheim, Thombs & Suzuki, 2016; Sherk et al., 2018). Our findings showed different distribution of alcohol promotion features according to alcohol outlet typologies that may explain the difference found in their effects on alcohol consumption patterns. Future studies should examine how these features relate to alcohol outcomes and acceptance of alcohol consumption among those who are exposed. Evidence from such studies may provide some hints for future interventions in countries with analogous policy framework and with similar typologies of alcohol outlets.

Alcohol exposure associated to alcohol outlets by socioeconomic characteristics of the area

Previous studies examining how alcohol outlets density differ according to the area-level SES found higher availability of alcohol outlets in areas of greater socioeconomic deprivation (Angus et al., 2017; Rhew et al., 2017). In our study, we found opposite results. Overall, higher density of alcohol outlets and extended opening hours were found in areas with high SES than in low SES areas. These differences could be explained by the land use distribution around the city. In compact cities such as Madrid, the areas with high SES are usually used by population from other neighbourhoods who commute to such areas for work, shopping or leisure, being crowded central places with a high number of alcohol outlets. Moreover, outlets located in high area-level SES are related with more expensive products which may influence on the location of the alcohol outlets, where the purchase power and alcohol demand of population ensure the feasibility of the alcohol-related business (Schneider & Gruber, 2013). In addition, these areas often match the touristic areas (Veal, 2006). Surrounding the touristic sites in the city exist a great demand for leisure activities that may increase the number of alcohol outlets, especially on-premise alcohol outlets.

In contrast, off-premise alcohol outlets were equally distributed according to area-level SES. The high availability of off-premise alcohol outlets have been related with hazard patterns of alcohol consumption among young population (Shih et al., 2015; Young et al., 2013). Moreover, alcohol beverages in these outlets are cheaper than in on-premise outlets. The easier access of alcohol makes it more appealing not only to young people but also to low-income communities. The higher availability of off-premise alcohol outlets has been also related with an increase of the signs of alcohol consumption (Forsyth & Davidson, 2010a). These signs of consumption were described as the presence of litter related to alcohol and the presence of people drinking alcohol in public spaces, sometimes near off-premise outlets (Forsyth & Davidson, 2010a; Galloway, Forsyth & Shewan, 2007; Sureda et al., 2017a). The effects of the visibility of signs of alcohol consumption on alcohol behaviours are similar to the

effects of alcohol promotion (Forsyth & Davidson, 2010b; Villalbí et al., 2019). We did not include this element on the analysis since the source of exposure in our study was the alcohol outlets. However, future studies may include this aspect of urban environment in their explorations.

The distribution of alcohol promotion associated to all alcohol outlets and on-premise alcohol outlets (when considering any type of promotion) also differed according to the area-level SES. Density of alcohol outlets and on-premise alcohol outlets with promotion were higher in medium and high area-level SES. These results could be also explained by the land use of these areas, and by the higher density of alcohol outlets, especially on-premise outlets, that facilitates alcohol promotion opportunities.

These findings taken together suggest evidence of social inequalities in the availability of alcohol outlets and its promotion. The unequal distribution of the alcohol availability and promotion may influence alcohol behaviours among individuals who are exposed. Previous studies found higher prevalence of alcohol daily intake in areas with high area-level SES in comparison with deprived areas (Grittner, Kuntsche, Gmel & Bloomfield, 2013; Pabst, Auwera, Piontek, Baumeister & Kraus, 2019) However, hazardous alcohol patterns as heavy episodic or binge drinking had higher prevalence in more deprived areas (Bellis et al., 2016; Pabst et al., 2019). Reducing alcohol availability through licensing and zoning regulations have proven to be a good option to reduce and prevent these inequalities (Hippensteel, Sadler, Milam, Nelson & Furr-Holden, 2018; Jennings et al., 2013) These regulations identify the zones with overprovision of alcohol outlets, and redistribute them by guaranteeing minimum distances between them. Future policies should consider these types of initiatives to protect those who are more exposed and more vulnerable to the harmful use of alcohol.

Strengths and limitations

All measurements were conducted between 4 and 9 PM. These times were chosen to ensure that most on- and off-premises would be open during the data collection. However, some pubs and nightclubs were closed at the time of the observation. Future analysis could include an entire 24-hour period to capture outlets open at different times. Although we could not include information of all alcohol outlets within the city of Madrid, we registered all alcohol outlets distributed within 42 census sections scattered around the city and representative in terms of sociodemographic and socioeconomic characteristics. Three observers collected all data. However, they were trained by the principal investigator before conducting the fieldwork to avoid inter-observer variability. Our study also presents some strengths. Most of studies examining the alcohol environment focused on the alcohol availability measured as density or proximity of alcohol outlets, and

most of them were located in America or Australia (Burton et al., 2017; Lu et al., 2018; Trapp et al., 2018). Moreover, the approaches to measure exposure to alcohol promotion did not include the promotion associated to alcohol outlets underestimating the real exposure (Burton et al., 2017; Gentry et al., 2018). This is the first study to explore comprehensively the alcohol availability and promotion associated to on- and off-premise alcohol outlets, and to compare differences between them, and its distribution according to area-level socioeconomic characteristics. The differences found according to the types of alcohol outlets and social inequalities in its distribution reaffirm and support the need of considering this type of analysis in future studies and further examining their association with drinking behaviours.

This study is part of the 'Heart Healthy Hoods' (HHH) project, aiming to understand how physical and social characteristics of the urban environment may affect the cardiovascular health. The HHH project includes a cohort of adult residents in Madrid, and we are currently collecting data on drinking behaviours among those residents. Future studies will use this information to understand how alcohol exposure on outlets may be associated to alcohol drinking behaviors.

Conclusions

To our knowledge, this is the first study describing the availability and promotion of alcohol in both on- and off-premises alcohol outlets in a representative sample of census tracts in a large city like Madrid. Our findings showed different distribution in the availability and promotion of alcohol according the different types of alcohol outlets and area-level SES. The availability and promotion of alcohol at alcohol outlets were high, especially at on-premise. Moreover, we found different distribution on alcohol outlets availability and promotion according to area-level SES. Alcohol outlets were more available and had more associated promotion in higher area-level SES than in areas of low SES.

Future steps should be taken to strengthen regulations on the availability, and promotion of alcohol at on- and off-premise alcohol outlets considering socioeconomic inequalities in the city.

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X.S. and A.P. conceive the original idea. X.S. supervised the data collection. A.P. prepared the databases and analysed the data with the advice of X.S. and A.E. A.P. and X.S. drafted the manuscript. All authors contributed substantially to the interpretation of the data, the manuscript review and approved its final version. X.S. and

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