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Characteristics of tobacco retailers in New Zealand

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ABSTRACT

Using data on known tobacco outlets throughout NZ, GIS was used to map outlets, deprivation and secondary schools. A total of 5008 tobacco outlets were identified, giving a density of one outlet per 617 people or one outlet per 129 smokers. One-half of secondary schools had an outlet within 500 m. Tobacco outlets were more densely located in areas of higher socioeconomic deprivation. One third of all tobacco outlets had a licence to sell alcohol. This study indicates the widespread retail availability of tobacco and the need for a mandatory system of registration for better enforcement of smokefree legislation.

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1. Introduction

Many countries, including New Zealand (NZ), have adopted tobacco control policies that restrict tobacco marketing and smoking in work spaces, that mandate health warnings on cigarette packaging, and ensure the availability of smoking cessation services (Edwards et al., 2011; Henriksen, 2012). It has recently been suggested that tobacco control policies should be broadened to reduce the supply and availability of tobacco products (Edwards et al., 2011; Henriksen, 2012). The widespread retail availability of tobacco represents a major form of tobacco promotion, particularly in countries that restrict other forms of tobacco industry marketing (Paul et al., 2010).

In 2011, in response to an inquiry on tobacco use in NZ by the Māori Affairs Select Committee (2010), the government launched a goal to make the nation smokefree by 2025 (New Zealand Government, 2011). As part of this inquiry, the Māori Affairs Select Committee recommended that the government consider reducing the number of tobacco retail outlets, and investigate giving local authorities the power to control the number and location of tobacco retail outlets (Māori Affairs Select Committee, 2010). No licence or registration is required to be able to sell tobacco in NZ: any type of outlet is permitted to retail tobacco, and tobacco products are also available at many non-retail premises, such as alcohol-licensed premises, sporting and social clubs. By contrast, access to alcohol in NZ is regulated through a licensing system overseen by the national Liquor Licensing Authority and

managed by local government agencies (District Licensing Agencies). Alcohol-licensed premises are required to complete host responsibility training, and legislation prohibits the sale of alcohol in certain types of outlet such as dairies (small convenience stores or corner shops) and service stations.

Evidence from the United States suggests that a greater density of tobacco retail outlets in a neighbourhood is associated with higher rates of smoking amongst both adults (Chuang et al., 2005) and youth (Lipperman-Kreda et al., 2012; Novak et al., 2006). While this research is cross-sectional and therefore does not tell us about the direction of causation, it is plausible that the tobacco retail supply may influence smoking rates. Higher tobacco outlet density might be associated with higher smoking prevalence including greater exposure to cigarette advertising (Henriksen et al., 2008; Henriksen et al., 2010), promoting relapse (Hoek et al., 2010; Reitzel et al., 2011), and the creation of a more competitive local market, possibly driving cigarette prices down (McCarthy et al., 2011; Scollo et al., 2000), and increasing sales to minors (Leatherdale and Strath, 2007). The only study from NZ to examine this issue showed inconclusive results, and has limitations insofar as only access to supermarkets and convenience stores was examined (Pearce et al., 2009).

Overseas studies indicate that vulnerable population groups may be exposed to the retail availability of tobacco to a greater extent. The density of tobacco retail outlets tends to be higher in areas of socioeconomic deprivation (Henriksen et al., 2008; Novak et al., 2006; Pearce et al., 2007; Yu et al., 2010) and this may contribute to the trend for higher smoking prevalence amongst socioeconomically disadvantaged groups (Henriksen, 2012; Ministry of Health, 2010). The density of retailers is also higher in areas where a larger proportion of the population are younger

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than 18 years old (Novak et al., 2006), which is a concern given that the risks of initiation of tobacco use and transitions to daily use are greatest amongst younger people. A higher density of tobacco retail outlets around a school is associated with higher levels of experimental smoking (Henriksen et al., 2008; McCarthy et al., 2009) and greater reported ease of purchasing cigarettes (Leatherdale and Strath, 2007) amongst school's students. Tobacco products are also commonly sold at locations where alcohol is consumed, such as pubs, bars and nightclubs (Paul et al., 2010). This is a concern given that many smokers report a tendency to smoke more at licensed premises when cigarettes are available for purchase (Paul et al., 2010).

A system of licensing or registering tobacco retailers, similar to those implemented in some jurisdictions in the United States, Canada and Australia, is a mechanism which could enable the number and location of tobacco retailers to be managed by local government. In addition, a licensing system may enable stricter enforcement of legislation prohibiting the sale of tobacco to minors and of restrictions on point-of-sale tobacco displays. The retail availability of tobacco is an area that has not been well researched, and there are no published data describing the type of outlets where tobacco is available for purchase in NZ. The distribution of supermarkets and convenience stores according to neighbourhood socioeconomic deprivation has previously been studied in NZ, though this study did not include the full range of retail premises where tobacco is sold (e.g. on-licensed premises, liquor stores and cafes) in their analysis (Pearce et al., 2007). The purpose of the present study is to describe the number and types of tobacco retail outlets throughout NZ, to examine how Smokefree Enforcement Officers (SEOs) identify tobacco retailers in their local areas, and to examine the distribution of outlets according to neighbourhood deprivation, their proximity to secondary schools, and the extent to which tobacco is sold alongside alcohol.

2. Method

2.1. Identification of known tobacco retail outlets

There is no available list or register of every tobacco retail outlet in NZ. The names and physical addresses of known tobacco retail outlets were obtained by contacting SEOs at each District Health Board (DHB) in NZ between March and May 2012. Smokefree Enforcement Officers are government employees with statutory powers who are responsible for enforcing smokefree legislation, including restrictions on sales to minors and on point of sale displays (New Zealand Parliamentary Counsel Office, 2003). The local lists compiled by SEOs represented the most accurate source of data on tobacco retailers that was available at the time of writing. Eleven DHBs (some SEOs worked across more than one DHB) provided information regarding the method of collecting and maintaining tobacco retailer databases. The SEOs for seven of the DHBs reported that they had initially used lists of registered food premises from their respective Territorial Local Authority (TLA). All SEOs who responded to this question reported that they used a variety of methods to update and maintain their tobacco retailer databases and these included visits to retailers, local knowledge, and the use of directories such as Yellow Pages, internet directories and local newspapers. Three DHBs reported that they were collaborating with (or planning to collaborate with) District Licensing Agencies to update their lists with regards to alcohol-licensed premises.

Data from each DHB were transferred into a single database. Duplicate listings were removed. Missing or incomplete physical addresses were resolved by searching internet directories (Yellow Pages, Zenbu) and Google Street View. Each retailer was then matched to its meshblock area; the smallest geographic unit for which statistical data is collected and processed by Statistics NZ.

Tobacco retail outlets were categorised according to the type of premises. Categories were selected based on the previous research with tobacco retailers both in NZ (Radford, 2011) and overseas (Paul et al., 2010). Categories were firstly assigned on the basis of the outlet name; for example, well-known supermarket, service station and liquor store brands were assigned their respective categories. Where the retail category was not obvious from the outlet name, this was determined by referring to the category assigned by the SEO (if this information was available) or by searching internet directories for further information on the outlet.

2.2. Supplementary data

A list of all premises licensed to sell alcohol was obtained from the New Zealand Liquor Licensing Authority (Ministry of Justice, 2012). The Liquor Licensing Authority is responsible for making decisions on applications relating to liquor licences in NZ. Tobacco outlets that sold alcohol were identified primarily on the basis of their outlet category (i.e. large supermarkets, taverns, nightclubs and liquor stores were all flagged as selling alcohol). Where it was unclear whether a tobacco retail outlet also sold alcohol (i.e. for small supermarkets, convenience stores, restaurants, cafés and accommodation) the outlets were manually compared against the alcohol licensing database provided by the Liquor Licensing Authority. A search was conducted in the alcohol licensing database for each tobacco outlet by premises name, and subsequently by address, to determine whether these remaining tobacco retail outlets were licensed to sell alcohol.

We assessed the density of tobacco retailers as the number of places tobacco is sold (i) within 500 m walking distance of school, (ii) within 1000 m walking distance of school, (iii) per usually resident adult NZ population and (iv) per population of adult smokers in NZ. Data from the New Zealand 2006 census (Statistics New Zealand, 2012) were used for residents aged 15 years and above: this age range was chosen because approximately one third of current smokers aged 14–15 years are known to purchase cigarettes from retail stores (Marsh et al., 2012). Current smoking prevalence, defined as someone who has smoked more than 100 cigarettes in their lifetime and at the time of the survey was smoking at least once a month, (World Health Organisation, 1998) of people aged 15 and older was obtained from the most recent New Zealand Tobacco Use Survey (Ministry of Health, 2010).

A Geographic Information System (GIS) layer of secondary school locations was obtained from the geographic data website *Koordinates.com*. The position of each school ($n=463$) was confirmed by visual inspection and was relocated if necessary. Distances of 500 m and 1000 m away from the schools were selected as the mostly likely distances pupils would be willing to walk to reach a retailer. The measure of socioeconomic deprivation used was the NZDep2006 index (Salmond et al., 2007), which combines nine variables from the 2006 census that reflect eight dimensions of deprivation, including income, education, qualifications, employment, housing, access to a car and telephone. Deprivation score for each meshblock was used to define the socioeconomic area each retailer was located in. The NZDep2006 scale divides NZ into tenths of the distribution giving an ordinal score from 1 to 10, where 1 represents the area with the least deprived score and 10 the areas with the most deprived score.

2.3. Analysis

Once the retailer addresses were confirmed, geocoding allowed the addresses in the database to be translated to spatial locations using the *batchgeo.com* website and then mapped using ArcGIS 10 software (Environmental Systems Research Institute, 2011). Since all retailer addresses included either a city or region, the accuracy

of the geocoding results was first checked by confirming that each of the 5008 retailers had been correctly located at that level. Those that were in the wrong city or region were relocated to their correct street address by hand. Secondly, 100 random points were selected and each checked to ensure they were in the correct position. Of these 100 points, 93% were within 20 m of their correct location. A GIS layer of the national road network was obtained from Land Information New Zealand (LINZ) for use in network modelling. In order to identify the areas that were accessible on foot within 500 m and 1000 m via the road network, this layer was converted to a network dataset, and then used to create the 500 m and 1000 m walking zone polygons around each secondary school in the regions for which tobacco retailer data were obtained ($n=463$). These polygons delineate the areas that are accessible within 500 m and 1000 m via the road network around each school. By spatially intersecting the retailer locations and the walking zones, the number of retailers within any of the zones could then be easily quantified. This process also allowed for the number and type of retailer in each walking zone to be summarised in a spreadsheet for further statistical analysis. In addition, the decile values of the NZDep2006 were joined to a GIS layer of the 2006 census meshblocks (Statistics New Zealand, 2012). By attaching the NZDep2006 index to both retailers and schools, this value could be mapped and quantified for each.

Simple (unadjusted) linear regression analysis was used to assess the relationship between number of retailers and deprivation. Logistic regression was used for three models: (a) relating the presence of a licence to sell alcohol in a tobacco outlet to deprivation, (b) relating the presence of a retailer within 500 m of a school to deprivation, and (c) relating the presence of an outlet within 500–1000 m to deprivation. Analyses were performed using Stata v11.1 software (Stata Corporation, 2011).

3. Results

3.1. Number, type and population density of tobacco retail outlets

Data on known tobacco retail outlets were provided for 19 of the 20 DHBs; one DHB declined to participate. A total of 5008 tobacco retail outlets were identified. The initial database comprised 5705 tobacco retail outlets, 697 were excluded as they were either duplicate listings, or their physical address and/or outlet name (hence the retail category) was incomplete, invalid or unable to be verified. The population of residents aged 15 years and above in NZ at the last census (2006) was 3,091,080 (excluding the population of the region where the DHB did not participate), giving a density of one outlet per 617 adults. Based on a 2009 current smoking prevalence of 21.0% among the NZ adult population (15 years and older) (Ministry of Health, 2010), this equates to approximately one tobacco outlet per 129 smokers. Variation in density of retailers was found between DHBs; there was a range of one outlet per 377 adults to one outlet per 1523 adults.

Convenience stores were the most common type of retailer selling tobacco in NZ with 40% of retailers being classified under this category (Table 1). The next most common category of retailer was service stations (18%), followed by on-licensed premises (13%), and supermarkets (9%). One-third (32%) of the tobacco retail outlets identified also had a licence to sell alcohol.

3.2. Distribution of tobacco retail outlets

The density of tobacco retail outlets tended to be greater in areas of higher socioeconomic deprivation (Fig. 1). Simple linear regression found a statistically significant relationship between number of retailers in a meshblock and meshblock deprivation,

Table 1
Categorisation of tobacco retail outlets.

Outlet type	Tobacco outlet	
	n	%
Convenience store	2023	40.4
Service station	911	18.2
On-licensed premises	646	12.9
Supermarket	471	9.4
Café	345	6.9
Liquor store	213	4.3
Other retail/service/manufacturing	153	3.1
Bookshop	70	1.4
Accommodation	53	1.1
Tobacconist	51	1.0
Community	36	0.7
Duty free	19	0.4
Unknown	17	0.3
Total	5008	100

Convenience store (dairy, corner store, mini mart, and small supermarket), on-licensed premises (bar, nightclub, hotel, restaurant, Returned Services' Association and sports clubs), café (any food place, eat in or takeaway, which does not sell alcohol), other retail/service/manufacturing (businesses that did not traditionally sell tobacco, e.g. architects, party goods retailer, trade/construction businesses), bookshop (includes post shops, lotto shops, and gift shops), accommodation (motor camps, motels, and rest homes), tobacconist (tobacconist and hairdressers; most fall under both), community (includes facilities such as art gallery, city council, swimming pool, prisons and consulates), and unknown (unknown what these businesses are).

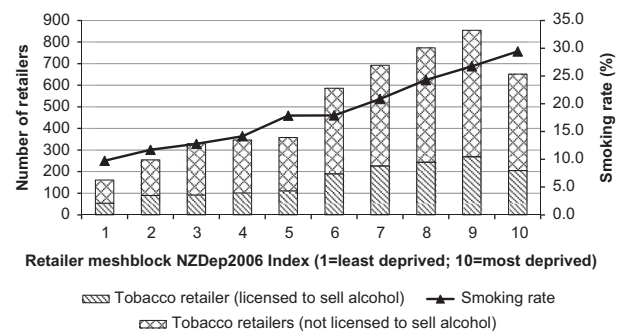


Fig. 1. Tobacco retail outlets by meshblock socioeconomic deprivation and smoking rates. Source of smoking data: Ministry of Health New Zealand Health Survey 2011/2012, current smoking 15 years and over.

which indicated a higher retail outlet density in areas of higher deprivation (Table 2). For every one unit increase in the meshblock NZDep score, the number of tobacco retailers in the meshblock increased by approximately 72 (95% CI: 49.32–95.48). There was no statistically significant relationship between the number of tobacco retail outlets licensed to sell alcohol and meshblock deprivation.

The 5008 tobacco retailers were mapped in relation to walking distances (500 m and 1000 m) from the 463 secondary schools in the regions for which tobacco retail data were obtained. Thirteen per cent of retailers were located within 500 m of a school and 53% of retailers were located within 1000 m of a school. Forty-six per cent of secondary schools (215 schools) had at least one tobacco retail outlet within a 500 m walk, and 76% of secondary schools (353 schools) had at least one outlet within a 1000 m walk. Twenty-four per cent (110 schools) of schools had no retailer within a 1000 m walk of their school. There was a mean of 1.4 tobacco retailers within 500 m of secondary schools and 5.7 tobacco retailers within 1000 m of secondary schools. For illustration, the polygons in Fig. 2 show the distribution of tobacco retail outlets in Dunedin and Mosgiel (inset) within 500 m and 1000 m walking distances of secondary schools.

Table 2
Tobacco retailers' relationship with deprivation.

Dependent variable for linear regression	Independent variables	Coefficient	Standard error	Confidence interval
Outlets selling tobacco	NZDep	72.4	10.01	49.32–95.48*
Dependent Variable for logistic regression	Independent variables	Odds ratio	Standard error	Confidence interval
Tobacco retailer licensed to sell alcohol	NZDep	1.00	0.01	0.98–1.02
Retailers with 500 m of a school	NZDep	1.05	0.04	0.98–1.12
Retailers 500 m to 1000 m of school	NZDep	1.10	0.07	1.03–1.19*

* $P < 0.05$.

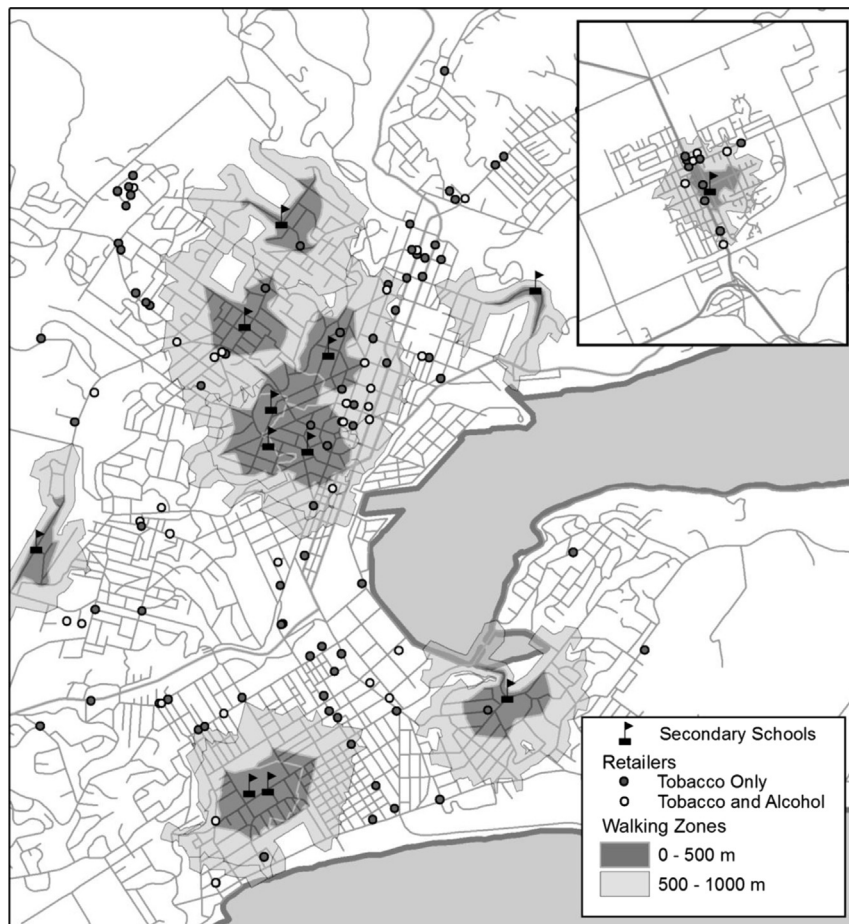


Fig. 2. Tobacco retail outlets within 500 m and 1000 m of Dunedin secondary schools (Mosgiel inset).

There was no evidence to suggest that having a retailer within 500 m of a school was related to the deprivation of the neighbourhood around the school, however, for every unit increase in a school's meshblock NZDep score, the odds of having a retailer within 500–1000 m of the school increased by 10% (Table 2).

4. Discussion

This study sought to describe the number and types of outlets where tobacco could be purchased in NZ, and to examine their distribution according to neighbourhood deprivation and proximity to secondary schools. We also aimed to estimate the extent to which tobacco products were sold alongside alcohol. This research identified approximately 5000 tobacco retail outlets, which equates to approximately one outlet per 617 adults, and one outlet per 129 adult smokers in NZ. The most prevalent types of tobacco retailer were convenience stores, service stations, on-licensed

premises and supermarkets, which together made up 81% ($n=4051$) of outlets. Spatial analyses indicated that almost half of all secondary schools in NZ have at least one tobacco retailer within a 500 m walk, and that three quarters had at least one tobacco outlet within a 1000 m walk. Just over half (53%) of tobacco retail outlets were located within 1000 m of a secondary school. The density of tobacco outlets was found to be greater in areas of higher socioeconomic deprivation. Approximately one third of the tobacco outlets identified had a licence to sell alcohol, and 13% of tobacco outlets were on-licensed premises (i.e. taverns, bars and nightclubs) where alcohol was purchased for consumption at the location.

This was the first study that has sought to describe the types of outlet where tobacco is sold in NZ, and to examine their distribution according to neighbourhood deprivation and proximity to schools. Our findings are consistent with previous NZ (Pearce et al., 2007) and US (Henriksen et al., 2008; Hyland et al., 2003) studies, which suggest people living in more deprived communities have greater

access to tobacco retail outlets. Our study extends previous NZ research by using data collected by SEOs at a local level, which encompasses a larger range of outlets not included by Pearce and colleagues. These included on-licensed premises, liquor stores, cafes, and bookshops amongst others. Our study is the first to describe the wide range of outlets where tobacco is able to be purchased in NZ, and uses the best available data that exists concerning these outlets. A particular strength of this study is that in determining the proximity of tobacco outlets to secondary schools, we used polygons of 500 m and 1000 m walking distances, whereas previous research in the US has used circumferences around schools measured 'as the crow flies' (Henriksen et al., 2008).

Our results share some similarities with findings from a recent study on tobacco retailers in the Hunter region of New South Wales (NSW), Australia (Paul et al., 2010). In this Australian study, the proportions of tobacco retail outlets categorised as service stations (19%) and supermarkets (9%) were almost equivalent to those in the present study (18% and 9%, respectively). However, our study found a far greater prevalence of convenience stores selling tobacco (40%) compared to the equivalent categories in the Australian study (corner shops, which made up 8% of all tobacco outlets). We also found a much lower proportion of on-licensed premises (13%) compared to the NSW study (32%). These results may simply reflect the differences in the prevalence of retail stores and licensed premises between NSW and NZ, or the way in which outlets were categorised. Alternatively, they could indicate that the databases compiled by SEOs in NZ under-represent on-licensed premises that retail tobacco. However, even if this category of tobacco outlets has not been underestimated, the fact that 13% of tobacco outlets were on-licensed premises is concerning particularly given the increased risks of cancer associated with smoking and drinking simultaneously (Winstanley, 2011). Our study also found a lower ratio of tobacco outlets to smokers (one outlet per 129 smokers) compared to the Australian research (one outlet per 77 smokers), despite the prevalence of adult cigarette smoking in NSW (20%) (Paul et al., 2010) being similar to that of NZ (21%) (Ministry of Health, 2010). Our results are consistent with previous research in the US and Canada that suggests tobacco retail outlets are commonly located within easy walking distances to secondary schools (Henriksen et al., 2008; Hyland et al., 2003; Leatherdale and Strath, 2007; Lovato et al., 2007).

This study suggests that SEOs use a variety of methods to collate and maintain their databases of local tobacco retail outlets. These included obtaining lists of registered food premises from TLAs and modifying them using the results of searches of directories (e.g. Google and Yellow Pages), local knowledge, and retailer visits. The reason SEOs employ methods such as this is that retailers do not have to be licensed or registered to sell tobacco products and, as such, there is no accurate database of outlets that sell tobacco in NZ. Given these methods of data collection, it is highly likely that the information on tobacco outlets we obtained from SEOs is not completely accurate and is likely to be an underestimation of the number of tobacco retail outlets in NZ. The Maori Affairs Select Committee recently estimated the number of tobacco retail outlets in NZ was approximately 10,000 (Maori Affairs Select Committee, 2010), and though it is unclear how this estimate was calculated, the number of tobacco outlets this study identified does not come close to this figure. Even if the DHB region that did not participate, as well as the 697 retailers which this study excluded, was taken into account the figure would not reach 10,000. It was beyond the scope of this study to verify whether each outlet identified in the lists provided by SEOs actually did sell tobacco. Furthermore, it was not possible in this study to adjust our analyses for potential confounding factors such as meshblock population and rurality/urbanicity. Disadvantaged areas tend to be located in more heavily populated urban areas, therefore closer to shopping centres and high-traffic areas where tobacco retail outlets are likely to be more prevalent. Given

this, and the cross-sectional nature of our research, caution is required in drawing inferences about a causal relationship between deprivation and tobacco outlet density.

This research highlights the difficulty of obtaining accurate information on tobacco retailers, which is at odds with the requirement to ensure tobacco retailers comply with smokefree legislation. Knowing how many tobacco retailers there are would better inform the amount of SEO personnel needed in each region: currently there are around 40 designated SEOs in NZ, but no data are available on the number of full time employees dedicated to SEO work, and SEO duties are often carried out on a part-time basis by health promotion and health protection employees.

In order to achieve the government's goal of a smokefree Aotearoa by 2025, a comprehensive range of tobacco control measures has been proposed (Smokefree Coalition of New Zealand, 2011), and mandatory registration or licensing of all tobacco retailers in NZ is one intervention in this strategic plan. This might not only enable existing smokefree legislation to be better enforced, but could also provide a mechanism for further regulation to decrease the retail availability of tobacco in the future. Regulatory options to reduce the number of tobacco outlets include (i) prohibiting particular types of outlet (e.g. dairies or on-licensed premises) from selling tobacco; (ii) prohibiting the sale of tobacco in certain zones (e.g. near schools); and (iii) restricting the sale of tobacco to a limited number of controlled outlets (such as only allowing tobacco to be supplied via specialist tobacconists or pharmacies) (Tilson, 2011). Evidence strongly suggests that reducing alcohol outlet density is an effective strategy to reduce alcohol consumption and related harm (Campbell et al., 2009), which suggests a similar approach may also be effective in the case of tobacco. Another policy option that would promote smoking cessation in the retail environment would be to require nicotine replacement therapy and other smoking cessation resources to be available wherever tobacco products are sold (Jaine, 2012) and registration of tobacco retailers would be an intermediate step that could enable this measure to be implemented. Although there have been limited studies in this area, some research suggests that the majority of the NZ public supports measures to decrease the retail availability of tobacco (Thomson et al., 2010) as do tobacco retailers (Edwards et al., 2007).

Our study indicates that tobacco is retailed widely throughout NZ, and that a high proportion of tobacco retail outlets were located within a 1000 m walk of a secondary school and at least 13% of tobacco outlets were on-licensed premises. The heterogeneity of approaches used by SEOs to collect data on tobacco retail outlets and a probable underestimation of the total number of outlets demonstrates an urgent need for better monitoring of smokefree legislation, which would be facilitated by introducing tobacco retail licences. Our findings provide further support for developing and evaluating tobacco control interventions in the retail setting in order to achieve the 2025 smokefree NZ goal.

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