



Is neighbourhood access to tobacco outlets related to smoking behaviour and tobacco-related health outcomes and hospital admissions?



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ABSTRACT

Objectives. Although the harms of tobacco use are widely accepted, few studies have examined the relationship between access to tobacco outlets and hospital admissions. This study aimed to examine the relationship between neighbourhood access to tobacco outlets, smoking and hospital admissions and self-reported morbidity.

Methods. Responses as to smoking behaviour were obtained from 12,270 adult participants in Western Australia (2003–2009) and individually record-linked to hospital admissions and geographically linked to tobacco outlets.

Results. Neighbourhood access to tobacco outlets was marginally positively associated with being a current versus a past smoker. Tobacco outlet access was also positively associated with heart disease for smokers but not non-smokers. For smokers, each additional outlet within 1600 m of home was associated with a 2% increase in the odds of heart disease.

Conclusion. Smokers with greater access to tobacco outlets were more likely to be diagnosed with or admitted to hospital for heart disease. Regulating the density of tobacco outlets in the community has immense potential to improve health benefits and our results motivate the need for future longitudinal studies to confirm this hypothesis.

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1. Introduction

Globally, almost 6 million people die each year from direct tobacco use or second-hand smoke (WHO, 2011). Furthermore 71% of lung cancer, 42% of chronic respiratory disease and 10% of cardiovascular disease is attributable to smoking (WHO, 2011). Ratification of the World Health Organization's Framework Convention on Tobacco Control (WHO, 2003) by almost 180 countries has accelerated efforts to curb tobacco use, which advocates for bans on tobacco advertising, promotion and sponsorship, smoking in indoor public areas and workplaces and strengthening of health warnings. However, there is still an estimated one billion smokers worldwide (WHO, 2011) and the widespread availability of tobacco products undermines the effectiveness and consistent messaging of other tobacco control measures. Hence there is growing policy and research interest in evidence to support reducing the availability and access of tobacco products (Cohen and Anglin, 2009; Intergovernmental Committee on Drugs, 2012).

Emerging evidence demonstrates a link between higher neighbourhood access to tobacco outlets and smoking in both youth

(Henriksen et al., 2008; Novak et al., 2006; Scully et al., 2013) and adults (Chuang et al., 2005; Pearce et al., 2009; Peterson et al., 2005). For example, Pearce et al. (2009) measured access to tobacco outlets across New Zealand as the car travel time to the nearest outlet, and identified a positive association with risk of being a smoker (Pearce et al., 2009). Chuang and colleagues (2005) found significant positive associations among Californian adults between smoking and three different measures of access to convenience stores: density of, distance to and number of stores within a one mile radius (Chuang et al., 2005). Research has also shown that retail availability of tobacco is positively associated with impulse purchases (Paul et al., 2010) and cessation relapse (Reitzel et al., 2011). Furthermore, there is substantial evidence that access to tobacco outlets is greater in more disadvantaged areas (Novak et al., 2006; Chuang et al., 2005; Pearce et al., 2009; Diez Roux et al., 2003; Hyland et al., 2003; Peterson, 2011).

Research on area-level variations of alcohol (Pereira et al., 2013; Zhu et al., 2004; Young et al., 2013; Shamblen et al., 2011) and unhealthy food (Li et al., 2009; Day and Pearce, 2011; Fraser et al., 2012) outlet access have moved beyond examining associations with prevalence and consumption patterns, to more complex relationships with health outcomes. However, the same cannot be said for research explicitly exploring tobacco outlet access and tobacco-related health outcomes.

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It is plausible that greater retail access to tobacco can lead to poorer health outcomes via a number of pathways, as tobacco outlet density has been identified as an impediment to successful cessation among smokers (Reitzel et al., 2011) and associated with higher smoking prevalence in adults (Chuang et al., 2005; Pearce et al., 2009; Peterson et al., 2005) and young people (Henriksen et al., 2008; Novak et al., 2006; Scully et al., 2013). Research in this area remains scarce despite calls for further exploration (Cohen and Anglin, 2009) and governments demanding evidence that proposed tobacco control strategies will work (Gartner et al., 2010). Yet currently there is insufficient evidence on the relationship between access to tobacco outlets and tobacco-related disease and death; this evidence is necessary to attract the attention of governments to enforce retail regulations. In the tobacco control literature to date, only one study appears to investigate the relationship between access to tobacco outlets and tobacco related health outcomes. This US study found that number of tobacco outlets was associated with changes in the geography of chronic obstructive pulmonary disease hospitalization (Lipton et al., 2005).

The overall purpose of this study was to investigate the association between neighbourhood access to tobacco outlets and smoking behaviour and tobacco-related health outcomes using a large, representative Western Australian sample of adults (18+ years). This study had three aims: (1) to examine the relationship between neighbourhood tobacco outlet access and smoking status; (2) to investigate the relationship between tobacco outlet access and self-reported morbidity and objectively measured hospital admission for tobacco-related health outcomes among smokers; and (3) to test for an interaction between the association of tobacco outlet access and health outcomes and smoking status.

2. Methods

2.1. Study population

Cross-sectional survey data from the Health and Wellbeing Surveillance System (HWSS) were linked with objectively measured data on hospital admissions and tobacco outlets located across the Perth metropolitan area in Western Australia (WA). The Department of Health in Western Australia (DoHWA) collects self-reported information about health, wellbeing and lifestyle factors on a continuous basis through the HWSS (Villanueva et al., 2013). Monthly computer-assisted telephone interviewing was used to administer cross-sectional surveys and responses obtained from a representative stratified random sample of the WA population (N = 1,959,088, 2006 Census). The WA Data Linkage System matches respondents' names and other identifiers in order to link available administrative health data. Respondents to the HWSS are asked to consent to having their survey data linked with other datasets through a de-identifying process conducted by the DoHWA. The Hospital Morbidity Database System is one of the data systems routinely linked to the HWSS and provides inpatient discharge data from all WA hospitals, both public and private. The combined database is close to complete with 98.5% of records linked (Stanley et al., 1994). For this study, 2003–2009 HWSS adult (18+ years) data were examined with a five-year window of Hospital Morbidity Database System data centred on the year the HWSS was completed. These protocols were approved by the Human Research Ethics Committees of The University of Western Australia and the DoHWA (#2010/1). The final sample (n = 12,270) excluded those who either did not consent to data linkage or could not be linked based on available data.

2.2. Measures

2.2.1. Neighbourhood access to tobacco outlets

A geocoded list of the addresses of all retail outlets within WA with a licence to sell tobacco (e.g. supermarkets, convenience stores, liquor stores, nightclubs) was provided to the Cancer Council WA by the WA

Department of Health (DoHWA) with permission for this to be linked in May 2011. For respondents who consented to data linkage, neighbourhood buffers were generated at a 1600 m distance (along the street network) from their home address using Geographic Information Systems software (ArcGIS, version 10.0). The number of tobacco outlets within the neighbourhood buffer was then computed. The 1600 m distance (approximately 1/2 a mile) was selected as it approximately represents a 15 min walk for an average adult (Hooper et al., 2012). Walkable accessibility of tobacco was mooted in the New South Wales study by Paul et al. (2010), who found that 85.7% of smokers reported that they would be within walking distance of a tobacco outlet during the course of their day to day activities (Paul et al., 2010).

2.2.2. Demographics, smoking status and diagnosis with diseases

Demographic characteristics, smoking status and disease diagnosis were sourced from the HWSS. The demographic characteristics included sex, age, highest level of education completed, household income and socioeconomic indexes for areas (SEIFA) (Index for relative socioeconomic advantage and disadvantage 2006). SEIFA is calculated at the Census Collection District level (Australian Bureau of Statistics, 2006a) which has an average of 225 households per Census Collection District (Australian Bureau of Statistics, 2006b). For smoking status, respondents were asked which of five categories best described them in terms of smoking behaviour i.e., 'I smoke daily', 'I smoke occasionally', 'I don't smoke now but I used to', 'I've tried it a few times but never smoked regularly' and 'I've never smoked'. These items were similar to those used in previous studies (Paul et al., 2010; Clattenburg et al., 2013). Respondents indicating daily or occasional smoking were classified as 'smokers' and this sub-sample was the focus of the tobacco outlet access and health outcome analyses (n = 1873). For diagnoses with tobacco-related health outcomes, respondents were asked if a doctor had ever told them that they had a respiratory disease other than asthma (non-specified), heart disease, stroke and cancer. For diagnosis with asthma, respondents were asked if they had taken treatment for or had symptoms of asthma in the last 12 months.

2.2.3. Hospital admissions

Respondents providing consent for data linkage had their survey data linked with their hospital admissions data (1999–2011) through the DoHWA data linkage system (Villanueva et al., 2013). A 5-year window of hospital data was obtained centred on the year they completed the HWSS. Hospital admission data for asthma, other respiratory diseases (non-specified), heart disease, coronary heart disease, stroke and cancer were obtained for this study. In addition, hospital data for a range of known tobacco-related diseases including lung cancer, oesophageal cancer and heart failure were combined into a single measure as the case numbers for each disease were too low to examine specifically. The full list of diseases and health outcomes combined into this measure is presented in Table 1.

2.3. Statistical analysis

Logistic regression was used to identify the odds of being a smoker for each additional tobacco outlet within 1600 m of home, with and without adjusting for potential confounders of sex, age (and age (WHO, 2003)), household income, and socio-economic status (SEIFA). Analyses compared daily smokers with: (1) participants who have never smoked; and (2) those currently classified as non-smokers (i.e., past smokers, experimental smokers and those who have never smoked). Additional analyses compare those classified as 'current' smokers (i.e., daily and occasional smokers) with: (1) those who have never smoked; and (2) those currently classified as non-smokers. Current smokers (i.e., daily and occasional smokers) were also compared with past smokers to investigate whether tobacco outlet access might impact a smoker's ability to successfully quit. To examine whether tobacco outlet access was associated with the amount smoked daily

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