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Neighbourhood safety and smoking in population subgroups: The HELIUS study

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ABSTRACT

This study examines the associations between neighbourhood safety and three types of smoking behaviour, and whether these associations differ by sex, age, ethnicity and individual-level socio-economic position. Baseline data (2011–2015) from the The HEalthy LIfe in an Urban Setting (HELIUS) study (Amsterdam, the Netherlands) were used. Smoking behaviour was based on self-report. Heavy smoking was defined as smoking ≥10 cigarettes per day. Nicotine dependence was assessed using the Fagerström questionnaire. Geographic Information System techniques were used to construct local residential areas and to examine neighbourhood safety for these areas using micro-scale environmental data. Multilevel logistic regression analyses with 6-digit zip code area as a second level were used to assess the association between neighbourhood safety and smoking. In our study sample of 22,728 participants (18–70 years), 24.0% were current smokers, 13.7% were heavy smokers and 8.1% were nicotine dependent individuals. Higher levels of neighbourhood safety were significantly associated with less heavy smoking (OR = 0.88, 95% CI = 0.78–0.99) and less nicotine dependence (OR = 0.81, 95% CI = 0.69–0.95), but not with less current smoking (OR = 1.01, 95% CI = 0.91–1.11). The associations between neighbourhood safety and the three types of smoking behaviour varied by ethnicity. For instance, higher levels of neighbourhood safety were associated with less current smoking in participants of African Surinamese origin (OR = 0.71, 95% CI = 0.57–0.89), but not in those of Dutch (OR = 1.13, 95% CI = 0.91–1.39), South-Asian Surinamese (OR = 1.22, 95% CI = 0.95–1.55), Turkish (OR = 1.08, 95% CI = 0.84–1.38), Moroccan (OR = 1.53, 95% CI = 1.12–2.10) or Ghanaian (OR = 1.18, 95% CI = 0.47–2.94) origin. Policies that improve neighbourhood safety potentially contribute to less heavy smoking and nicotine dependence.

1. Introduction

Tobacco smoking is the primary preventable cause of disability and death worldwide (United States Department of Health Human Services, 2014). It is increasingly recognized that the neighbourhood where people live is associated with their health behaviours, including smoking (Goenka and Andersen, 2016; Pearce et al., 2012; Shareck and Ellaway, 2011). To create neighbourhood-level interventions that discourage smoking, it is important to understand which neighbourhood characteristics affect smoking behaviour and which specific population subgroups are particularly susceptible for these neighbourhood effects (Pearce et al., 2012).

Neighbourhood safety represents socio-cultural characteristics of the neighbourhood and includes various components, such as physical/social disorder, crime-related safety and traffic-related safety (McGinn et al., 2008). It has been suggested that unsafe neighbourhood conditions may act as chronic stressors and as such, may influence smoking through pathways, such as stress and psychological well-being (Nielsen et al., 2008; Pearce et al., 2012; Shareck and Ellaway, 2011; Weden et al., 2008). Furthermore, it has been suggested that pro-smoking norms are operating more strongly in deprived and unsafe neighbourhoods than in affluent and safe neighbourhoods. In addition, it has been

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suggested that tobacco products are more readily available in deprived and unsafe neighbourhoods than in affluent and safe residential areas This may make it harder for individuals to quit smoking in deprived and unsafe neighbourhoods than in affluent and safe neighbourhoods (Ellaway and Macintyre, 2009; Giskes et al., 2006; Stead et al., 2001; Wiltshire et al., 2001).

Previous studies investigating the association between neighbourhood safety and smoking behaviour are inconclusive (Diez Roux and Mair, 2010). Some studies showed that individuals who are exposed to higher levels of objectively measured crime (Shareck and Ellaway, 2011; Tsjeng et al., 2001) or perceive lower levels of neighbourhood safety (Ellaway and Macintyre, 2009; Ganz, 2000; Miles, 2006; Patterson et al., 2012) are more likely to be current smokers, but other studies found no associations (Diez Roux and Mair, 2010; Jitnarin et al., 2015; Rachelle et al., 2016; Virtanen et al., 2007). Several methodological limitations are presented among the current body of evidence. Particular problems include small study samples (e.g., Ganz, 2000; Tsjeng et al., 2001), ignorance of data-clustering at the environmental-level (e.g., Ellaway and Macintyre, 2009; Patterson et al., 2012), and no adjustment for environmental-level characteristics, such as socio-economic status (e.g., Ellaway and Macintyre, 2009; Shareck and Ellaway, 2011).

It remains undocumented whether the association between neighbourhood safety and smoking is stronger in some specific population subgroups than in others. Women, older adults, ethnic minorities and individuals with a low socio-economic position more often report poor neighbourhood safety than their counterparts (Skogan and Maxfield, 1981). It has been suggested that these specific groups are more exposed to their local living environment and are more aware, or sensitive to, what happens in their neighbourhood (Ellaway and Macintyre, 2009; Miles, 2006; Shareck and Ellaway, 2011; Stafford et al., 2005; Yen et al., 2009). These groups are suggested to be more dependent upon their immediate – "local" – environment and to be more concerned about safety because of their limited mobility and higher physical and social vulnerability (Skogan and Maxfield, 1981; Stafford and Marmot, 2003). A limited number of studies suggest that lower levels of neighbourhood safety are more strongly associated with current smoking in women and older adults (Dyck et al., 2001; Ellaway and Macintyre, 2009; Miles, 2006; Shareck and Ellaway, 2011). Studies examining the differential effects of neighbourhood safety on smoking behaviour across ethnic groups and socio-economic positions are lacking.

This large-scale population-based study extends previous research and aimed to examine whether lower levels of neighbourhood safety are associated with three types of smoking behaviour, including current smoking, heavy smoking, and nicotine dependence, while adjusting for a range of individual- and environmental-level characteristics and for the clustering of participants within neighbourhoods. Furthermore, this study aimed to examine whether the associations between neighbourhood safety and smoking behaviour differ by sex, age, ethnicity and individual-level socio-economic position. We expected that higher levels of safety are associated with less current/heavy smoking and less nicotine dependence. Furthermore, we expected that higher levels of safety are more strongly associated with less smoking in women, older adults, ethnic minority groups and individuals with a low socio-economic position than in their counterparts.

2. Methods

2.1. Design and study sample

Baseline data from the HEalthy LIfe in an Urban Setting (HELIUS) study were used. The HELIUS study is a multi-ethnic cohort study conducted in Amsterdam, the Netherlands, including Dutch, Surinamese, Turkish, Moroccan, and Ghanaian origin ethnic groups. The study protocol has been described in detail elsewhere (Snijder et al., 2017; Stronks et al., 2013). Briefly, baseline data were collected from January 2011 to December 2015. Participants aged 18–70 years were randomly sampled, stratified by ethnicity, through the municipality registry of Amsterdam. In total, 90,019 individuals were invited to participate in the HELIUS study. We were able to contact and get a response from 49,952 (55%) invited persons, either by response card or after a home visit by an ethnically matched interviewer. Of those, 24,789 individuals (50%) agreed to participate. Non-response analyses showed that socio-economic differences between participants and non-participants were very small (Snijder et al., 2017). Participants received a confirmation letter of the appointment for the physical examination, including a digital or paper version of the questionnaire (depending on the preference of the subject). Of the 24,789 participants, 23,942 (96.6%) participants completed the questionnaire. The HELIUS study has been approved by the Institutional Review Board of the Academic Medical Center, University of Amsterdam.

For the current study, from the total sample of participants who completed the questionnaire (n = 23,942), we excluded participants who were aged over 70 year (n = 11) and those who had no full data available on all outcome measures (n = 395), neighbourhood safety (n = 236) or both (n = 3). Furthermore, we excluded participants of Javanese Surinamese (n = 243) and unknown Surinamese origin (n = 276) from the remaining sample because of the small sample sizes. We also excluded participants with an unknown or other ethnic origin (n = 50). Consequently, the analytical sample consisted of 22,728 individuals who lived across 8851 6-digit zip code areas. The average number of participants per 6-digit zip code area was 7, with a range of 1–92.

2.2. Dependent variables

2.2.1. Smoking status

Three measures were used to assess different smoking behaviours. Current smoking was assessed as currently smoking one or more tobacco products (i.e., cigarettes, cigars and/or pipe tobacco) (0 = no, 1 = yes).

Heavy smoking was defined as smoking ≥10 cigarettes daily (0 = no, 1 = yes). For this measure, the number of cigars and packages of pipe tobacco were converted to cigarettes based on the tobacco content (i.e., 1 cigar is similar to 3 cigarettes, and 1 package of pipe tobacco is similar to 62.5 cigarettes). Often, studies use a cut-off of ≥20 cigarettes per day for heavy smoking (Neumann et al., 2013), which may represent nicotine dependence. To clearly distinguish between the smoking behaviours, we decided to use the cut-off ≥10 cigarettes per day (Visser et al., 2017). Non-smokers were classified as 'no heavy smokers'.

Nicotine dependence was determined by the Fagerström scale (Heatherton et al., 1991) consisting of six questions (e.g., 'Do you find it hard not to smoke in places where it is not allowed?'). The sum score varied from 0 to 10, with a cut-off of ≥4 considered nicotine dependence (0 = no, 1 = yes). If one of the items was missing, the Fagerström sum score was calculated with a score of 0 for the missing item. If more than one item was missing the Fagerström sum score was coded as missing. For non-smokers the sum score is 0. This approach corresponds with previous research (Visser et al., 2017).

2.3. Independent variables

2.3.1. Neighbourhood safety

A neighbourhood safety score was assessed by using data from the Amsterdam Safety Monitor 2013/2014 (ASM) maintained by the Municipality of Amsterdam (Municipality of Amsterdam, 2017; Smeets, 2015). Participants of the ASM were asked how they perceive safety in their neighbourhood on a scale from 1 to 10, with higher scores indicating higher levels of neighbourhood safety. More details about the assessment of neighbourhood safety in the ASM are described