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Self-assessed health of elderly people in Brussels: Does the built environment matter?

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ABSTRACT

The living environment plays a key role in the "Aging in Place" strategy. We studied the influence of the built environment on the health status of elderly people living in Brussels. Using census and geo-coded data, we analysed whether built environment factors were associated with poor self-assessed health status and functional limitations of elderly residents (aged 65 and over). We concluded that evidence of such an association is weak and vulnerable to the composition of the neighbourhood.

1. Introduction

Given that 8% of the OECD population is expected to be aged 80 and over in 2040, most health, social, and housing resources are increasingly considering a "healthy aging" perspective. A desire to control health care expenditure, a shift towards community care, efforts to promote healthy behaviour, and increasing numbers of elderly people willing to live at home have fostered the "Aging in Place" strategy (OECD, 2005). Within this context, a growing body of literature has focused on the role of the environment in the health status of the elderly. The association between the deprivation (or affluence) of an area and the health status of its elderly residents has been investigated by several studies, which have demonstrated that elderly people living in less affluent areas have poorer health status (Bowling and Stafford, 2007; Burton, 2012; Lang et al., 2008; Wight et al., 2008). However, the underlying mechanism is not always clear and deprivation is only one possible component of the living environment that may contribute to the health status of elderly people (Clarke and Nieuwenhuijsen, 2009). Another possibility is that less affluent areas may be subject to a less satisfactory built environment compared to more affluent areas (Frumkin, 2005).

The last decade has seen a growing number of papers examining the role of the built environment on various health outcomes and health-related behaviours (in particular physical activity and obesity) for various age groups. This issue is also particularly relevant for elderly adults. Indeed, due to functional and mental decline and consequent reductions in mobility and social contacts, the elderly are more vulnerable to barriers in their surrounding environment than are other age groups (Clarke and Nieuwenhuijsen, 2009). Better street layouts, wider sidewalks, local service facilities, and welcoming green spaces are likely to support an "Aging in Place" strategy (Burton, 2012).

The role of the "built environment" on elderly health status requires clarification (Cunningham and Michael, 2004), particularly if public resources are to be appropriately allocated to improve their living environment. To date, studies focusing on elderly adults have emphasised the role of the built environment on physical activity (Brown et al., 2008; Gomez et al., 2010; King et al., 2005; Li et al., 2005), obesity (Hess and Russel, 2012; Li et al., 2009), or disability (Clarke et al., 2008; Freedman et al., 2008), with some studies also addressing psychological wellbeing (Clark et al., 2007). The results of these studies, unfortunately, are not consistent. In a review of 14 studies relating the built environment to physical activity, most effects were shown to be non-significant, with the exception of recreational facilities (Kerr et al., 2012). More recently, Clarke et al. (2008) have suggested that the impact of the built environment may be more important for individuals with more severe limitations.

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This paper aims to study the influence of the built environment on the health status of elderly people living in Brussels, Belgium. The effect of the built environment on health has been previously investigated in Belgium by Van Dyck et al. (2009, 2010), who focused on a sample of middle-aged adults in the city of Ghent. They showed that higher residential density, land use mix, and street connectivity were positively associated with physical activity. The present study is, to our knowledge, the first to focus on contextual effects on the health of elderly adults in Belgium. In particular, this paper investigates the role of characteristics of the built environment that facilitate walking and social activity, as these factors are known to promote healthier aging. We used an extensive database linking official census data in combination with a Geographic Information System (GIS) to investigate the role of the built environment on self-rated health and on functional limitations caused by chronic illness, through a set of logistic regressions.

2. Data and methods

2.1. Individual-level data

We used data from the 2001 Belgian Census, which is a 100% sample, i.e. all individuals residing officially in the country were included. Our analysis was restricted to members of private households (we excluded individuals residing in communities such as nursing homes, convents, or prisons), aged 65 and over and residing in the 19 municipalities of the Brussels Capital Region. Our sample comprised 147,367 individuals. For the first time, the 2001 Belgian Census collected information on the perceived health status of individuals – including whether or not they suffered from functional limitations, as well as information on residents' perceptions of their local environment, in particular the presence and quality of a number of amenities and infrastructures (Vanneste et al., 2007). These can be used to compute subjective indicators about the built environment (see Section 2.2).

Health status was measured using two variables widely used in population surveys: self-rated health and functional limitations (Deboosere et al., 2006; Lorant et al., 2008). Self-rated health was derived from the question “How is your health in general?” that offered five possible answers: very bad, bad, fair, good, and very good. We further classified answers into two groups: very bad, bad, and fair in one group, good and very good in another. Functional limitation was assessed by two questions on long-term illness and resulting limitations. Individuals reporting a long-term illness with “permanent” limitations were classified as having “severe limitations”, whereas those reporting being limited “from time to time”, “not or rarely”, or not having a long-term limiting illness were classified as having “no or few limitations”. The age, gender, educational level, nationality, and household type of individuals were used as covariates, as these are all factors known to influence health and thus may confound the relationship between the built environment and health.

2.2. Neighbourhood characteristics

2.2.1. Neighbourhood definition

This paper focuses on the Brussels Capital Region, which is one of the three institutional regions of Belgium, the other two being Flanders and Wallonia. It is made up of 19 municipalities and hosts about 1 million inhabitants within a 163-km² area. This area represents the core of the city of Brussels, which in fact extends into Flemish and Walloon countryside (Dujardin et al., 2007; Thomas et al., 2012). It can be considered to be fully urban, although there is considerable variation in the built-up environment (see e.g. De Keersmaecker et al., 2003). The smallest spatial unit for which residential locations are officially available is the statistical ward, a subdivision of the municipality that is defined according to social, economic, and architectural similarities. Statistical wards host an average of 1434 inhabitants (222 individuals aged 65 or over), but variability is high, with some statistical wards having only a few inhabitants. Therefore, to prevent problems arising from extreme values in neighbourhood characteristics, wards with fewer than 200 inhabitants were not considered and all elderly people residing in these wards were removed from the analysis (123 wards and 865 individuals aged 65 and over, respectively).

In the literature, the built environment of a neighbourhood has been measured using either perceived measures, such as the rating of some environmental attributes by inhabitants, or by objective measures based on GIS data (Leslie et al., 2007). In the latter case, neighbourhood built environment is often assessed using measurements of density, design, and diversity, which are interpreted as indicators of walkability (Yamada et al., 2012). Both types of measures are used in this paper.

2.2.2. Perceived built environment

A number of questions on perception of the local environment were asked in the 2001 Census. Heads of household were asked whether they considered their neighbourhood to be “very well equipped”, “normally equipped”, or “poorly equipped” for a number of facilities (Vanneste et al., 2007). Some of these facilities were particularly relevant for our analysis, notably sidewalks, green spaces, and public transport. For each item, we used the percentage of heads of household that were unsatisfied with their neighbourhood's level of equipment. The use of perceived environmental characteristics instead of objectively measured ones can generate a reverse causality bias, because perception of the environment is influenced by functional status (i.e. people with poor functional status might undervalue the quality of their environment). In order to avoid this problem, general adults' perceptions were used instead and these variables were therefore computed using answers from *all* heads of household, regardless of their age. It is interesting to note, however, that the correlation between the perceptions of all heads of household and those of heads of household aged 65 and over was above 0.90 in all cases.

2.2.3. GIS-based measures of the built environment

Objective indicators of the built environment were created through the integration of several digitised data sources into a Geographical Information System (GIS). These digitised data sources included: land registry data for 2009 (provided by the AGDP – Administration Générale de la Documentation Patrimoniale); street networks and green spaces (both from the BRIC Brussels Urbis 2007–2008 database); land surface elevation information (from the EROS website[1]), and the boundaries of statistical wards (provided by the National Institute of Statistics).

In this study, we focused on characteristics of the built environment that encourage walking and social contacts for the ageing population. These characteristics were residential share, land use mix, net retail ratio, street connectivity, area of green spaces, and slopes. The first four characteristics are similar to the (now standard) indicators used in Leslie et al. (2007) and Frank et al. (2004, 2005). However, unlike these studies, we did not combine these characteristics to create a single composite “walkability index”, in the hope of being able to more clearly distinguish

[1] Earth Resources Observation and Science Centre (EROS), 2002. Shuttle Radar Topography Mission (SRTM) – Elevation Data Set (Belgium). http://eros.usgs.gov/.