CrossMark

Neighbourhood social and physical environment and general practitioner assessed morbidity

Peter P. Groenewegen[a,b,*], Jan-Paul Zock[a,1], Peter Spreeuwenberg[a], Marco Helbich[b], Gerard Hoek[c], Annemarie Ruijsbroek[d], Maciej Strak[c], Robert Verheij[a], Beate Volker[e], Geeke Waverijn[a], Martin Dijst[b]

[a] NIVEL, Netherlands
[b] Geosciences UU, Netherlands
[c] IRAS UU, Netherlands
[d] RIVM, Netherlands
[e] Sociology UvA, Netherlands

ABSTRACT

The aim of our study was to investigate the association between health enhancing and threatening, and social and physical aspects of the neighbourhood environment and general practitioner (GP) assessed morbidity of the people living there, in order to find out whether the effects of environmental characteristics add up or modify each other. We combined GP electronic health records with environmental data on neighbourhoods in the Netherlands. Cross-classified logistic multilevel models show the importance of taking into account several environmental characteristics and confounders, as social capital effects on the prevalence of morbidity disappear when other area characteristics are taken into account. Stratification by area socio-economic status, shows that the association between environmental characteristics and the prevalence of morbidity is stronger for people living in low SES areas. In low SES areas, green space seems to alleviate effects of air pollution on the prevalence of high blood pressure and diabetes, while the effects of green space and social capital reinforce each other.

1. Introduction

Chronic illness and medically unexplained physical symptoms are highly prevalent and have high impact on quality of life and associated high costs (Murray et al., 2016). Traditionally, the emphasis has been on individual determinants. However, during the past decades the focus shifted towards environmental characteristics and their interaction with individual characteristics (MacIntyre and Ellaway, 2000; Sallis et al., 2008). Exposure to environmental influences occurs in several contexts, of which the direct environment of the residential neighbourhood is the most important. In this article we focus on neighbourhood influences on health. There are still many knowledge gaps about the relationships between neighbourhood characteristics and health. We will address three of them.

First of all, although it is common knowledge that different dimensions of the neighbourhood environment have an influence on health, analyses often have only addressed one specific dimension (examples: for green space De Jong et al., 2012; for social safety: Lovasi et al., 2014; for social capital: Giordano et al., 2011; for air quality: Jacquemin et al., 2015). Consequently, there is a gap in our knowledge on the relative contribution of different aspects of the environment and their interplay in affecting health (Ruijsbroek et al., 2016).

Secondly, it is important to address potential confounding variables at the neighbourhood level and not only at individual level. We will therefore take into account the socio-economic status of neighbourhoods, ethnic population composition and urbanicity. These characteristics may be in a complex relation with the environmental characteristics that we will study, partly influencing environmental characteristics and partly interacting with them in influencing health.

A final issue is related to the emphasis on either health threatening or enhancing aspects of the environment. Particulate matter in the air and ticks in the local park are health threatening, while nice and well-

	Physical environment	*Social environment*
Health enhancing	Green space	Social capital
Health threatening	Air pollution	Neighbourhood unsafety

Fig. 1. Matrix of two dimensions of the neighbourhood environment with examples of characteristics in each combination.

kept street greenery is health enhancing. The same holds for social capital that is considered as health benefit, while low neighbourhood safety is a health threat. These examples show that health threatening and enhancing are not just opposite poles of the same dimension, but are qualitatively different and might have their own and combined effects on health. Over time, there is an increasing attention for health enhancing or salutogenic environments (Lindström and Eriksson, 2005). In our study we will address these knowledge gaps by studying health threatening and health enhancing influences of characteristics of both social and physical environments, including their interrelationships. Although there is not a strict distinction between physical and social environment, as we live in a largely man-made world, the physical environment refers to spatial characteristics and physical exposures, while the social environment is usually understood to refer to characteristics based on social activities and life style (see for example the conceptual framework of Schulz et al., 2005). This results in the matrix in Fig. 1. The cells of the matrix contain the influences that we will study in this article.

An important question is how these different influences relate to each other in their net effect on health. The most straightforward argument is that they have separate, additive effects on health. It is however also conceivable that health enhancing features of the neighbourhood environment alleviate the negative effects of health threats. Effects of air pollution, for example, might be weakened by social capital and green space. Furthermore, positive or negative features can reinforce each other. For example, social capital effects might become stronger if there are also green spaces in a neighbourhood, or the health consequences of air pollution might be worse in neighbourhoods that are unsafe. Finally, there might be a difference in strength in effects regarding physical and social environmental conditions: Green spaces might be more important than social capital.

Studies on the relationship between neighbourhood characteristics and health use a wide variety of outcome measures. They can be divided into self-reports and physician-assessed measures and into general and physical/somatic health measures and mental health. The most commonly used health variable is self-reported health. Apart from that, mortality, either or not by cause, has been used (Gascon et al., 2016) and the prevalence of specific diseases, such as depression (Zijlema et al., 2016), or a broader range of clusters of disease as assessed by general practitioners (GPs) (Maas et al., 2009).

Our study is largely explorative in its use of a wide range of health outcomes. We will use GP-assessed morbidity and we will select a number of clusters of morbidity, based on systematic reviews, highlighting the most common pathways between neighbourhood characteristics and health. Some of these pathways are specific to certain kinds of exposure in the neighbourhood, whilst others are rather generic.

One of the clusters is cardiovascular diseases which are often seen as influenced by environmental stress (Kim et al., 2008). Exposure to particulate matter is related to cardiovascular disease through physical mechanisms (Brook et al., 2010). A review concluded that there is evidence of reduced cardiovascular disease mortality with more green space in the residential environment (Gascon et al., 2016).

Both social and physical characteristics of neighbourhoods are related to increased stress and less social contacts. Through these pathways they may be related to mental and neurological disorders and so-called medically unexplained physical symptoms (MUPS, e.g. weakness/tiredness, abdominal pain, headache, back complaints) (Hartig

et al., 2014; Lorenc et al., 2012; Ehsan and De Silva, 2015). MUPS are highly prevalent in the general population (Van der Windt et al., 2008) and related to (perceived) environmental threats (Spurgeon, 2002; Baliatsas et al., 2011).

Different gaseous and particulate air pollutants have been related to respiratory morbidity and mortality. Most evidence points to an increased risk of exacerbations. The onset of COPD (due to accelerated pulmonary function decline) and the incidence of asthma have been linked to air pollution (Kurt et al., 2016; Jacquemin et al., 2015).

Recently, a relation was established between diabetes and air pollution (Eze et al., 2015). In view of the expected increase of the prevalence of type 2-diabetes, this is an important finding, which is still in need of further replication. The evidence for the Netherlands is small and still inconclusive (Dijkema et al., 2011).

Against this background, we will answer the following research questions:

How are social and physical aspects of the neighbourhood environment, conceived as health enhancing and health threatening, related to morbidity of the people living there?

Are these different environmental characteristics additive in their effects on morbidity or do they modify each other's effects?

2. Data, measurements and methods

2.1. Data

The main source of our data was the NIVEL Primary Care Database (Prins et al., 2015; https://www.nivel.nl/en/dossier/nivel-primary-care-database). This database holds data extracted from the electronic health records systems, kept routinely as part of the care process by general practitioners (GPs). As nearly all Dutch are registered with a specific GP or practice, morbidity data from general practice give a good overview of the health of the population (Westert and Jabaaij, 2006). GPs record the information on symptoms and diagnoses using the International Classification of Primary Care (ICPC) (Lamberts and Wood, 1987). Patient records of different consultations were combined into disease episodes. Data from one calendar year (2013) were used in order to avoid seasonal influences/differences. Patients who consulted their GP for chronic illnesses in 2011 and 2012 were regarded as chronically ill in 2013 as well, even if they had not consulted their GP for this illness in 2013. The data refer to 1,16 million people of all ages (7% of the Dutch population), registered with 347 practices, who were with the same practice during all 12 months of 2013. As individual level socio-demographic characteristics, the database only contains age and sex.

Data sources for the other independent variables will be described in the next section.

2.2. Measurements

2.2.1. Dependent variables

As an indicator for health, we used the morbidity as presented to GPs during one-year.

Health problems were grouped into ten clusters of ICPC, following Maas et al. (2009). Diagnoses were combined with related symptoms in order to decrease variation across GPs in recording practices. Not all clusters were mutually exclusive. We selected four clusters of cardiovascular morbidity: (1) high blood pressure, (2) cardiac disease, (3) coronary heart disease, and (4) stroke and brain hemorrhage. With respect to mental health problems we selected two clusters: (5) depression and (6) anxiety disorder. In neurological disorders we selected (7) migraine/severe headache. From respiratory disorders we selected (8) asthma and Chronic Obstructive Pulmonary Disease (COPD). Various symptoms were combined into the cluster (9) Medically Unexplained Physical Symptoms (MUPS). Finally we selected (10) diabetes. The dependent variable is the binary variable