Improving neighbourhoods, improving health?
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General introduction
GENERAL INTRODUCTION

Area inequalities in health have become an important research topic in the field of public health. Considerable evidence from several countries indicates that mortality, morbidity, and health (behaviour) differ across deprived and non-deprived areas (see reviews\(^1,2\) for overview). These inequalities in health between deprived and non-deprived areas have increased in the last decades (e.g.\(^3,7\)). In Scotland, for instance, very large inequalities in self-rated health are found between those living in the most deprived areas (40% probability of reporting poor health around age 66) and those living in the most non-deprived areas (40% probability of reporting poor health around age 83).\(^7\) In the Netherlands, similarly large area inequalities in health are found. Individuals living in the most deprived districts report poorer general health (odds ratio (OR) 1.39), more obesity (OR 1.16), asthma (OR 1.33), and diabetes (OR 1.54) compared to individuals living in other districts in the same towns.\(^8\)

The frequently found health inequalities between deprived and non-deprived areas are largely accounted for by socio-demographic differences between populations (e.g.\(^1,9\)). The processes underlying the unequal distribution of health across geographical areas, which is not accounted for by individual, compositional characteristics, are still far from clear. There are two possible explanations for the remaining area inequalities in health: selective migration and specific social and physical characteristics of the area (contextual explanation). In this thesis both explanations will be further investigated. Furthermore, there is scarce evidence on the extent to which policies and interventions aimed to change area characteristics are effective in improving the health of residents and reducing area inequalities in health. In response to this knowledge gap, we examined in this thesis whether a Dutch large-scale area-based initiative (ABI; hereafter called the District Approach), aimed at improvement of the livability of an area as well as improvement of the socio-economic position of the inhabitants have a positive effect on health and health behaviour.

The introduction starts with a presentation of the objectives. Next, an explanation for the impact of selective migration on observed area inequalities in health is given, followed by an elaboration on how specific neighbourhood characteristics investigated in this thesis are thought to have an impact on health. We then describe the context of a Dutch large-scale ABI. Subsequently, the research questions addressed in this thesis are described. Finally, a short description of the datasets used in this thesis is given, followed by an overview of the data and design used in each study.
Objectives of this thesis

The first main objective of this thesis was to evaluate whether inequalities in health between deprived and non-deprived neighbourhoods are influenced by selective migration. This objective is important because if selective migration is to be responsible for a – large – part of the existent neighbourhood inequalities in health this would suggest that the neighbourhood environment itself only has a weak influence on the health outcomes of the residents.

The second main objective of this thesis was to identify if changes in specific characteristics of the neighbourhood environment influence health outcomes in the Netherlands. In this thesis eight characteristics of the neighbourhood environment were investigated, i.e. traffic safety, green space, social cohesion, parking facilities, general safety (fear of crime), physical disorder, social disorder, and criminal victimisation. These associations were investigated for subgroups of sex, age, employment status, and duration of residence.

The third main objective of this thesis was to investigate whether the District Approach did improve health outcomes in the 40 most deprived districts of the Netherlands (hereafter called the target districts). While the previous main objective was to examine the effect of changes in specific characteristics in the neighbourhood environment on health outcomes, this objective was to investigate the actual impact on health outcomes of complex area-based interventions attempting to ameliorate problems with housing conditions and residential environment, employment, educational level, social cohesion, and safety in the 40 target districts. These associations were investigated for subgroups of sex, intensity of ABI efforts, and investments in the neighbourhood environment versus the socio-economic circumstances of individual residents.

For all main objectives, the associations examined were adjusted for sex and age only, and with additional adjustment for other potential socio-demographic confounders (household composition, ethnicity, education, and household income).
In summary, the main objectives of this thesis are to assess whether:

- Inequalities in health between deprived and non-deprived postal code areas can be explained by selective migration.
- Changes in specific neighbourhood characteristics influence health outcomes of neighbourhood residents.
- The District Approach has a significant effect on health outcomes in the 40 most deprived districts of the Netherlands.

The ultimate aim of this thesis is to assess the potential of ABI's to improve the health of disadvantaged populations.

Part one: Migration and neighbourhood inequalities in health

A number of studies reported that area inequalities in health are largely the result of differences between populations living in these areas (compositional explanation). However, area inequalities are not completely explained by differences in the composition of the population. The remaining area inequalities in health might be explained by selective migration (e.g., 10-13). Migrants are defined as those who moved between deprived and non-deprived areas within a country, whereas non-migrants are defined as those who stayed in deprived or non-deprived areas, including those who made intra-deprived or intra-non-deprived moves. Migration is selective on health if different flows of migrants carry different health-risks. Migration influences the health inequalities between areas if residents migrating to less deprived areas have better health than those who stay in deprived areas, while residents migrating to more deprived areas have worse health than those who stay in non-deprived areas.

A number of studies have examined whether and how geographical variations in health as observed at a certain point in time are influenced by migration flows, with conflicting results. 10-20 Most of them reported that selective migration tends to enlarge area inequalities in health to a small or large extent. 10,12,14-16,20 However, other studies found that selective migration does not enlarge area inequalities in health. 11,13,15,17,19

The majority of these studies have been conducted in the United Kingdom. It is possible that differences exist between countries with regard to the impact of migration on area inequalities in health, as the direction, the strength, and the health status of migration flows can differ between countries. Results from a Dutch study 21 suggest that area inequalities in health in the
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Netherlands are not influenced by selective migration flows. This study can, however, not be generalised to the rest of the Netherlands, as it was conducted in one Dutch city (i.e. Eindhoven). Therefore, more Dutch studies are needed on a representative sample of the Dutch population to investigate whether and how area inequalities in health are influenced by migration flows using different health outcomes.

Part two: The impact of specific neighbourhood characteristics on health outcomes

Interest in neighbourhood effects on health has grown extensively over the past 15 years. The interest in neighbourhoods and health has been driven by an increasing awareness that individual-based explanations of the causes of poor health are insufficient and fail to capture important disease determinants. In addition, address individual determinants turns out to be quite difficult and interventions tend to be less effective among lower socio-economic groups, increasing inequalities (e.g.10). Neighbourhoods have become apparent as a potentially relevant context because of the physical and social characteristics which could plausibly affect the health of individuals. These neighbourhood characteristics may influence health directly or indirectly. Indirect pathways may include constrains on, or enhancement of, health related behaviour or mechanisms involving experienced stress (e.g.10), powerlessness, fear of crime, and the protective effects of social connections (including social cohesion).

Research has consistently reported that a significant proportion of health inequalities is related with area context independently of individual characteristics. The majority of these studies had a cross-sectional design, which limits ascribing causality. A review4 found that area effects, although significant in most studies, often depend on both the health outcome and the area characteristic studied. This emphasises the importance for researchers to elaborate on how and why specific area characteristics are thought to have an impact on health, and assess the importance of these causal pathways.

In this part of the thesis, we chose to focus on physical activity and mental health, because these health indicators can reasonably be expected to be affected by changes in specific neighbourhood characteristics over a relatively short period of time. Not much research has been performed on the mechanisms that link the area environment to physical activity and mental health. We considered it plausible that the specific features of the neighbourhood environment investigated in this thesis (i.e. traffic safety, green space, social cohesion, parking facilities, general safety (fear of crime), physical disorder, social disorder, and criminal victimisation) would be relevant to phys-
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Physical activity and/or mental health, based on the following research. Powerlessness and fear of crime are suggested causal pathways linking neighbourhood disorder (physical and social disorder) to mental health. Fear of crime is also a mechanism in the relationship between criminal victimisation and mental health. With regard to physical activity, green spaces in one’s neighbourhood may positively impact physical activity through stress reduction. Social disorder and fear of crime, on the other hand, may negatively impact physical activity through an increase in stress which is known to be associated with lower levels of physical activity. Furthermore, we expect that a clean and intact neighbourhood - absence of physical disorder - stimulates more time spent outdoors and hence physical activity, because individuals are motivated to be physically active in aesthetically attractive environments. Observing others being physically active is associated with higher levels of physical activity, thus when residents are more close-knit they might be more inclined to adopt healthy norms of behavior such as physical activity than those living in less cohesive neighbourhoods. This might explain why social cohesion has been related to more healthy behaviour, such as more physical activity. A previous study has suggested that neighbourhoods with low traffic safety (e.g. high average speed) and high traffic volume may have more air pollution and stench nuisance, which in turn may negatively affect local PA. In addition, traffic safety may influence physical activity directly because residents would restrict physical activity in their local environment if they perceive traffic to be unsafe. A Dutch study suggests that in neighbourhoods with limited parking facilities fewer residents are car owners compared to neighbourhoods with more parking facilities, which results in more transport-related physical activity in the first neighbourhoods.

Part three: The impact of a Dutch large-scale area-based initiative on health outcomes

Internationally, ABI’s started by governments to address spatially clustered social, economic, and environmental problems in more deprived, urban, neighbourhoods, became very popular during the 1990s, although its origin in the UK dates back to the 1960s. Although, a number of large-scale ABI’s have been implemented in various parts of the world, evidence on the effectiveness of ABI’s is often inadequate because evaluation is complex, for example due to lack of baseline data or limited resources to trace and study changes over time. In order to reduce the gap between the poorest neighbourhoods in the UK and the rest of the country and to provide more robust evidence, the UK government launched an intensive ABI in 1998: the New Deal for Communities Programme, which was to be a long-lasting programme (10 years).
Concerns about health inequalities have also a long history in the Netherlands. In the seventies and eighties there was an urban renewal project in many Dutch cities which especially focused on physical improvements. In 1994, health inequalities and health disadvantage received a new impulse when the Dutch government instigated a large-scale ABI – called the Big city policy (BCP) - to cope with social, economic, and physical problems in the four largest Dutch cities in an integral and area-based way. Later on, this initiative was extended to include 32 large and medium large municipalities.

A window of opportunity to investigate the impact of a Dutch large-scale ABI on health outcomes was opened by the decision taken by the Dutch government in 2007, to invest in 40 ‘problem’ districts. The aim of this comprehensive large-scale ABI - called the District Approach - was to increase the livability of the districts focusing on problems with housing and residential environment, employment, education, social cohesion, and safety. The 40 districts have been selected based on 18 indicators of deprivation, including average income, unemployment rate, livability, safety, and quality of the housing. The 40 districts with the highest problem scores were selected. These districts are situated in 18 large municipalities, and therefore have an urban character. The implementation of this initiative started approximately mid-2008. From then until 2012 in excess of 5 billion euros had been invested. The interventions implemented under the auspices of the District Approach were initiated additionally to interventions and policies that were already going on. The interventions included, among others, the creation or improvement of green, amelioration of sports facilities and organization of sports activities, regeneration or housing improvement, or employment opportunities (see for detailed information on the content and scale of implemented interventions). Each target district has implemented selected interventions to suit the specific local needs. Large variations existed in the number of residents reached by the interventions, or the number of changes in the neighbourhood environment, and/or the amount of different types of activities which were implemented. Originally health issues were not explicitly addressed in the District Approach. Mediation of the Ministry of Health, Welfare, and Sports however resulted in the added ambition to improve the health of residents of selected districts through an integrated approach focusing on healthy residents, healthy environment, and a comprehensive prevention oriented primary care. In total 16 target districts have taken part in this ‘healthy district experiment’.

It is likely that the District Approach - with investments in the social position of residents as well as the district environment of the most deprived districts of the Netherlands - will not only improve the livability of the districts, but will also improve the health of their residents, since the District Approach addresses the social determinants of health problems. From a public health
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Perspective, this ABI thus provides a ‘natural experiment’ to study the effects of changing the physical and social neighbourhood conditions or the social position of residents on the health outcomes of the local population. Features of the neighbourhood environment have been shown to be important for the health of the residents, including physical features (e.g. green areas), availability of healthy environments (e.g. housing conditions), services provided (e.g. primary health care), social-cultural features (e.g. social cohesion, levels of crime, social disorder), and the reputation of an area (e.g. ‘problem districts’). Furthermore, it has been suggested that efforts to reduce inequalities in health should not only focus on places but on people as well. Investments in individuals such as education have a positive impact on health. The District Approach target the most deprived districts of the Netherlands. Previous studies have shown that in the Netherlands, as in other countries, health problems tend to concentrate in deprived districts (e.g.). Therefore, from a public health perspective, it would be effective to target the districts that need it the most: namely the most deprived districts.

Research questions

To address the objectives of this thesis the following research questions were examined:

1. Are inequalities in health between deprived and non-deprived neighbourhoods influenced by migration flows (within different age groups) (part one)?
2. Are environmental characteristics and changes over time in environmental characteristics related to physical activity and mental health among adults (part two)?
3. What is the short-term impact of the District Approach on trends in leisure-time physical activity, mental health, and general health (part three)?
Data and methods

Table 1 presents an overview of the studies presented in this thesis, the study outcome(s), the data source(s), and design used in each study. Three national datasets were used in this thesis. The first dataset (Netherlands Housing Survey (WoON)) is a large three-yearly survey among non-institutionalised people aged 18 and over. WoON measures people’s current living situation and people’s housing needs, and also includes questions on health outcomes, place of residence, migration history, perceived neighbourhood characteristics, and socio-demographic factors. Data from this survey are used in chapters 1 to 4. In chapter 1 and 2 we conducted a cross-sectional study and only used WoON data from the year 2006. In chapter 3 and 4 we conducted a repeated-cross sectional study and made use of data from 2006 and 2009.

The second national dataset - the Dutch Health Interview Survey (HIS) - includes individual-level information on a large number of health outcomes and socio-demographic factors. The HIS is a large yearly survey among non-institutionalised persons aged 0 years and older. Data from this survey are used in chapters 5 to 8. We conducted either a repeated-cross sectional study using the years 2009 to 2011 (chapter 5) or a quasi-experimental study on the years 2004 to 2011 (chapters 6 to 8).

The third national dataset - the National Safety Monitor and its successor, the Integral Safety Monitor - is a large yearly survey among non-institutionalised persons aged 15 years and older. This survey contains data on, among others, neighbourhood characteristics such as social and physical disorder, general safety, and criminal victimisation. Data from this survey are used in chapter 5. We aggregated individual-level data from the years 2005 to 2011 to the neighbourhood-level. Subsequently, these neighbourhood-level safety information was linked to the individual-level HIS dataset which were used in a repeated cross-sectional study design.

In all studies only adults aged 18 years and older were included in our analyses. Furthermore, our studies, comparable with other studies, use area definitions based on administrative boundaries. In all three datasets the information is available at the 4-digit postal code level. In the Netherlands there are approximately 4,000 postal code areas which, on average, are 8.3 km$^2$ large and contain about 4,000 residents. We are aware of the fact that the four digit postal code areas are not identical to neighbourhoods as perceived by residents (see$^{16}$). The findings of Stafford et al. (2008)$^{17}$ indicate that alternative definitions of neighbourhood boundaries have no substantive effect on the estimates of neighbourhood inequalities in health. There was no evidence that neighbourhood inequalities in health are being greatly underestimated by the use of adminis-
trative boundaries. They conclude that we can have larger confidence in the results of studies which have used administrative boundaries to define the neighbourhood.

Outline of this thesis

The first part of this thesis (which includes Chapters 1 and 2) focuses on migration and neighbourhood inequalities in health. In Chapter 1 we explore whether and how migration flows influenced area inequalities in perceived general health, longstanding health problems, and disabilities between deprived and non-deprived neighbourhoods. Chapter 2 assesses whether and how migration flows within different age groups influenced area inequalities in perceived general health between deprived and non-deprived neighbourhoods. Chapters 1 and 2 also examine the extent to which socio-demographic characteristics explain the differences in health between migrants and those who stayed in the areas of origin.

The second part of this thesis (which includes Chapters 3-5) focuses on whether changes in specific neighbourhood characteristics influence physical activity and mental health of neighbourhood residents. Chapter 3 investigates the association of levels of traffic safety and changes over time in traffic safety with physical activity among adults for the total neighbourhood population and for different subpopulations. Chapter 4 examines the relationship between several neighbourhood characteristics and changes over time in these neighbourhood characteristics and physical activity among adults in both the total and different subpopulations. Chapter 5 assesses the association of levels of neighbourhood safety and changes over time in levels of neighbourhood safety with mental health among adults for the total neighbourhood population and for different demographic subgroups.

The third part of this thesis (which includes Chapters 6-8) focuses on the impact of the Dutch District Approach on health outcomes. Chapter 6 evaluates the short-term impact of the Dutch District Approach on trends in leisure-time physical activity (walking, cycling, and sports). Chapter 7 assesses the short-term impact of the Dutch District Approach on trends in mental health. Chapters 6 and 7 also examine the physical activity and mental health trends among target districts distinguished by intensity of ABI efforts. Chapter 8 determines the short-term impact of the Dutch District Approach on trends in general health. Moreover, the general health impact of ABI’s that focused on the improvement of the neighbourhood environment is compared with the impact of ABI’s that mainly invested in the socio-economic circumstances of inhabitants. Finally, the General discussion summarises the main findings of these studies, discusses some of the methodological considerations, reflects on the main findings, and also presents implications for future policy and research.
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### Table 1. Overview of the studies, data sources, and designs in each chapter of the thesis

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