Improving neighbourhoods, improving health?
Jongeneel-Grimen, B.

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In preparation:
Droomers M, Jongeneel-Grimen B, Bruggink JW, Kunst AE, Stronks K. General health effects of area-based initiatives in Dutch deprived neighbourhoods. Should we invest in the neighbourhood environment or its residents?
ABSTRACT

Aim
This paper reports on the impact of area-based initiatives targeting problems with employment, education, housing and the residential environment, social cohesion, and safety in severely deprived districts on perceived general health. We compared the health impact of area-based initiatives that focused on the improvement of the livability of the district environment with area-based interventions that mainly invested in the socioeconomic position of its inhabitants.

Method
We employed a quasi-experimental design to compare the prevalence of good perceived general health in the target districts with control areas. We performed time-series analysis over a prolonged period before and after the implementation of the area-based initiatives that started around mid 2008. We fitted generalised general mixed models to assess the rate of change in the prevalence of good general health per half year.

Results
Perceived general health improved slightly between 2004 and 2008, but deteriorated since mid 2008 in both the target districts and control areas. In districts that focused investments on the social position of residents, the prevalence of good general health deteriorated from 78% mid 2008 till 65% end 2011. An exception was the stable prevalence of good general health from mid 2008 onwards in the deprived target districts that focused investments on the district environment.

Conclusion
Targeted investments in the livability of the district environment seemed to have safeguarded the district population from a deterioration of general health since mid 2008 – the onset of the economic crisis in the Netherlands - that was observed among inhabitants of districts that chose to invest in the social position of individual residents.
INTRODUCTION

There is a widespread agreement that health policy measures should be based on evidence on their effectiveness.\(^1\) In reality, very few measures are properly evaluated with regard to their impact on health or health inequalities.\(^2,3\) This applies in particular to the so-called ‘upstream’ approach to improve health and tackling inequalities in health.\(^4-6\) This approach focuses on the social determinants that are considered the structural drivers of socio-economic health inequalities, including education, income, poverty, or employment.

The complex interventions needed to tackle multiple social determinants of health and their distribution are sometimes delivered as area-based interventions that target deprived neighbourhoods. Area-based interventions are often employed as a means to address problems that are spatially concentrated as well as those problems that result of area dynamics and the local environment.\(^7,8\) Experiences thus far have, however, rarely been investigated with regard to their health impact\(^9\) and if so, failed to come up with conclusive empirical evidence on the health impacts of area-based interventions.\(^10,11\)

The size and type of health impacts following neighbourhood regeneration remain unknown, due to the mix of conflicting positive as well as negative and unclear effects that have been reported. Neighbourhood regeneration in the United Kingdom led to significant positive impacts on several general mental health indicators according to most evaluation studies, though the more rigorous studies failed to show a clear impact on the mental health index of the SF-36.\(^9\) In the United Kingdom, area-based initiatives have achieved overall improvements in mortality rates, on average with 0.6%, although in some individual areas the standardized mortality rates did increase.\(^12\) Impacts on general health outcomes were inconclusive and, if existing, small.\(^12,9\) There is no evidence for an impact of neighbourhood regeneration on health related behavior, respiratory health, or chronic diseases prevalence.\(^9\)

In the UK, the lack of consistent success of area-based interventions in reducing spatial health disparities has been related to an imbalance between people and place policies, with exaggerated spending on place or physical regeneration.\(^13\) In other words, they hypothesise that more health benefits might have been achieved, had more interventions focused on people’s socio-economic position. This is corroborated by the results of New Deal of Communities, showing that investments in the neighbourhood environment only affect certain health outcomes, such as mental health\(^10\) but not others, such as health-related behavior.\(^14\)
In order to find out if either investments in people or investments in place would benefit health most, we compared the general health impact of area-based initiatives that focused on the improvement of the physical as well as social environment with the impact of area-based interventions that mainly invested in the socio-economic position of its inhabitants. This paper reports on the evaluation of the health impact of the Dutch District Approach targeting problems with employment, education, housing and the residential environment, social cohesion, and safety. Policies aimed to change the social determinants, like the District Approach, provide a unique opportunity to study the extent to which area-based initiatives are effective in preventing health problems in ‘real life’. Evaluation of such so-called natural experiments is even considered the only option when it is impossible to manipulate exposure to or control the implementation of the intervention, which is often the case when the social determinants of health are concerned.15-17

METHODS

Area-based initiatives in the Dutch District Approach
The District Approach was launched by the Dutch government in 2007 in order to improve the livability in the 40 most deprived districts in the Netherlands. Until 2012, around 5 billion euros had been spent to ameliorate the problems with employment, education, housing and the physical neighbourhood environment, social cohesion, and safety.18 The districts were selected using registry-based physical and socio-economic deprivation indicators as well as reports of physical and social problems by residents. The 40 districts are situated in 18 large Dutch cities, so they all have an urban character, with some variation from one city to the other.19

The District Approach can be considered a procedural program for which the national government laid down a broad thematic framework and provided funds, support, and expert advice. Local authorities were given the autonomy to deliver locally tailored activities and to organize accountability locally. Each district developed an area-based initiative plan tailored to its specific local problems and needs. In 2008 (or in rare cases, in 2009), the districts put their plans into action and have been implementing the interventions since then. As such, the District Approach can be seen as 40 complex area-based interventions in 40 different contexts.

Focus of area-based initiatives on environment or socio-economic position
We distinguished between area-based initiatives that focused their interventions on the improvement of the physical and social environment (13 districts), on individual socio-economic position of the residents (11 districts), and target districts that intervened with lower or unknown intensity (12). We retrospectively collected information on the interventions that had been
implemented (type, duration, scale) in 36 districts until the end of 2011 and in early 2012, in order to provide a clear and detailed picture of the contents of the area-based initiatives we are evaluating.\textsuperscript{20} We used standardized questionnaires and face-to-face interviews with the local district managers, inquiring into 17 different types of activities, which we selected because of their potential to produce short-term health effects.\textsuperscript{21} Four types of interventions focused on individual residents, such as employment programs, income assistance, comprehensive primary schooling, and the prevention of school dropout. Twelve types of interventions focused on improving the district environment, such as housing, the physical and social environment, or social safety. We analysed the duration and scale of the activities in order to assess the scale of the combined activities per type of action to be smaller (score 0), intermediate (score 1), or larger (score 2). We summed the scores of all 4 types of interventions aimed at the social position and those of the 12 intervention types targeting the district environment. Target districts that scored less than 4 on individual interventions and less than 12 on the environmental interventions were considered to have underinvested to expect any health impact (lower or unknown intensity). The ratio between the scores on individual versus environmental interventions determines whether the focus of the area-based initiatives are considered to be people or place. A ratio lower than one third (4 versus 12 types of interventions) indicates a focus on improving the district environment and a ratio higher than one third indicates that relatively more investments focused on the individual socio-economic position of residents.

\textbf{Study population}

Nation-wide repeated cross-sectional data have been used from the National Health Survey (NHS) collected between 2004 and 2011. Respondents are of all ages and live in private households in the Netherlands. Respondents were interviewed at home using Computer Assisted Personal Interviewing (CAPI). A written questionnaire was left behind after the interview for respondents older than 12 years to ask them about more sensitive or detailed topics, such as health related behavior. The yearly non-response is around 35-40\%. Starting in 2010, the NHS employs a mixed-mode design. People are first asked to participate using Computer Assisted Web interviewing (CAWI). Non-respondents are approached by telephone for Computer Assisted Telephone Interviewing (CATI). People that cannot be reached by internet or phone are approached for a personal interview (CAPI). Respondents younger than 18 years were excluded from the reported analyses. Analyses were based on 66,800 respondents of which 2,454 were living in the target districts.
Chapter 8

Measures

General health
Self-reported general health is a good indicator of the overall health of a population,22 also among lower socio-economic groups.23-24 General health was measured asking respondents during the personal interview how their health is in general? Possible answers were “very bad, bad, all right, well, or very well”. We have dichotomized these answers into good perceived health (well or very well) and less than good perceived health (all right, bad, or very bad). The latter serves as the reference group in the time-series analyses.

Socio-demographic confounders
Analyses were adjusted for potential individual-level confounders to adjust for differences in population composition between neighbourhoods. Potential individual-level confounders include age (continuous), sex (male or female), household composition (living together or married with child(ren), living together or married without child(ren), single with child(ren), or single without child(ren)), ethnicity (native Dutch, migrant of Western origin, migrant of non-Western origin, migrant origin unknown), and socio-economic status (SES). SES is operationalized as highest achieved educational level (primary, lower secondary, upper secondary, or tertiary education) and equivalent disposable household income (categorized in quintiles). Age, sex, household composition, and education have been assessed using NHS. Ethnicity was derived from the national population registry. Information on household income was obtained from the national tax registries.

Different definitions of control areas
We used a quasi-experimental design to compare trends in the prevalence of good perceived general health in the target districts with control areas. We used propensity score matching to select control areas that are comparable to the target districts with regard to their livability at the moment the District Approach started (beginning 2008) in an attempt to approach a randomized design to reduce selection bias.25-27,17 We calculated the propensity score based on data on housing circumstances, physical and social neighbourhood characteristics, and safety (13 variables). We imputed missing data as well as data from neighbourhoods based on less than 10 respondents with the average score of all neighbourhoods.

We varied the selection of control areas in order to balance the larger number of districts needed for sufficient statistical power with the selection of smaller numbers of control areas that are identical to the experimental neighbourhoods. First, we selected those areas that have exactly the same range of propensity scores as the group of target districts for maximum comparability
General health effects of area-based initiatives in Dutch deprived neighbourhoods

(narrow definition). Second, we selected those areas that belong to the 10% of areas with the highest propensity scores to increase the number of eligible areas to enhance the statistical power (wide definition). Third, starting with the 10% worst areas, we distinguished those areas that are situated within the same municipality as the target districts (wide definition same municipality). Finally, to maximize statistical power, we compared the trend in general health in the target districts with the trend in all other areas in the Netherlands.

Analyses
Multilevel logistic regression analysis were applied to take into account the clustering of individuals within neighbourhoods. We performed time-series analysis of measurements over a prolonged period before and after the implementation of the District Approach to establish a better idea of impact. We fitted multi-level logistic regression models to assess the rate of change in the prevalence of good perceived general health per half year. This trend parameter was estimated for the pre-intervention period (January 2004 to June 2008) to establish a baseline trend, because it is generally unrealistic to assume that nothing happened before the District Approach was implemented. We compared this baseline trend with the trend during the post-intervention period (July 2008 to December 2011) by means of an interaction term between the ‘trend’ and ‘period’ parameters. The comparison of the change in trends between the target districts and control areas was explored, including the interaction term of ‘trend’, ‘period’, and ‘district’. Data were analysed using STATA 11.0.

RESULTS

Impact of District Approach on perceived general health
The prevalence of good general health was highest in the rest of the Netherlands during the period studied and almost always lowest in the target districts (Figure 1). In general, perceived general health improved slightly between 2004 and mid 2008. Mid 2008, the 40 deprived target districts reached the same prevalence of good health as comparable control areas, i.e. 69%. After mid 2008 the perceived general health did not show much change (Figure 1).
Figure 1: Trends in good perceived general health between 2004-2011 in 40 deprived target neighbourhoods, comparably deprived neighbourhoods according to narrow definition, wide definition & same municipality, and wide definition, and rest of the Netherlands.

Table 1 shows that all different groups of areas studied, experienced a slight improvement of general health between 2004 and mid 2008, as well as a slight deterioration afterwards (Table 1). This trend in general health, however, was only statistically significant among the rest of the Netherlands and those control areas that are comparable to the target districts using a wide definition of comparability (Table 1). There was no clear distinction in prevalence nor trend of good general health between the different selections of control areas in the sense that more comparable districts resembled the target districts most (Figure 1; Table 1).

Overall, there was no difference in the trend of good perceived general health between the 40 target districts of the District Approach and the control areas (Table 1).
Area-based interventions focusing on the district environment versus individual residents

Residents of the 13 target districts that mainly intervened in the district environment reported the highest prevalence of good health in 2004 of the three groups of target districts, i.e. 69% (Figure 2). In contrast with all other groups of residents, their perceived general health deteriorated between 2004 and 2008, and improved after 2008, although these trends were not statistically significant (Table 2). This pattern in perceived health did not statistically significantly differ from the trend among residents of the rest of the Netherlands (Table 2).

People living in the 11 deprived districts that invested mostly in the individual social position of residents reported an improvement in good general health from 64% in 2004 till 72% halfway 2008 (Figure 2). They also reported a steep, statistically significant deterioration of perceived general health between 2008 and 2011. The resulting large, statistically significant negative
change in trend in good general health was only borderline statistically significantly different from the trend in the rest of the Netherlands though (Table 2). The negative change in trend in perceived general health in districts focusing on residents did differ statistically significantly from the positive change in trend good general health among residents of the 12 target districts that intervened in the district environment (Table 2).

**Figure 2:** Trends in good general health between 2004-2011 in (1) 13 target neighbourhoods focusing on environmental interventions, (2) 11 target neighbourhoods focusing on individual interventions, and (3) rest of the Netherlands

*The prevalence for each half year is the average prevalence of that specific half year and the half year before and after (a moving average).*
Table 2: Comparison of development of good general health between 2004-2008 and 2008-2011 in 13 target neighbourhoods focussing on environmental interventions, 11 target neighbourhoods focussing on individual interventions, 13 target neighbourhoods intervening with low or unknown intensity, and the rest of the Netherlands

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<tr>
<td>13 Target districts focussing on district environment</td>
<td>-0.02 (-0.08 – 0.05)</td>
<td>0.03 (-0.06 – 0.12)</td>
<td>0.05 (-0.09 – 0.19)</td>
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<tr>
<td>Rest of the Netherlands</td>
<td>0.02 (0.01 – 0.02)*</td>
<td>-0.02 (-0.03 – -0.01)*</td>
<td>-0.04 (-0.06 – -0.02)*</td>
</tr>
<tr>
<td>Target districts environment vs rest Netherlands</td>
<td>0.08 (-0.00 – 0.16)</td>
<td>-0.13 (-0.24 – -0.02)*</td>
<td>-0.21 (-0.38 – -0.04)*</td>
</tr>
<tr>
<td>11 Target districts focussing on individual residents</td>
<td>0.01 (-0.01 – 0.02)</td>
<td>-0.02 (-0.03 – -0.01)*</td>
<td>-0.04 (-0.06 – -0.02)*</td>
</tr>
<tr>
<td>Rest of the Netherlands</td>
<td>0.25 (0.02 – 0.49)*</td>
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*p≤0.05.

a adjusted for age, sex, household composition, ethnicity, education, and income.

DISCUSSION

Residents of deprived districts that focused their area-based initiative on improvement of the district environment were the only ones that did not experience a deterioration in general health since mid 2008. They were furthermore the only group that showed a positive change in trend of good general health during the period studied, in contrast with inhabitants of target districts that focused their investments on the individual socio-economic position.

Limitations and strengths of the study design and methods

The implementation of the District Approach provides a unique opportunity to study the health impact of multiple complex area-based interventions that target the social determinants of health among severely deprived people in ‘real life’. We were able to study the development of general health using time-series analyses comparing the trend in outcome based on multiple half-year measurements before as well as after the start of the intervention.
The downside of this governmental procedural program is that there was no randomization of the intervention, and, therefore a selection of control areas, since all 40 most severely deprived areas were targeted. We have overcome this using a quasi-experimental design and propensity score matching to select comparable control areas with regard to the physical and social environmental characteristics. The comparable results using different definitions of control areas show that this procedure to select control areas did not interfere with our conclusions.

Though we used large-scale, nation-wide data sets, the small number of respondents available for the analysis of smaller groups of districts incurred larger fluctuations in the estimation of prevalence (Figure 2). The calculation of trends using at least 7 half-year measurements reduced the impact of fluctuations due to these small numbers, and the numbers turned out to be sufficient to calculate statistically significant trends with acceptable confidence intervals.

We used repeated cross-sectional data to estimate the trend of perceived general health in different groups of districts. This means that each half year, different residents did report on their health status and that those who moved were ‘lost’. This might have diminished the measurable impact of investments in individual socio-economic circumstances; those that were involved in these activities and managed to get a job or improve their income or educational level might have ‘cashed’ this by moving to a better neighbourhood. Investments in the district environment on the other hand have consequences for most of the residents, including those who just moved into the neighbourhood. The use of repeated cross-sectional data might therefore have influenced our results favoring the impact of investments in the district environment. Such an impact of changes in population composition is, however, refuted by the comparable results of analyses with and without controlling for socio-demographic confounders, including educational level and income (results not tabulated).

We studied target districts that focused on the improvement of the socio-economic position of residents, using employment programs, income assistance, comprehensive primary schooling, and preventing school dropout. Schooling programs are directed mainly at adolescents while we did study the trend in general health among respondents aged 18 years and older, due to too small numbers of younger respondents. This might have hampered the demonstration of the general health impact of investments in the individual socio-economic position.
Area-based initiatives focusing on district environment versus socio-economic position

Why do area-based initiatives that focus their investments on the district environment show more beneficial developments in general health than target districts that invest in improvement of the socio-economic position? One reason could be that the investments in the district environment are more effective in the sense that they better managed to change the neighbourhood environment than that interventions targeting socio-economic position ameliorated socio-economic disadvantage. A recent evaluation of the District Approach concluded that the target districts in general did not show more beneficial changes in livability, social cohesion, safety or income level than other areas. They did not evaluate the impact on the housing conditions and the physical neighbourhood environment, but the monitor of Statistics Netherlands reported improvements with regard to the housing stock. These observations suggest no impact on the socio-economic position of residents and are in line with suggestions that area-based interventions in themselves are a more effective means to improve the neighbourhood environment than to level up the inhabitants.

The second reason is that changes in the environment might have a more measurable impact on population health than changes in socio-economic status, because these kind of activities reach more residents than individually targeted interventions to improve socio-economic status. Even when the latter interventions are highly effective on an individual level, their benefits will be concealed when assessed at an area level.

A third reason is that current evaluation focuses on the short-term trends in general health – within three-and-a-half years from the start of the area-based initiatives - while environmental investments tend to yield health benefits quicker and more direct than improvements in the socio-economic position, which is a more upstream determinant of health. We recommend to evaluate the longer term health consequences of the area-based initiatives to reveal health consequences that take a longer time to evolve, and to see if the current benefits persist.

Conclusion

Area-based initiatives that focus their investments on the district environment show more positive trends in general health than those that focused on the improvement of individual socio-economic position. Targeted investments in the district environment seemed to have safeguarded the district population from a deterioration of perceived general health since mid 2008 – the onset of the economic crisis in the Netherlands - that was observed among the rest of the Netherlands and particularly among inhabitants of districts that chose to focus investments on the social position of individual residents.
REFERENCES


