Neighbourhood conditions, social cohesion and psychological distress

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Background: Neighbourhood inequalities in psychological distress are well reported, but underlying mechanisms remain poorly understood. The main purposes of this study were to investigate associations between structural neighbourhood conditions and psychological distress, and to explore the potential mediating role of neighbourhood social cohesion. Methods: Cross-sectional questionnaire study on a random sample of 18 173 residents aged ≥16 years (response 49%) from the four largest cities in the Netherlands. Psychological distress was measured with the Kessler Psychological Distress Scale (K10). Structural environmental factors under study were neighbourhood socioeconomic status (SES), neighbourhood green, urbanity and home maintenance. Neighbourhood social cohesion was measured by five statements and aggregated to the neighbourhood level by using ecometrics methodology. Multilevel linear regression analysis was used to investigate associations of neighbourhood characteristics with psychological distress, adjusted for individual level characteristics. Results: High neighbourhood SES and neighbourhood social cohesion were associated with decreased psychological distress. Adjusted for individual level characteristics and neighbourhood SES, only neighbourhood social cohesion remained significantly associated with psychological distress. Neighbourhood social cohesion accounted for 38% of the differences in the association between neighbourhood SES and psychological distress. Conclusions: High neighbourhood social cohesion is significantly associated with decreased psychological distress among residents of the four largest cities in the Netherlands. Reducing neighbourhood inequalities in psychological distress may require increasing social interactions among neighbourhood residents.

Introduction

Major depressive disorders are among the leading causes of disability-adjusted life years worldwide.1 The prevalence of depressive disorders among adults is 7% in the US2 and 5% in the Netherlands3 and is expected to increase.1 Major depressive disorders may have negative consequences for individuals’ quality of life,4 and for the mental health of persons in their social
neighbourhoods, high-quality housing, more social cohesion and hypothesized that (i) higher neighbourhood SES, more green in
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tions. Neighbourhood differences suggest that structural and social
environment: social support and networks, socio-economic position
evidence for a protective role of social cohesion on mental health.8 A review on the influence of social capital and social
economic deprivation,9–13 neighbourhood racial/ethnic compos-
level social capital.18 In the past few years, some studies have found
Neighbourhood environmental factors may interplay with each other and with individual level factors in relation to mental
health. Carpiano proposed a conceptual model on the relationship
between social cohesion and social capital with individual health
outcomes.22 Besides separating social cohesion of social capital, he
highlighted to structural neighbourhood factors and individual level
factors and their interrelations. In this model that consist of both
neighbourhood and individual levels, structural and social factors
may be related directly or indirectly to individual health.22 However,
for mental health a broader range of social environmental factors is
important. McNeill et al.,23 identified five dimensions of the social
environment: social support and networks, socio-economic position
and income inequality, racial discrimination, neighbourhood de-
privation, and social cohesion and social capital. Figure 1 depicts
the conceptual model for this study, which draws heavily on the
previously mentioned work by Carpiano and McNeill et al. In this
model, social and structural factors are directly related to mental
health, but social factors are also considered to be intermediates
on the pathway through which structural neighbourhood factors are
associated with individual health. Such direct and indirect pathways from neighbourhood structural and social cohesion to
depressive disorders have hardly been investigated.21 In this study,
it was therefore explored whether structural and social environmental
factors are directly and indirectly related to psychological distress
(an indicator of depressive disorders in urban adults). It was
hypothesized that (i) higher neighbourhood SES, more green in
neighbourhoods, high-quality housing, more social cohesion and
lower urbanity are associated with less psychological distress
among inhabitants of the four largest cities in the Netherlands and
that (ii) these associations of structural factors with psychological
distress are mediated partly by social cohesion.

Methods

Study design

Data for the present study were used from the health survey
carried out in 2008 by the municipal health services of the four
largest Dutch cities (Amsterdam, The Hague, Rotterdam and
Utrecht). Using a uniform research methodology, information on
physical and mental health, social well being, lifestyle, health care use
and demographics of residents were collected. The survey was based
on a random sample of 42 686 residents aged 16 years and older
from the municipal population registers, stratified by city district
and age.

Although no formal power calculation was conducted, this sample
size was considered sufficiently large to have at least 100 respondents
per neighbourhood. Respondents were asked to fill in a written or
web-based questionnaire or to take part in a personal interview
when having difficulties to complete the questionnaire. Extra effort
was made to target vulnerable groups, i.e. older Turks and
Moroccans with limited language skills and residents of neighbour-
hoods with a low response in previous surveys. Non-responders were
contacted by telephone or visited at their home and were offered
personal help to fill in the questionnaire in the language used by the
respondent, e.g. in Turkish or Arabic.

Response

In total 20 877 respondents completed the questionnaire (49%
overall response; 54% in Utrecht, 51% in The Hague, 50% in
Amsterdam and 47% in Rotterdam). Response was higher among
women than among men and increased with age. The response was
highest among the Dutch (57%) and lowest among Moroccans
(30%).24

We limited our analyzes to respondents who answered all
questions used in the analyzes (18 173). These respondents lived in
one of 211 neighbourhoods [on average 86 respondents (SD: 63)
per neighbourhood]. Dutch neighbourhoods comprise on average of
approximately 4000 residents.

By participating in this survey respondents gave permission to use
their answers for scientific purposes. The dataset is anonymous and
the Dutch Code of Conduct for Medical Research allows the use of
anonymous data for research purposes, without an explicit informed
consent.25

Measures

Psychological distress

Psychological distress was measured with the Kessler Psychological
Distress Scale (K10). The K10 is able to discriminate DSM-IV
disorders from non-cases26 and has a good agreement with the
Composite International Diagnostic Interview (CIDI) diagnosis of
anxiety and affective disorders.27 The K10 scale consists of 10
questions on anxiety and depressive symptoms in the previous 4
weeks: ‘Did you feel... (1) tired out for no good reasons’, (2)
‘nervous’, (3) ‘so nervous that nothing could calm you down?’,
(4) ‘hopeless’, (5) ‘restless or fidgety’, (6) ‘so restless that you
could not sit still?’, (7) ‘depressed?’, (8) ‘that everything was an
effort?’, (9) ‘so sad that nothing could cheer you up? and (10)
‘worthless’. Response categories were ‘none of the time’ (1), ‘a
little of the time’ (2), ‘some of the time’ (3), ‘most of the time’
(4) and ‘all of the time’ (5). Cronbach’s alpha was 0.92, therefore
a sum-score was calculated (10–50; higher scores reflecting higher
levels of psychological distress).

![Conceptual model for associations between individual and
neighbourhood level factors and psychological distress](https://example.com/model.png)
Individual level factors

Gender, age, ethnic background, marital status and years of residence in the current city were derived from the questionnaire. Ethnic background was defined by respondent or one of the parents being born in a foreign country.28 Years of residence in the city was included to adjust for exposure to the environment.

Education, occupation and having financial difficulties were included as measures of individual SES. Educational level was categorized into: ‘primary school’ (1), ‘lower general secondary education’ (2), ‘higher general secondary education’ (3) and ‘college, university’ (4).

Occupation status was categorized into four categories: ‘housewife, houseman, student’ (1), ‘unemployed, recipient of disability benefits or social assistance benefits’ (2), ‘(early) pensioner’ (3) and ‘(self-) employed’ (4).

Financial difficulties were measured with the question ‘Have you had difficulty in the past year to make ends meet with the household income?’ with a four-point answering scale ranging from ‘great difficulty’ (1) to ‘no difficulty’ (4). Financial difficulties was defined by some and great difficulties (scores 1 and 2).

Neighbourhood structural factors

Composite scores on neighbourhood SES were obtained from the Netherlands Institute for Social Research (SCP). For each six-digit zip-code area (on average 17 addresses), the SCP conducted a telephone interview among a randomly selected person. The responses of the six-digit zip-code areas were aggregated to a higher level four-digit zip-code area. Neighbourhood SES was composed by three characteristics of individuals within the four-digit zip-code area: income, work and level of education. Composite scores were created by conducting a factor analysis on these three variables.

Home maintenance was used as an indicator of the quality of housing and was obtained from the WoON 2009 dataset (Ministry of Housing, Spatial Planning and the Environment), a national survey among 78,000 (response = 59%) randomly selected Dutch inhabitants (age ≥ 18 years).29 Home maintenance was measured with the item: ‘My house or living area is poorly maintained’ [’totally agree’ (1) to ’totally disagree’ (5)]. Individual responses were aggregated to the neighbourhood level by taking the mean value of the individual responses.

The degree of urbanity of the municipality was retrieved from Statistics Netherlands and was based on the number of addresses per km² in 2008: more than 2499 addresses (urban); 1500–2499 addresses (semi-urban); 1000–1499 addresses (intermediate urban-rural); 500–999 addresses (semi-rural); 499 addresses (rural).

Data about green areas per neighbourhood were derived from the Dataset Land Use of Statistics Netherlands. In this geographical database, land use was defined in polygons. Each polygon had a land use typology (e.g. business, parks) and an area. For each neighbourhood, we calculated the proportion surface area that could be classified as green (i.e. the typologies of parks, plantations, green belts and forests) relative to total land area excluding surface area consisting of water.

Social environmental factors

Data on neighbourhood social cohesion were obtained from WoON 2009 Dataset. At the individual level, social cohesion was measured with five items: ‘the people in my neighbourhood get along well with each other’, ‘I live in a close-knit neighbourhood with a lot of solidarity’, ‘I have a lot of contact with my direct neighbours’, ‘I have a lot of contact with other neighbours’, ‘In this neighbourhood, the people hardly know each other’. All items were measured on a five-point scale [’totally disagree’ (1)–’totally agree’ (5)]. The last item was reverse-coded.

Social cohesion was aggregated on a neighbourhood level by using an ecometrics approach.31–34 A linear three-level multi-level model (with neighbourhoods, individuals, items as levels) was fitted with the items measuring social cohesion as the dependent variables and gender, ethnicity, age, education, type of housing the participant lives in and years living in the current home as the independent variables. The neighbourhood residuals from this analysis, the part that cannot be attributed to individual response patterns, constitute the social cohesion variable. Positive values indicate higher than average levels of social cohesion. The reliability of the social cohesion variable was acceptable at 0.66.35 The calculations for this variable was done in MLwiN 2.02.

Data analysis

Descriptive statistics were used to show the distribution of variables in the study sample. Pearson correlations were calculated to show the associations between the neighbourhood structural factors and neighbourhood social cohesion.

Multilevel linear models were fitted to examine the associations of individual- and neighbourhood-level predictors with psychological distress.36 Seven models were fitted. The empty model (Model 1) was an intercepts-only model. In Model 2, individual characteristics were entered. In Model 3, the amount of green area was entered. Subsequently, the amount of green area was substituted by neighbourhood SES (Model 4), degree of urbanity (Model 5), home maintenance (Model 6) and social cohesion (Model 7). In these models, the neighbourhood variables were transformed to z-scores. To determine whether the association between neighbourhood SES and psychological distress was attenuated by other neighbourhood characteristics, candidate intermediate factors were entered in Model 2 together with neighbourhood SES. Neighbourhood variables were considered to be candidate intermediate factors if their association with psychological distress was statistically significant. For all models, intraclass correlations (ICCs) were calculated to assess the proportion of the total variability in psychosocial distress that is attributable to the neighbourhoods: \( \frac{\text{variance}_\text{neighbourhood}}{\text{variance}_\text{neighbourhood} + \text{variance}_\text{individual}} \).

All analyses were performed in SPSS 20. Results were considered to be statistically significant at \( P < 0.05 \).

Results

Study sample

The study sample consisted of relatively high percentage women (56%), persons below the age of 55 years (62%), native Dutch (68%), married or living together (57%), persons with university education (32%), employees or self-employed (53%), persons without or with almost no financial difficulties (74%) and persons residing for > 26 years in their city (50%) (table 1).

Multivariate associations of individual factors with psychological distress

Women reported higher psychological distress than men (\( \beta = -1.53, 95\% \text{ CI} -1.73 \) to \(-1.34 \)) (table 1). Compared with married persons or cohabitants, widowed persons reported higher psychological distress (\( \beta = 1.35, 95\% \text{ CI} 0.97 \) to \(1.74 \)). People with lower levels of education (\( \beta = 1.62, 95\% \text{ CI} 1.29 \) to \(1.96 \)) reported higher psychological distress than people with academic education. Unemployed persons, recipients of disability benefits or social assistance benefits (\( \beta = 5.54, 95\% \text{ CI} 5.20 \) to \(5.89 \)) reported higher psychological distress than workers. Finally, those who experienced great or some financial difficulty (\( \beta = 3.40, 95\% \text{ CI} 3.18 \) to \(3.62 \)), reported higher psychological distress than those without financial difficulties.
Descriptive statistics on neighbourhoods factors

We found that the amount of green area was not correlated with neighbourhood SES, urban density and home maintenance. All other neighbourhood factors were correlated with each other. The correlations ranged between 0.07 and 0.61 (online Supplementary table S1).

Associations of structural and social neighbourhood factors with psychological distress

Of the total individual differences in psychological distress, 2.87% (Model 1, table 2) could be explained at the neighbourhood level.

After including the individual level variables (Model 2 in table 2) the neighbourhood variance was substantially reduced to 0.25%.

Higher neighbourhood SES ($\beta = -0.13$, 95% CI $-0.24$ to $-0.02$) (table 2) and larger neighbourhood social cohesion ($\beta = -0.16$, 95% CI $-0.27$ to $-0.06$) were associated with lower psychological distress. No associations were found between green area, urban density, home maintenance and psychological distress.

Pathways linking neighbourhood SES and psychological distress

The association between neighbourhood SES and psychological distress attenuated to non-significance ($\beta = -0.08$, 95% CI $-0.19$ to...
Table 3 Multilevel regression analysis of psychological distress by neighbourhood social cohesion (mediator) for the pathway of neighbourhood SES on psychological distress

<table>
<thead>
<tr>
<th></th>
<th>Model A</th>
<th>Model B</th>
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<tbody>
<tr>
<td><strong>Structural neighbourhood factor</strong></td>
<td></td>
<td></td>
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<tr>
<td>Neighbourhood SES</td>
<td>–0.13 (–0.24 to –0.02)</td>
<td>–0.08 (–0.19 to 0.04)</td>
</tr>
<tr>
<td><strong>Social neighbourhood factor</strong></td>
<td></td>
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<tr>
<td>Neighbourhood social cohesion</td>
<td>–0.13 (–0.24 to –0.02)</td>
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</tr>
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a: All neighbourhood factors are in z-score units (per 1 SD increase). b: Bold values are significant (P<0.05). c: CI = confidence interval; in both models is adjusted for individual level variables: gender, age, ethnic background, marital status, education, occupation, financial difficulties and years of residence.

0.04) after adding neighbourhood social cohesion to the model (table 3). Neighbourhood social cohesion accounted for 38% [(–0.13 – –0.08)/–0.13*100%)] of the differences in the association between psychological distress and neighbourhood SES. The other factors did not attenuate this association (not shown).

Discussion

Despite the pivotal importance of individual characteristics, the results of this study indicate that adults living in neighbourhoods with lower SES or lower social cohesion were more likely to experience psychological distress. Moreover, social cohesion accounted for a considerable part (38%) of the association between neighbourhood SES and psychological distress.

The finding that the association of neighbourhood SES with psychological distress attenuated to non-significance after taking neighbourhood social cohesion into account as a mediator, is in line with Carpiano’s framework and other studies. Previous studies have shown that neighbourhood social cohesion mediates the association between neighbourhood SES and psychological distress. Likewise, individually rated social cohesion mediated associations between neighbourhood disadvantage and depressive symptoms in women. Other studies have found that network social capital and individually rated neighbourhood social capital mediate the association between neighbourhoods disadvantage and depressive symptoms. Neighbourhood inequalities in psychological distress are well reported but underlying mechanisms remain poorly understood. The mediating role of neighbourhood social cohesion contributes to our understanding of how economically disadvantaged neighbourhoods deteriorate mental health among some residents. We found that economically disadvantaged neighbourhoods (i.e. neighbourhoods with higher proportion of citizens with lower education, poverty and unemployment), had higher levels of depressive symptoms through lower neighbourhood social cohesion. This is in line with neighbourhood disadvantage theories which suggest that economically disadvantaged neighbourhoods lead to disruption in social relationship among the residents.

No evidence was found for associations of amount of green, urbanity and home maintenance with psychological distress. This is in contrast to some other studies, which have shown that people living in poor quality built environments, e.g. percentage of buildings in deteriorating conditions or living in a dwelling with structural problems, were more likely to report depression. However, these factors were not measured at the neighbourhood level and the association with depression was not controlled for individual level variables. An alternative explanation is the limited variation in home maintenance between neighbourhoods in this study, which reduces the possibility of finding associations.

Also with respect to green space and depression, no significant association was found. Miles et al. have shown that moderate amounts of green space were associated with fewer depressive symptoms. In this study, the results were adjusted for the nested data structure (i.e. multilevel analyzes), whereas Miles et al. did not take within-area associations into account. Therefore, the results of both studies are not comparable.

Major strengths of this study include the theoretical framework that guided the analysis and interpretation, whereas research on contextual determinants of depressive disorders has been criticized for its poor theoretical basis. Investigating associations of a wide array of neighbourhood characteristics (i.e. neighbourhood SES, urbanity, home maintenance, green area and social cohesion) with psychological distress is rare, but needed according to the framework used. Moreover, the use of multilevel modelling in a large sample allowed unravelling the associations of neighbourhood factors with psychological distress above and beyond individual level factors.

Another strength of this study is that neighbourhood factors were derived from other data sources than psychological distress, which prevents same-source bias. With regard to definition of neighbourhood social cohesion, an econometrics approach was used to arrive at neighbourhood level constructs from individual data. This procedure takes into account that items of social cohesion are not independent of each other but nested within respondents.

In order to maximize response, respondents had various options to complete the questionnaire (i.e. paper and pencil, web based or face-to-face interview). Only those who were offered a face-to-face interview (N = 117; 11%) differed from the other groups. This group had on average a lower SES and higher psychological distress than the rest of the sample. It is unclear whether these differences can be attributed to the methodological differences of data collection. However, no substantial changes in the study results should be expected, because of the small size of this group.

Some limitations need to be taken into account when interpreting the results. This is a cross-sectional study, and as such limits causal inference. Furthermore, endogeneity cannot be entirely excluded. Although factors were included to adjust for residential self-selection towards particular neighbourhoods, persons living in different neighbourhoods may differ in other respects, such as personality factors. Thus, we cannot entirely rule out an overestimation of the importance of neighbourhood SES and social cohesion. Yet, adjustment for education, occupation, ethnicity, marital status and financial problems may have addressed this problem sufficiently. Selective migration may be responsible for some of the associations found. Depressed persons may have less energy to move away from more deprived neighbourhoods or from neighbourhoods with low social cohesion. Previous research has shown, however, that health is a marginal reason for moving. Another limitation is that linear relations between the neighbourhood factors and psychological distress were assumed. Future studies with larger populations in more neighbourhoods should investigate also non-linear associations. Finally, there may have been selective drop-out of respondents, due to eligibility definitions (i.e. data available on socio-economic factors and psychological distress) or inability to merge neighbourhood data with the individual record (e.g. for those living in industrial areas, for whom no social environmental information was available).

To conclude, adults living in deprived neighbourhoods or in lower social cohesive neighbourhoods experience higher levels of psychological distress. Neighbourhood social cohesion accounted for a considerable part of the differences in the association between neighbourhood SES and psychological distress. Promoting social cohesion may prevent the occurrence of psychological distress and may reduce neighbourhood inequalities in distress.
Supplementary data
Supplementary data are available at EURPUB online.

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Conflicts of interest: None declared.

Key points
- There are few studies in which the associations of various neighbourhood characteristics are examined on depression or psychological distress.
- Especially, the association between neighbourhood social cohesion and psychological distress is understudied. Strong evidence for an inverse association between neighbourhood social cohesion and depression or psychological distress is still lacking.
- This study highlights which neighbourhood characteristics are important as population determinants of mental health. Of the environmental characteristics studied, neighbourhood social cohesion had the strongest (protective) associations with psychological distress.
- There is limited theory about how neighbourhoods may influence depression or psychological distress, especially on the role of neighbourhood social cohesion as a mediator in this process. This study help us to understand how neighbourhood SES shape psychological distress through neighbourhood social cohesion.
- Interventions aimed at improving social interactions among inhabitants in disadvantaged neighbourhoods may prevent the occurrence of psychological distress.

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The effect of Greek herbal tea consumption on thyroid cancer: a case-control study

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Background: Although in the last decade several studies have addressed the protective role of black and green tea on several diseases, including cancer, there are only few and controversial studies on the effect of tea on benign and malignant thyroid diseases. Methods: An age and gender group matched case-control study conducted in Athens, Greece, was designed. 113 Greek patients with histologically confirmed thyroid cancer and 286 patients with benign thyroid diseases along with 138 healthy controls were interviewed with a pre-structured questionnaire in person by trained interviewers. Results: An inverse association between chamomile tea consumption and benign/malignant thyroid diseases was found (P=0.001). The odds of chamomile tea consumption, two to six times a week, after controlling for age, gender and BMI, were 0.30 (95% CI: 0.10–0.89) and 0.26 (95% CI: 0.12–0.5) for developing thyroid cancer and benign thyroid diseases, respectively when compared with not consumption. The duration of consumption did not alter the results. Conclusions: Our findings suggest for the first time that drinking herbal teas, especially chamomile, protects from thyroid cancer as well as other benign thyroid diseases.

Introduction

Tea is one of the most commonly consumed beverages in the world, second only to water. Most studies have examined the effect of tea on cancer looking at black and green tea separately, probably because the 80% of the tea consumed in Europe and the USA is black, whereas green tea is the most widely consumed beverage in China, Japan and other Asian countries. In Greece, herbal tea has been widely consumed for centuries. In particular, chamomile (genus Matricaria Chamomila, family Composita), sage (family Salvia fruticosa L.) and mountain tea (genus Sideritis, family Lamiaceae) grow extensively in the Greek countryside and mountains. They are locally collected and home-prepared for direct consumption without any special manufacturing process, like the black tea. In the last decade several studies described the beneficial properties derived by tea consumption: antioxidative, anti-inflammatory, antibacterial, antiarthritic, antiviral, antiangiogenic, neuroprotective.

Furthermore, it is now well known that the active components of tea can also play a role in lowering cholesterol levels and in preventing cancer and cardiovascular diseases. In the endocrine field, tea is appreciated as a precious ally on reaching metabolic control and preventing diabetes, although in high doses it can exert anti-thyroid and goitrogenic effects. Additionally, though there are plenty of data describing a protective effect of black and green tea on colon rectum, breast,