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Neighbourly support of people with chronic illness; is it related to neighbourhood social capital?

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Highlights

- It is unknown if neighbourhood social capital is related to support by neighbours.
- Chronically ill people who are more connected to neighbours receive more support.
- Social capital on the neighbourhood level is not related to support by neighbours.
- Support by neighbours is related to differences in disease characteristics.
- Individual and neighbourhood social capital do not provide access to the same resources.

ABSTRACT

The neighbourhood may provide resources for health. It is to date unknown whether people who live in neighbourhoods with more social capital have more access to practical and emotional support by neighbours, or whether this is a resource only available to those who are personally connected to people in their neighbourhood. We investigated whether support by neighbours of people with chronic illness was related to neighbourhood social capital and to individual neighbourhood connections. Furthermore, we investigated whether support received from neighbours by people with chronic illness differed according to demographic and disease characteristics. We collected data on support by neighbours and individual connections to neighbours among 2272 people with chronic illness in 2015. Data on neighbourhood social capital were collected among 69,336 people in 3425 neighbourhoods between May 2011 and September 2012. Neighbourhood social capital was estimated with econometric measurements. We conducted multilevel regression analyses. People with chronic illness were more likely to receive practical and emotional support from

neighbours if they had more individual connections to people in their neighbourhood. People with chronic illness were not more likely to receive practical and emotional support from neighbours if they lived in a neighbourhood with more social capital. People with chronic illness with moderate physical disabilities or with comorbidity, and people with chronic illness who lived together with their partner or children, were more likely to receive support from neighbours. To gain more insight into the benefits of neighbourhood social capital, it is necessary to differentiate between the resources only accessible through individual connections to people in the neighbourhood and resources provided through social capital on the neighbourhood level.

Residential neighbourhoods are meaningful contexts of life and are important for health and wellbeing of their inhabitants (Cramm and Nieboer, 2015 and Diez Roux, 2001; Diez Roux and Mair, 2010, Greenfield and Reyes, 2014, Lomas, 1998, Pickett and Pearl, 2001 and Subramanian et al., 2003). The neighbourhood has gained increasing attention as a site for social support and help, for instance for elderly in the context of 'ageing in place' (Gardner, 2011, Gray, 2009, van Dijk et al., 2013 and Wiles et al., 2011). Theories on the significance of neighbourhood relationships have traditionally emphasized their instrumental value (Cantor, 1979 and Litwak and Szelenyi, 1969). Research shows that neighbours usually fulfil tasks that require proximity (for instance monitoring that someone is okay), tasks that are practical (for instance shopping, transportation or assistance with household maintenance) and non-intimate (not concerning personal care or nursing tasks for instance (Barker, 2002, Bridge, 2002, LaPierre and Keating, 2013, Litwak and Szelenyi, 1969 and Nocon and Pearson, 2000). This study aims to gain more insight into support by neighbours, specifically for people with chronic illness. Previous studies have focused on support by neighbours for elderly in the general population (Gardner, 2011, Barker, 2002 and Nocon and Pearson, 2000), but to date there is no information on support by neighbours specifically for people with chronic illness. To manage the demand put on health care systems due to long-term health problems, there has been an increasing focus on the responsibility of patients and their social network for health (Lipszyc et al., 2012 and Maarse and Jeurissen, 2016). However, people with long-term health problems, such as people with chronic illness, might not always be able to rely on support from social network members, such as friends and family. The growing number of people with chronic illness and the changing age structure of the population, place high demands on available informal caregivers and raise questions regarding the future availability of informal care (De Boer and De Klerk, 2013, Pickard et al., 2000 and Pickard et al., 2007). Social network members, who possibly have to balance other responsibilities, including work and child care, can be busy and therefore limited in the amount of help they can provide (LaPlante et al., 2004). Furthermore, social network members might live far away and physical distance can be a barrier to support (De Klerk et al., 2009, Linders, 2010 and Wellman and Wortley, 1990). When there are barriers to support from social network members, or when people with chronic illness otherwise lack the resources they need for health, the neighbourhood can possibly provide compensatory resources. A previous study found that people with less frequent

contact with friends and family were more likely to report good health when they lived in neighbourhoods with more social capital (Mohnen et al., 2015). This study however did not provide information on the specific compensatory resources provided in neighbourhoods with more social capital. It is valuable to shed more light on the specific resources that are provided in neighbourhoods, such as practical and emotional support.

A rich literature on neighbourhood resources has shown that social capital in the neighbourhood on both the individual and the neighbourhood level can benefit people's health. Here we link the literature on support for people with chronic illness and the literature on neighbourhood resources by asking the question whether more support by neighbours is available for chronically ill people in neighbourhoods with more social capital. Or is more support by neighbours only available if they are personally more connected to their neighbours, i.e. when they have more individual social capital?

Social capital is defined by the resources that develop through social relations. These resources can facilitate the achievement of goals and contribute to health and wellbeing (Coleman, 1988). Social capital can be conceptualized on a number of analytic levels, among which the macro level (countries, states and regions) (see for instance Kawachi et al., 1997), the meso level (neighbourhood and blocks) (see for instance Lochner et al., 2003), and the individual micro-level (individual social relationships, trust and norms) (Portes, 1998 and Veenstra, 2000). Social capital on the individual level differs from social capital at the community level, for instance the neighbourhood. Individual social capital is a personal asset and consists of resources that are only accessible to individuals that are part of the relationships that generate specific resources (Portes, 1998). On the other hand, social capital on a community level is the source of collective resources that do not belong to a specific individual, or inhere in a specific set of relationships, but are part of the social structure of a community (Coleman, 1988). Social capital on the community level provides public resources that can benefit even people with poor personal social connections. Neighbourhoods with more social capital might for instance be more successful at realizing informal social control, which might result in reduced violence (Sampson et al., 1997). More neighbourhood safety benefits all neighbourhood residents and not only those personally connected to specific others in their neighbourhood. In addition to a distinction made between social capital on different levels, it is also possible to distinguish between bonding and bridging social capital. The distinction between 'bonding' and 'bridging' social capital helps to differentiate between people in homogeneous networks with similar social identities (intragroup relations) and relations between people in heterogeneous networks (intergroup relations) (Putnam, 2002). There is evidence that community or collective social capital in the neighbourhood can benefit health of people in the general population as well as people with chronic illness (Anonymous, 2014, Gilbert et al., 2013, Hunter et al., 2011, Islam et al., 2006, [Subramanian et al., 2003](#), Sundquist and Yang, 2007 and Vyncke et al., 2013). Examples of public resources provided through neighbourhood social capital that can benefit health, are increased informal social control and increased access to health information (Kawachi et al., 1999, Kawachi and Berkman, 2000 and Sampson et al., 1997). Another possible mechanism might be the provision of support by neighbours (Kawachi et al., 1999 and Kawachi et al., 1997). It might be case that in a neighbourhood with more

collective social capital there is more of a general tendency to help each other (for instance with work in the garden, carrying groceries, or by having a conversation on the street), even when people don't know each other very well. Others, however, stress the importance of being connected to people or networks that generate specific resources, and state that access to social support is restricted to people who are embedded in specific relationships with those that can provide social support (Carpiano, 2006 and Carpiano, 2008). Simply living in a neighbourhood with more social capital, without having relationships with specific neighbours or being integrated into neighbourhood networks, might thus not be enough for an individual to gain access to social support by neighbours.

Not only might support by neighbours depend on personal integration in the neighbourhood and individual connections to others. The use of social support by neighbours might also differ according to demographic and disease characteristics of people with chronic illness. Based on demographic and disease characteristics, people with chronic illness might either have more access to support by neighbours or might have a higher need for support by neighbours. Regarding differential access to neighbourhood resources, a study showed differences in the effect of neighbourhood social capital based on duration and intensity of exposure to the neighbourhood environment (Mohnen et al., 2013).

To gain more insight into the relationships between support by neighbours, neighbourhood social capital and individual neighbourhood connections, we will explore differences in the use of support by neighbours according to demographic and disease characteristics of people with chronic illness and we will test the following hypothesis:

People with chronic illness more often receive support from neighbours if they live in neighbourhoods with more social capital, beyond individual connections to neighbours.

1. METHODS

1.1. Data collection

1.1.1. National panel of the chronically ill and disabled (NPCD)

We used data from the 'National Panel of the Chronically ill and Disabled'. This is a nationwide prospective panel study in The Netherlands, established to gather information on the consequences of chronic disease and disability from a patient perspective. For the NPCD, participants are recruited from random samples of general practices that are drawn from the Dutch Database of General Practices. They are selected according to the following criteria: diagnosis of a somatic chronic disease by a certified medical practitioner, aged >15 years, not permanently institutionalized, aware of the diagnosis, not terminally ill (life expectancy > 6 months according to their general practitioner), mentally capable of participating, and sufficient mastery of Dutch. Members of NPCD are also recruited on the basis of a self-reported moderate or severe physical disability from several national population surveys conducted by the Netherlands Institute for Social Research, the Dutch Ministry of Infrastructure and the Environment and Statistics Netherlands. In 2015, the NPCD consisted of more than 4000 people with chronic illness or physical

disability. Annually, 500 new panel members are selected via the standardized procedure to replace panel members who withdrew or who had participated for the maximum term of four years. The NPCD is registered with the Dutch Data Protection Authority; all data are collected and handled in accordance with the privacy protection guidelines of this Authority. Panel members fill in questionnaires at home twice a year. For this study in 2015 a questionnaire was sent to 2893 people with chronic illness and filled in questionnaire were received from 2272 people (response rate of 79%). Respondents were on average older than non-respondents (65 years versus 60 years) and more often had multiple chronic diseases (56% versus 48%). In our sample, there were in total 832 neighbourhoods, with on average three respondents per neighbourhood (the minimum number of respondents per neighbourhood is one, the maximum number of respondents per neighbourhood is seventy).

1.2. Main variables

1.2.1. Support from social network members and people in the neighbourhood

People with chronic illness were asked whether they received support in the previous year from their family or other people they know, and what type of support. They were asked whether they received help with domestic work (cooking, doing groceries, doing the laundry, cleaning, etc.); help with personal care (taking a shower, getting dressed, putting on support stockings, getting up and going to bed, eating, etc.); nursing tasks (wound dressing, injections, help with taking medications, etc.); help arranging practical matters or guidance undertaking activities; help with their medical treatment; help making lifestyle changes (for instance regarding to diet or exercise); emotional support, understanding and listening; help with requesting professional care, domestic aids, care or services or with doing administrative tasks; help with transportation to family, medical professionals, the hospital or making trips; practical support with chores in and around the house; help with understanding and applying information about health, illness or medication; help with formulating goals or making choices in treatment or life in general.

If people with chronic illness received informal support, they were asked whom they received this support from, including partners, children (residential and non-residential), other family, people from the neighbourhood (excluding family living in the neighbourhood), friends and acquaintances, volunteers, other people with chronic illness or physical disability, someone from church or other faith community. People with chronic illness were said to have received support from neighbours if they had received one of the above mentioned forms of support from people in the neighbourhood. We did not define 'the neighbourhood', so people with chronic illness answered these questions based on their own perception of what constitutes their neighbourhood. In this study we constructed a measure of whether or not people receive support from neighbours based on the five types of support people with chronic illness most often received from people in the neighbourhood.

1.2.2. Individual neighbourhood connections

We constructed a measure of individual neighbourhood connections based on three questions. We included the questions:

1 About how many adults do you recognize or know by sight in your neighbourhood – would you say no adults, a few, many, or most? (No adults, a few adults, many adults, most adults).

2 In the past 30 days, how many of your neighbours have you talked with for 10 min or more? (None, one or two, three to five, six or more).

3 How many of your friends live in your neighbourhood? (None, a few, many, most or all).

Again, we did not define ‘the neighbourhood’, so on the individual level this variable reflects residents’ individual perceptions of what constitutes their neighbourhood and who their neighbours are. For the analyses we standardized the variables and created a scale. A higher score indicates being more connected to people in the neighbourhood ($\alpha = 0.61$, mean = 0.00, std. dev. = 0.76, min = -1.93, max = 1.88).

1.2.3. Neighbourhood social capital

Neighbourhood social capital was based on five questions of about social contacts among neighbours: contact with direct neighbours; contact with other neighbours; whether people in the neighbourhood know each other; whether neighbours are friendly to each other; and whether there is a friendly and sociable atmosphere in the neighbourhood. Response categories were ‘totally agree’, ‘agree’, ‘neutral’, ‘don’t agree’, and ‘totally don’t agree’ (thus ranging from 1 to 5). Variables and the resulting scales were coded so that higher values indicate more social capital. We applied ecometric analysis, using a three-level hierarchical model (Raudenbush et al., 1991, Raudenbush and Sampson, 1999 and Raudenbush, 2003), to aggregate the measurement of social capital to the neighbourhood level (Anonymous, 2014). The reliability of the social capital measure on the neighbourhood level was 0.74. Information about neighbourhood social capital was acquired through WoOn, the ‘Housing and Living Survey 2012’, commissioned by the Ministry of the Interior and Kingdom Relations. WoOn 2012 is representative of residents of the Netherlands of 18 years and above. The data were collected among 69,336 people between September 2011 and May 2012 (response rate of 58%) in 3425 neighbourhoods with an average of 20 respondents per neighbourhood. In our study neighbourhoods were spatially defined based on 4-digit postal codes. Postal codes in the Netherlands are used to identify small geographical areas that comprise between 1 and 8 km². On average there are 4000 residents in a postal code area (Statistics Netherlands, 2015). The size of neighbourhoods is generally larger in rural areas than in urban areas. Statistics Netherlands gave us access to data of neighbourhoods that had a minimum of three respondents; which resulted in a dataset containing 2544 neighbourhoods with an average of 27 respondents per neighbourhood. Data were collected by telephone, face to face interviews and internet. Participants were randomly selected from the population of Dutch households with at least one person aged 18 years or above. We used the postal code of the residential address of people with chronic illness to add the information on neighbourhood social capital to the dataset containing information on support utilization and health of people with chronic illness.

1.3. Demographic and disease characteristics

1.3.1. Demographic characteristics

On the individual level we included a number of demographic characteristics, namely: gender, coded as a dummy variable; age in 2015; educational level, coded as either low (no education until the lowest high school degree), intermediate (vocational training and the highest two high school degrees), high (university of applied sciences degree and university degree); living status (living alone or living together with a partner or children).

1.3.2. Disease characteristics

We also included a number of disease characteristics of people with chronic illness, namely: the nature of the first diagnosed chronic disease (including cardiovascular diseases, cancer, respiratory diseases, diabetes, musculoskeletal diseases, neurological diseases and digestive diseases) as reported by the general practitioner; duration of the first diagnosed chronic disease; and number of chronic diseases (one or multiple chronic diseases). The presence of physical disabilities was measured by a self-reported validated Dutch questionnaire that consists of 24 items about activities in daily life and the ability to see/hear (De Klerk et al., 2006). The level of physical disability was defined by the level of motor disability. People with mild motor disabilities were those who had problems with one or multiple daily activities, such as household tasks. People with a moderate motor disability not only experienced problems with household tasks, but were also limited in other areas and had problems with mobility. People with a severe motor disability have at least one activity they are unable to perform without support.

1.3.3. Professional homecare

To not only take into account informal support received, but also take into account professional support, we included a variable indicating whether people with chronic illness received professional homecare. Professional homecare could be help with domestic work (cooking, doing groceries, doing the laundry, cleaning, etc.); help with personal care (taking a shower, getting dressed, putting on support stockings, getting up and going to bed, eating, etc.); nursing tasks (wound dressing, injections, help with taking medications, etc.); and support aimed at promoting self-reliance and the ability people have to live independently.

1.4. Neighbourhood characteristics

1.4.1. Urbanity

An indicator of the urbanity of the municipality in which a given neighbourhood was located, was provided by Statistics Netherlands (2015), and was based on the number of addresses per km² (1 = Urban = More than 2500 addresses/km², 2 = Semi-urban = 1500- 2499 addresses/km², 3 = intermediate urban-rural = 1000–1499 addresses/km², 4 = Semi-rural = Up to 1000 addresses per km², 5 = Rural = Up to 500 addresses per km²).

1.4.2. Socioeconomic status of the neighbourhood

To measure the socioeconomic status of the neighbourhood we used data on the average annual taxable income per household in neighbourhoods in 2012, based on information of all residents of a neighbourhood provided by Statistics Netherlands (2015). Average annual taxable income was divided into 4 categories; less than

22,100 euro per year, between 22,101 and 30,000 euro per year, between 30,001 and 35,739 euro per year, and more than 35,739 euro per year. In the analyses we included the percentage of households per neighbourhood with a taxable income less than 22,100 euro per year.

1.5. Analysis

Descriptive statistics were applied to describe the characteristics of our sample. Using STATA's module to run MLwiN 2.24 through STATA, we conducted multilevel regression analyses with respondents nested in neighbourhoods, to test our hypothesis. As previously mentioned, in the analyses we used the types of support people with chronic illness most often received from people in the neighbourhood. We investigated whether there was a relationship between support by neighbours, neighbourhood social capital and individual connections in the neighbourhood. First we examined the relationship between support by neighbours and neighbourhood social capital, without taking into account individual connections in the neighbourhood and differences in demographic and disease characteristics between people with chronic illness (Model 1). Second, we examined the relationship between support by neighbours and individual neighbourhood connections, without taking into account neighbourhood social capital and differences in demographic and disease characteristics between people with chronic illness (Model 2). Third, we ran a complete model including neighbourhood social capital, individual connections in the neighbourhood and demographic and disease characteristics between people with chronic illness (Model 3).

To enhance interpretability of the results, we centred the continuous variables in our models. Continuous variables were tested for linearity. No signs of non-linearity were found.

Not all people with chronic illness that responded to the questionnaire were included in the regression analyses. First, 262 people were excluded because they did not provide information about informal and professional support received. For 102 people we did not have information about neighbourhood social capital or individual connections in the neighbourhood. Of the remaining respondents, 182 people were excluded because they had missing data on demographic and disease characteristics. Univariate and multivariate regression analyses showed no significant differences between respondents who were excluded from the analyses and respondents who were included, with regard to support received, neighbourhood social capital, individual connections in the neighbourhood, and demographic and disease characteristics. The only exception was that people with a lower educational level were more likely to have missing data on support received from neighbours. However, educational level was not related to the likelihood of receiving support from neighbours, the level of social capital of the neighbourhood one lived in, and individual connections in the neighbourhood. Therefore we do not expect that results would be different if we would have been able to include these respondents.

2. RESULTS

2.1. Sample characteristics

Table 1 displays sample characteristics. A little more than half of the people in our sample was female and mean age was 65 years. About a third of the respondents had a low educational level and a quarter of the respondents lived alone. More than half of the respondents had multiple chronic diseases and average illness duration was 14 years. More than one third of the respondents experienced moderate or severe disabilities.

[TABLE 1]

2.2. Support received by neighbours

Almost half (41%) of the people with chronic illness received informal support from one or more social network members.

Fourteen percent of the people with chronic illness in our sample received one or multiple forms of informal support from neighbours, namely: emotional support and understanding (received by 7%); help with domestic work (received by 6%); practical help with chores in and around the house (received by 6%); help with transportation to family, physicians, the hospital or making trips (received by 4%); help arranging practical matters or guidance undertaking activities (received by 2%). The percentage of people with chronic illness who received other types of support from neighbours, such as nursing care, informational support, or help with medical treatment, was less than 1% for each type of support. In the analyses we included the abovementioned five types of support most often received from people in the neighbourhood by people with chronic illness.

2.3. Neighbourhood characteristics

Table 2 shows that average social capital of the neighbourhoods in our sample was lower than the average level of social capital of Dutch neighbourhoods in the WoOn-dataset (a score of zero means exactly average).

[TABLE 2]

2.4. Relationship between support received from neighbours, individual connections in the neighbourhood and neighbourhood social capital

In an empty model, excluding any independent variables, there was no significant neighbourhood variation in support received by neighbours (var = 0.13, std. error = 0.10) (not in table). In Model 1 we included neighbourhood social capital, urbanity and socioeconomic status of the neighbourhood (not in table). There was no significant effect of neighbourhood social capital on the likelihood of receiving support from neighbours (OR = 1.09, 95% CI = 0.92/1.29). In Model 2, including individual neighbourhood connections, urbanity and socioeconomic status of the neighbourhood, there was a significant positive effect of individual neighbourhood connections on the likelihood of receiving support from neighbours (OR = 1.47, 95% CI = 1.20/1.80) (not in table).

In model 3 we included neighbourhood social capital, individual connections in the neighbourhood, urbanity and socio-economic status of the neighbourhood, and

demographic and disease characteristics of people with chronic illness. People with chronic illness were more likely to receive support from neighbours if they were personally more connected to people in the neighbourhood (Table 3). The odds of receiving support from neighbours were higher for people with chronic illness with two or more diseases compared to people with chronic illness with only one disease. Furthermore, the odds of receiving support from neighbours were higher for people with chronic illness with moderate physical disabilities compared to people with chronic illness without physical disabilities. People with severe physical disabilities also more often receive support from neighbours than people without physical disabilities, but this difference does not reach the threshold of significance. People with chronic illness were less likely to receive support from people in the neighbourhood if they lived together with a partner or children. This effect was significant, beyond actually receiving support from other social network members, such as a partner or children.

[TABLE 3]

3. DISCUSSION

In this study we did not find a relationship between neighbourhood social capital and support received from neighbours by people with chronic illness, beyond individual social connections to people in the neighbourhood. As far as we know this is the first study to investigate the relationship between support received by neighbours, neighbourhood social capital and individual social connections in the neighbourhood. Previous studies have focused on the benefits of neighbourhood support for other groups, for instance for elderly in the context of aging in place ([Gardner, 2011](#), [Gray, 2009](#) and [Wiles et al., 2011](#)). Although the average age of people with chronic illness in our sample is 65, and there is thus overlap between 'elderly' in general and our sample of people with chronic illness, we specifically focused on the presence of a chronic illness.

Our results indicate that neighbours are not more likely to provide support for people with chronic illness in neighbourhoods with more neighbourhood level social capital, if people with chronic illness are not personally connected to others in their neighbourhood. This suggests that it is important that people with chronic illness who would benefit from support by neighbours, are connected to people or networks in their neighbourhood that are willing and able to provide social support (as suggested by [Carpiano, 2006](#) and [Carpiano, 2008](#)). It is relevant to discover which resources are available also for those who have poor social connections in their neighbourhood.

Our results show that people with chronic illness with multiple diseases and moderate physical disabilities are more likely to receive support from neighbours than people with chronic illness with only one chronic disease and people with chronic illness without physical disabilities. This confirms that people with chronic illness with a more complex health situation, due to comorbidity and more physical limitations, are more likely to need and therefore use support by neighbours.

We conducted our study in the Netherlands. The Netherlands is a small but densely populated country. The ageing of the population, and corresponding rise of health care costs, provide complex health challenges. To contain costs, the provision of

social support and home care for people with physical disabilities was reformed in 2007 by the introduction of the Social Support Act (Wmo). With the Social Support Act a greater part of the responsibility for the provision of social support was delegated to the municipal level (Kroneman et al., 2016). In 2015 long-term care was reformed and the Social Support Act was extended. This means that municipalities have become more responsible for the wellbeing of vulnerable groups and the fulfilment of their support needs. With this reform there is an increasing emphasis on care at home instead of in institutions. Municipalities have a certain degree of freedom to determine their spending on care and support (Kroneman et al., 2016). This has created opportunity for regional variation in the provision of care and support for vulnerable citizens. Coinciding with the decentralisation of social support and the focus on care at home for those with support needs, there is an increasing focus on individual responsibility for health and self-sufficiency. Before professional care and support is given, municipalities will inquire whether the social network is capable of providing informal care and what social resources people can call on (Kroneman et al., 2016). The shift towards more individual responsibility and self-sufficiency requires a cultural change from a more government-centred health-care system to a more family and neighbourhood-centred healthcare system (Kroneman et al., 2016). The decentralised nature of the Dutch health care system provides a unique cultural and socio-economic context for our study. There are other countries with a decentralised healthcare system, such as the Nordic countries in Europe. The Dutch context differs from the situation in these countries because in the Netherlands policy changes have only been implemented recently and Dutch society is still in a transition period. The reform in 2015 was implemented in a great hurry and caused social unrest because the organization of care changed drastically (Kroneman et al., 2016). Concerns that were voiced before the transition included, among others, the lack of coordination in care provision between municipalities and health insurance companies. Furthermore, there were concerns that providing informal care would become an obligation and the policy changes would create a difficult position for informal caregivers (Kroneman et al., 2016). The policy changes as well as resulting cultural changes and social unrest might play an important role in shaping the provision of support by neighbours for people with chronic illness with support needs. To gain more insight into the contribution of the cultural and socio-economic context of the Netherlands to the results found in our study, it would be beneficial to replicate this study in other countries with a decentralised health care system. Another country-specific aspect that might influence results of this study is the size of neighbourhoods. In this study we used the smallest possible unit of aggregation available to us to measure social capital (based on 4-digit postal codes). The size of neighbourhoods in the Netherlands is generally larger in rural areas than in urban areas. Similar studies in other countries might therefore yield different results if the size and layout of neighbourhoods differs from neighbourhoods in the Netherlands. Previous studies in the Netherlands, that use the same neighbourhood definition, present evidence that neighbourhood social capital is related to individual health (Anonymous, 2014 and Mohnen et al., 2011). However, the effects found in previous studies are small. It is possible that the effect of neighbourhood social capital in these studies is underestimated because of the crude neighbourhood measure used. Hipp (2007) also state that whereas most studies have found that the size of neighbourhood effects is relatively small, this may be due to misspecification of the proper level of

aggregation for these effects. Duncan et al. (2014) suggest the use of egocentric neighbourhoods. Studies have found that self-defined neighbourhoods were different from, and often smaller than, often used neighbourhood boundaries such as a predefined radius around the house and census tract boundaries (Colabianchi et al., 2014 and Coulton, 2012). However, using egocentric neighbourhoods and thus not defining the boundaries of neighbourhoods, we would not be able to study the effect of neighbourhood-level variables.

There is not one single “appropriate” level to study neighbourhood effects. Rather it is possible that the effects of contextual characteristics can work at different geographical levels, also dependent on the outcome of interest. Some effects might be very localized whereas other effects might be present on a larger scale. The assumption with regard to social capital is that with geographic availability, residents run in to each other. Contacts between neighbours can then produce resources and develop a sense of community among neighbours (Völker et al., 2007). We do not know on what scale neighbours are likely to run into each other and build relationships. In our study we did not ask people with chronic illness what the distance was between them and the neighbours they had contact with. Knowledge about physical distance in neighbourhood relations may provide more insight into what the relevant spatial scale is to study resources provided by neighbourhood social capital.

To be able to draw conclusions about the benefits of neighbourhood social capital, it is necessary to gain insight in the resources provided through neighbourhood social capital and the resources that are only accessible through individual connections neighbours. Furthermore, it is important to gain more insight into how health of people with chronic illness can be supported even when individuals themselves lack a social network and are poorly connected to people in their neighbourhood.

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TABLES

Table 1. : Demographic and disease characteristics of people with chronic illness (n = 2.272).

		Percent
Gender	Male	45.6
	Female	54.4
		Mean (sd)
Age in years		65.2 (13.3)
		Percent
Education	Low	32.4
	Intermediate	43.2
	High	21.7
	Unknown	2.7
Household status	Living alone	27.1
	Living with partner and/or children	71.7
	Unknown	1.1
First diagnosed chronic disease	Cardiovascular disease	19.1
	Respiratory disease	29.3
	Musculoskeletal disease	12.3
	Cancer	4.3
	Diabetes	11.7
	Neurological disease	6.4
	Digestive disease	3.9
	Other disease	13.0
Number of chronic diseases	One	43.6
	Two	56.4
Presence and severity of physical disability	No disability	27.5
	mild disability	25.9
	Moderate disability	29.3
	Severe disability	12.2

	Unknown	5.2
	Range	Mean (sd)
Illness duration in years (n = 2.230)	0.28–83	13.8 (10.3)
		Percentage
Support received from people in the neighbourhood (n = 2.082)		14.3
	Range	Mean (sd)
Individual connections in the neighbourhood (based on standardized variables) (n = 2.210)	–1.93–0.88	0.0 (0.8)
Self-rated general health (n = 2.163)	0–100	50.1 (20.8)

Table 2. : Descriptive statistics of neighbourhood level variables.

		Range	Mean (sd)
Neighbourhood social capital (n = 771)		–0.43–0.26	–0.02 (0.10)
	Category		Percent
Urbanity (n = 832)	Urban		18.6
	Semi-urban		29.8
	Intermediate urban-rural		23.9
	Semi-rural		19.3
	Rural		8.4
		Range	Mean (sd)
Neighbourhood socio-economic status (n = 824)	Percentage of households per neighbourhood with a taxable income less than 22,100 euro per year	6–70	26.2

Table 3. : Logistic multilevel regression analysis of the relationship between support received from neighbours, individual connections in the neighbourhood and neighbourhood social capital ($N_i = 1726$, $N_j = 668$)^a.

	Support from neighbours
	Odds ratios (95% CI)
Age	1.00 (0.99/1.01)
Gender	
Male	Ref.
Female	0.89 (0.62/1.29)
Educational level	

	Support from neighbours
	Odds ratios (95% CI)
Low	Ref.
Intermediate	1.29 (0.86/1.94)
High	1.49 (0.92/2.43)
Household status	
Living alone	Ref.
Living together	0.32 (0.22/0.48)***
First diagnosed chronic disease	
Cardiovascular disease	Ref.
Respiratory disease	0.92 (0.53/1.58)
Musculoskeletal disease	0.89 (0.48/1.63)
Cancer	1.05 (0.45/2.46)
Diabetes	1.06 (0.55/2.07)
Neurological disease	0.62 (0.28/1.38)
Digestive disease	0.82 (0.30/2.24)
Other disease	1.05 (0.58/1.92)
Number of chronic diseases	
One	Ref.
Two or more	1.53 (1.05/2.23)*
Illness duration	0.95 (0.80/1.12)
Receives support from other network members, such as partner and children	36.07 (20.52/63.41)***
Receives professional homecare	1.26 (0.81/1.95)
Presence and severity of physical disabilities	
No disabilities	Ref.
Mild disabilities	0.85 (0.47/1.56)
Moderate	1.83 (1.03/3.26)*
severe disabilities	1.38 (0.69//2.74)
Neighbourhood social capital	1.04 (0.85/1.26)
Individual neighbourhood connections	1.75 (1.38/2.23)***
Urbanity	
Urban	Ref.
Semi-urban	1.29(0.72/2.31)
Intermediate urban-rural	1.61 (0.86/3.02)
Semi-rural	0.96 (0.49/1.87)
Rural	0.98 (0.42/2.26)

	Support from neighbours
	Odds ratios (95% CI)
Neighbourhood socioeconomic status	0.99 (0.96/1.01)
Var (neighbourhood) (std. error)	0 (0)

* $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$.

A N_i = number of individuals, N_j = number of neighbourhoods.