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ORIGINAL ARTICLE

Migration and geographical inequalities in health in the Netherlands: an investigation of age patterns

Birthe Jongeneel-Grimen · Mariël Droomers · Karien Stronks · J. A. M. van Oers · Anton E. Kunst

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Abstract
Objectives This paper estimates, for six different age groups, whether and how migration influences inequalities in health between deprived and non-deprived neighbourhoods in the Netherlands.
Methods Data were accessed from the Netherlands Housing Survey 2006. Using multi-level logistic regression analyses, we compared the health of migrants with that of nonmigrants in the area of origin and assessed the role of demographic and socioeconomic characteristics. Next, we assessed the magnitude of health differences between deprived versus non-deprived areas among migrants and non-migrants.
Results For many age groups, migrants into non-deprived areas were healthier and migrants into deprived areas had similar levels of health compared with non-migrant populations in the area of origin. These differences in health were not explained by demographic and socio-economic characteristics. For all ages and for people aged 25–34 years we found smaller area inequalities in health among migrants compared with non-migrants. For most other age groups, about equally large differences were observed.
Conclusions For most age groups, the results do not provide empirical support to the expectation that migration would enlarge health differences between deprived and non-deprived neighbourhoods.

Keywords The Netherlands · Health inequalities · Selective migration · Age patterns · Socioeconomic factors · Morbidity

B. Jongeneel-Grimen (✉) · M. Droomers · K. Stronks · A. E. Kunst
Department of Public Health, Academic Medical Centre, University of Amsterdam, P.O. Box 22660, 1100 DD Amsterdam, The Netherlands
e-mail: b.jongeneel@amc.uva.nl

J. A. M. van Oers
Centre for Public Health Status and Forecasting, National Institute for Public Health and the Environment, Bilthoven, The Netherlands

J. A. M. van Oers
Academic Collaborative Centre for Public Health Brabant, Tranzo, Faculty of Social Sciences, University of Tilburg, Tilburg, The Netherlands

Introduction

An extensive amount of research has shown that people living in deprived areas have higher mortality and poorer physical health. This relationship largely but not entirely disappears once individual-level characteristics are controlled for (Chaix et al. 2006; Curtis et al. 2009; Jongeneel-Grimen et al. 2011). Inequalities in health between deprived and non-deprived areas may have been growing in recent years (Shaw et al. 2000; Davey Smith et al. 2002; Norman et al. 2005; Pearce and Dorling 2006; Leyland et al. 2007; Connolly et al. 2007). The mechanisms that might explain area inequalities in health are not yet fully clear.

One factor that may contribute to the existing area inequalities in health is selective internal migration (Brimblecombe et al. 1999, 2000; Norman et al. 2005; Martikainen et al. 2008). Internal migration between deprived and non-deprived areas may influence the health status of the residents living in these areas.

Many studies have explored, for a wide age range, to what extent migration influenced geographical inequalities in health as observed at a certain point in time (Fox and

Goldblatt 1982; Brimblecombe et al. 1999, 2000; Boyle et al. 2002; Boyle and Duke-Williams 2004; Norman et al. 2005; Connolly and O'Reilly 2007; Martikainen et al. 2008). Some studies concluded that selective migration tends to enlarge area inequalities in health to some extent (Brimblecombe et al. 2000; Norman et al. 2005; Martikainen et al. 2008), whereas others suggested that selective migration did not contribute to these inequalities in health (Boyle et al. 2002; Boyle and Duke-Williams 2004; Connolly and O'Reilly 2007). In a Dutch study (Jongeneel-Grimen et al. 2011) we found that migration of residents aged 18–54 years tended to attenuate inequalities in health between deprived and non-deprived neighbourhoods.

Because the size and composition of migration flows to and from deprived areas vary with age (Brimblecombe et al. 2000), the effect of migration on geographical inequalities in health may be different for different age groups. Young migrants move more often towards deprived areas while old migrants move as often towards deprived as non-deprived areas (Brimblecombe et al. 2000). In addition, elderly are more likely to move if they were ill, while young people are more likely to move if they were healthy (Bentham 1988). Moreover, migration motives have been shown to be highly age-specific (Mulder 1994; Feijten and Visser 2005). Young people migrate more often for becoming independent, for marriage or cohabitation and for educational motives. At age 25–44 years, the principal reasons to move relate to work and improvement in housing and residential environment. For people older than 45 years, health problems may be an important motive to move (Feijten and Visser 2005).

Few studies have assessed the impact of migration on the inequalities in health between deprived and non-deprived areas for different age groups. A Finnish study (Martikainen et al. 2008) showed for both 25- to 44-year-olds and 45- to 64-year-olds that migration had only a relatively small impact on area socioeconomic differences in mortality. Connolly et al. (2007) observed that selective migration accounted for about 50 % of increases in health inequalities between areas for those aged less than 75, while at older ages selective migration attenuated such health inequalities.

The aim of this study was to investigate whether and how migration flows within different age groups influenced inequalities in health between deprived and non-deprived neighbourhoods. In response to the concern of the Dutch public health community with the health of the most deprived urban areas (Ministerie van VROM; Wonen, Wijken en Integratie 2007), we were particularly interested in understanding the health of these deprived areas as compared with other areas. This article is built upon a previous paper by the authors (Jongeneel-Grimen et al. 2011). We used a large-scale nationwide survey in the Netherlands with data on respondents' health and migration history at the postal code level. These data were analysed with two main objectives.

Our first objective was to compare for six specific age groups the health of migrants with the health of non-migrant populations in the areas of origin, and we investigated the extent to which demographic and socio-economic characteristics explained the differences in health between migrants and non-migrants in the areas of origin. In this part of the study, we aimed to assess whether the chance of migration (as compared with staying behind) was associated with health and/or demographic and socio-economic characteristics. Our second objective was to assess, for each of the age groups, the inequalities in health between deprived and non-deprived areas among migrants only and to compare this with the area inequalities observed among non-migrants. We were particularly interested to identify age groups where the differences in health between deprived and non-deprived areas would be larger among migrants than among non-migrants, as these would be the age groups were migration would contribute to widen area inequalities in health.

Methods

Study population

We accessed data from the Netherlands Housing Survey 2006 (WoON06) (Dataset deposited with Data Archiving and Networked Services 2007), conducted by The Ministry of Housing, Spatial Planning, and the Environment. The WoON is a large three-yearly nationwide survey among people aged 18 and over. This survey focuses not only on housing quality and people's housing needs, but also includes data on their health, place of residence and migration histories. The sample was drawn using the continuous municipal population registries. The samples drawn within municipalities were stratified by clusters defined in terms of age, gender, civil status, country of birth and municipality (i.e. living or not in one of the 4 largest municipalities). The sample design took account that some population groups have higher non-response rates. Some municipalities were oversampled. Questionnaires were administered by means of telephone interviews, face to face interviews and by internet. Only one person per household was included in the study. WoON06 had a response rate of 59 %. Data from 61,687 respondents, aged 18–84 years, were included in the analyses.

Measures

Our outcome variables were two health measures, respondents' perceived general health and self-reported

prevalence of one or more longstanding health problems. Perceived general health was measured on a five-point scale using the question "How do you rate your health in general?" We created a dichotomous variable measuring whether respondents were having a "less than good" or a "(very) good" perceived general health. Having one or more longstanding health problems was measured by the following question: "Do you have problems with one or more long-term illnesses, disorders or handicaps?" We created a dichotomous variable measuring whether respondents were having one or more longstanding health problems or not.

One of the two main predictor variables in this study was deprivation status of the area of residence. The current paper distinguished deprived and non-deprived areas based on the Social Status Scores 2006 (Knol 1998).These social status scores were calculated by the Netherlands Institute for Social Research (SCP) for each of the postal areas in The Netherlands, using data on average level of income, employment rate and average level of education. The lowest quintile was defined as being deprived and the four highest quintiles were considered non-deprived areas.

Another main predictor variable was internal migration status. WoON only provides precise data on internal migratory histories going back 2 years. Migrants were, therefore, defined as those who relocated between deprived and non-deprived neighbourhoods during the past 2 years. Non-migrants were defined as those who remained in deprived or non-deprived areas, including those who relocated within deprived or non-deprived areas during the past 2 years.

Several demographic and socio-economic covariates were used to control for potential confounding: gender (male versus female), age (continuous variable), family type (living together versus single), education [four categories, based on the highest educational level achieved: up to elementary, lower secondary (lower vocational education or lower general secondary education), upper secondary (intermediate vocational education, higher general secondary education, or pre-university education), and tertiary education (higher vocational training or university)] and employment status (gainfully employed versus not gainfully employed). Another control variable used is this study was disposable equivalent household income, calculated by dividing the disposable household income by the square root of the number of household members (Buhmann et al. 1988) (categorized in quartiles: 1st quartile (<11,836 €), 2nd quartile (11,836–16,725 €), 3rd quartile (16,726–23,388 €) and 4th quartile (>23,388)).

Item non-response rate was less than 0.5 % for most variables except for family type (25.6 %). Non-respondents on this variable were included in the analyses by including a separate category for missing values.

Age groups

To investigate age patterns in migration and area inequalities in health, we distinguished the following age groups: 18–24 years, 25–34 years, 35–44 years, 45–54 years, 55–64 years and 65–84 years. A broader 20-year age group was chosen for the oldest age group because the frequency of migration at older ages and the statistical power were low.

Data analyses

First, age-specific prevalence rates of the two health measures were calculated for migrants and non-migrants in deprived and non-deprived areas. In order to take into account the large differences in age structure of migrant and non-migrant populations, even within some 10-year age groups (e.g. 25–34 years), all prevalence rates were in addition standardised by 5-year age group. We applied the direct standardisation method, using as the standard population the Dutch population in 2008.

Second, for both health indicators, multi-level multivariable logistic regression models were estimated using the statistical package R (version 2.12.1). To account for possible dependencies between observations within a neighbourhood, we included random intercepts in the model. Level 1 was defined as the individual level, and level 2 was defined as neighbourhood level. To address the first specific objective, we assessed differences in health between migrant and non-migrant populations from the same areas of origin. For each age group, this was assessed by including an interaction term in the model between migration status and deprivation status of the area of origin. The Wald test was used to test the significance of the odds ratios (ORs). In this step, we first controlled for gender and age only, and then we added family type, education, household income and employment status as additional control variables.

To address the second specific objective, we assessed inequalities in health between deprived and non-deprived areas for the migrant and for the non-migrant population. For each age group, this was assessed by including an interaction term in the model between migration status and deprivation status of the area of actual residence. The Wald test was used to test the significance of the ORs. Also in this step, we first controlled for gender and age only, and then we additionally controlled for family type, education, household income and employment status. In addition, the likelihood ratio test was performed of the models with full control to test the interaction effect of migrant status. The results presented below include ORs and their 95 % confidence intervals, the variances of the random intercepts and the p values of the likelihood ratio test.

Results

Table 1 shows, for all age groups, that most people remained living in deprived or non-deprived areas during the preceding 2 years. In total 1,172 participants (1.9 %) moved downwards from non-deprived areas towards deprived areas, while 1,110 participants (1.8 %) moved upwards. The size of the migrant population was largest in the age groups 18–24 and 25–34 years and smallest in the age group 65–84 years. For almost all age groups, migrants living in deprived areas and non-migrants living in deprived areas were more often single than the other groups. For almost all age groups, migrants living in non-deprived areas more often were highly educated compared with those who stayed in deprived areas. Migrants living in deprived areas at ages 35–44 years were more often less educated, while those aged 45–54 years were more often highly educated, compared with those who stayed in non-deprived areas.

For the six age groups, Tables 2 and 3 assess the relationship of migration with less than good general health and with any longstanding health problems, respectively. For most age groups migrants originating from deprived areas were healthier than those who stayed behind in the deprived areas. These health differences were statistically significant for all age groups together [OR 0.68 (0.56–0.83)] and for migrants aged 25–34 (limited control and general health only) [OR 0.66 (0.44–1.00)], 35–44 [OR 0.45 (0.28–0.73)] and 55–64 years [OR 0.56 (0.33–0.95)], but not for migrants in the other age groups. For longstanding health problems, an opposite pattern was observed for migrants in the oldest age group, who were unhealthier than peers who stayed in deprived areas [OR 1.72 (1.05–2.82)]. For migrants originating from non-deprived areas, marked age patterns were observed. Migrants aged 35–44 and 45–54 years were unhealthier [OR 2.58 (1.73–3.85); OR 2.20 (1.44–3.36), respectively], while no differences in health were found for migrants in other age groups, compared with those who stayed in non-deprived areas. The better health of migrants moving out of deprived areas as compared with the population in the areas of origin could not be explained by demographic and socio-economic characteristics. However, these characteristics could explain part of the worse health of migrants aged 35–54 years and coming from non-deprived areas.

Tables 4 and 5 show that for all age groups together and for people aged 25–34 years health inequalities between deprived and non-deprived areas were smaller in the migrant population than in the non-migrant population. For most other age groups, about equally large differences in health inequalities between migrant and non-migrant populations could be observed, even though this cannot be demonstrated with statistical significance possibly due to small number of cases. Only for the age group 35–44 years, area inequalities in health among migrants seem larger [for general health and the model with full control: OR 2.51 (1.37–4.62)] than the area inequalities in health within the non-migrant population [OR 2.26 (1.96–2.60)], although not statistically significant. For all age groups, significant area inequalities in health were found for non-migrants. In contrast, the health of migrants (for all age groups together) did not clearly differ between deprived and non-deprived areas [OR 1.08 (0.82–1.41)]. When controlling for demographic and socio-economic variables, the differences in health between deprived and non-deprived areas was reduced to a small extent in almost all age groups. The reduction was largest for migrants and non-migrants aged 35–54 years. The Likelihood ratio test showed that, for some age groups, the odds ratio of migrants was statistically different (smaller) from the odds ratio of non-migrants ($p \leq 0.05$), while for many other age groups the p value was small but not below the 0.05 level.

Discussion

This study explores potential differences between age groups with regard to the effect of migration on inequalities in health between deprived and non-deprived areas in the Netherlands. First, we found that, for all ages and people aged 35–44 and 55–64 years, migrants moving out of deprived areas were healthier than those who stayed behind. These health differences were not attributable to demographic and socio-economic characteristics. Migrants aged 35–54 years and moving out of non-deprived areas were unhealthier that those who stayed behind, while no such differences in health were found in other age groups. These health differences were only partly attributable to demographic and socio-economic characteristics. Second, for all ages together and for people aged 25–34 years we found smaller area inequalities in health among migrants compared with non-migrants. For most other age groups, about equally large differences were observed. Only for the age group 35–44 years, area inequalities in health among migrants were slightly larger than among non-migrants. For most age groups, the results do not provide empirical support to the expectation that migration would enlarge inequalities in health between deprived and non-deprived neighbourhoods.

Evaluation of data

The strength of this study is the availability of data on health status in a large representative sample of the

Table 1 Descriptive statistics of (non) migrants living in deprived and non-deprived areas for six age groups, The Netherlands 2006

Age groups (years)	18–24	25–34	35–44	45–54	55–64	65–84	All
Number of respondents	8,163	9,751	11,522	10,777	9,544	11,930	61,687
% Migrants living in deprived areas	4.2	4.0	1.5	1.0	0.7	0.6	1.9
% Migrants living in non-deprived areas	1.9	4.4	2.1	1.1	0.8	0.6	1.8
% Non-migrants living in deprived areas	24.4	28.0	24.9	24.3	24.8	28.9	26.0
% Non-migrants living in non-deprived areas	69.5	63.6	71.5	73.7	73.6	70.0	70.4
Gender: % women							
Migrants living in deprived areas	57.1	51.7	45.7	53.2	58.0	55.2	53.1
Migrants living in non-deprived areas	68.2	52.2	50.8	55.3	51.3	58.8	54.9
Non-migrants living in deprived areas	48.4	48.5	50.1	52.9	53.8	61.7	53.1
Non-migrants living in non-deprived areas	46.4	48.0	52.0	51.6	52.4	59.5	52.1
Family type: % single							
Migrants living in deprived areas	34.0	10.1	22.3	26.1	2.4	0.0	18.6
Migrants living in non-deprived areas	14.6	9.2	15.7	12.8	1.9	6.1	11.2
Non-migrants living in deprived areas	26.8	20.5	23.4	22.0	10.2	6.9	18.8
Non-migrants living in non-deprived areas	14.4	9.5	10.8	12.2	5.6	5.4	9.9
Socioeconomic variables							
Education level: % lowest 2 education groups[a]							
Migrants living in deprived areas	41.2	41.8	48.3	33.9	42.0	43.9	42.0
Migrants living in non-deprived areas	42.0	41.9	37.0	49.1	39.2	35.4	41.0
Non-migrants living in deprived areas	44.6	43.3	43.2	43.4	42.8	41.5	42.7
Non-migrants living in non-deprived areas	41.4	42.1	43.1	42.9	41.6	42.7	42.4
Income level: % lowest 2 income groups[b]							
Migrants living in deprived areas	49.0	56.0	57.2	43.1	37.7	49.3	51.4
Migrants living in non-deprived areas	57.3	52.9	52.1	57.0	52.5	41.2	53.0
Non-migrants living in deprived areas	50.9	52.6	51.5	51.2	50.2	45.9	50.2
Non-migrants living in non-deprived areas	51.0	52.1	50.1	50.4	48.6	47.3	49.8
Employment status: % not gainfully employed							
Migrants living in deprived areas	36.4	43.2	41.6	35.8	40.6	46.3	40.3
Migrants living in non-deprived areas	40.8	47.1	40.0	39.5	43.8	38.2	43.0
Non-migrants living in deprived areas	41.0	42.3	43.8	40.6	42.9	41.3	42.0
Non-migrants living in non-deprived areas	40.7	40.8	42.5	40.7	42.3	41.8	41.5

[a] The following were the two lowest education groups: up to elementary education and lower secondary education (as opposed to those with upper secondary education and tertiary education)

[b] The two lowest income groups were the 1st (<11,836 €) and 2nd (11,836–16,725 €) quartile groups (as opposed to the two highest quartile groups: 3rd quartile (16,726–23,388 €) and 4th quartile (>23,388))

national Dutch population aged 18–84 years. However, potential limitations of these data merit consideration.

First, by using a two-year definition of migration, it is possible that we underestimate, although capture, the effects of migration. However, even were we to have complete residential histories for all respondents in the study, it would be hard to decide what the most proper migration window would be. Half of the studies that have assessed the influence of migration on area inequalities in health used a migration window shorter than 10 years (Fox and Goldblatt 1982; Boyle et al. 2002; Boyle and Duke-Williams 2004; Connolly and O'Reilly 2007; Jongeneel-Grimen et al. 2011) and the other half used a longer migration window (Brimblecombe et al. 1999, 2000; Norman et al. 2005; Connolly et al. 2007; Martikainen et al. 2008). These short-window studies suggest that migration does not strengthen the health-deprivation relationship (Boyle et al. 2002; Boyle and Duke-Williams 2004; Connolly and O'Reilly 2007; Jongeneel-Grimen et al. 2011), whereas most studies who used a long migration window found a large impact of the migration process on area differences in health (Brimblecombe et al. 1999, 2000; Norman et al. 2005).

Second, the response rate was 59 %. Non-response includes people that were unapproachable because of recent death, recent emigration, or untraceable address. If

Table 2 Age-specific prevalence rates and odds ratios (ORs) comparing migrants to non-migrants from the area of origin for the risk of having less than good perceived general health, The Netherlands 2006

Age (years) and migrant group	Prevalence rate[a] (%)		Number of respondents	OR migrants vs. non-migrants (95 % confidence interval)		Area-level variance[b]
	Migrants	Non-migrants		Limited control[c]	Full control[d]	
18–24/Areas of origin:			8,136			0.44
Deprived	2.55	5.83		0.33 (0.11–1.03)	0.34 (0.11–1.02)	
Non-deprived	2.92	3.84		0.65 (0.32–1.33)	0.56 (0.27–1.15)	
25–34/Areas of origin:			9,751			0.13
Deprived	7.21	10.37		0.66 (0.44–1.00)*	0.74 (0.49–1.11)	
Non-deprived	5.70	5.94		0.96 (0.60–1.53)	0.91 (0.57–1.45)	
35–44/Areas of origin:			11,522			0.17
Deprived	8.64	18.85		0.43 (0.27–0.69)*	0.45 (0.28–0.73)*	
Non-deprived	20.18	8.33		3.01 (2.02–4.48)*	2.58 (1.73–3.85)*	
45–54/Areas of origin:			10,777			0.02
Deprived	27.21	29.01		0.83 (0.54–1.30)	0.87 (0.56–1.36)	
Non-deprived	31.49	14.83		2.62 (1.73–3.98)*	2.20 (1.44–3.36)*	
55–64/Areas of origin:			9,544			0.00
Deprived	22.38	34.75		0.55 (0.32–0.93)*	0.56 (0.33–0.95)*	
Non-deprived	21.28	21.64		1.01 (0.57–1.80)	0.97 (0.54–1.73)	
65–84/Areas of origin:			11,930			0.06
Deprived	46.40	43.46		1.06 (0.65–1.74)	1.08 (0.66–1.78)	
Non-deprived	41.21	35.32		1.26 (0.76–2.09)	1.24 (0.74–2.05)	
All/areas of origin:			61,687			0.05
Deprived	19.99	24.83		0.66 (0.54–0.81)*	0.68 (0.56–0.83)*	
Non-deprived	21.90	15.49		1.41 (1.16–1.70)*	1.28 (1.05–1.55)*	

* The association is statistically significant with $p \leq 0.05$, two-sided test

[a] The age-specific prevalence rates are age-standardised (calculated by 5-year intervals) using the Dutch population for the year 2008 as the standard population

[b] Proportion of variance explained by the random area-level component in the regression model with full control

[c] Control variables include gender and age only

[d] Control variables include gender, age, family type, education, equivalent household income, and employment status

the non-response were to be strongly related both to migration status and to health status, this would have biased our results. The WoON survey, however, documents that non-response is hardly related to deprivation status. The response rate for deprived neighbourhoods was 56 % and for other neighbourhoods in the Netherlands it was 60 %. The relationship to migration status is not documented. Thus, although non-response bias cannot be excluded, we do not see a major reason to expect this effect to be large.

Finally, in this study health was ascertained after respondents had moved. Migration is considered a stressful life-event that could be linked with higher chances of developing illness (Holmes and Rahe 1967). Therefore, migration could have influenced health status in such a way as to increase the prevalence of ill-health among migrant populations. As a result, health differences between migrants and those who stay in areas of origin (shown in Tables 2, 3) may reflect both the effect of migration on health and the other way around. In this paper, however, we do not aim to disentangle the causal mechanisms underlying the health status of migrants. Instead, we aimed to assess whether migrants could have influenced area inequalities in health as observed at one specific point in time (shown in Tables 4, 5).

Comparison with other studies and explanations

For most age groups, the results do not provide empirical support to the expectation that migration would enlarge health differences between deprived and non-deprived neighbourhoods. The smaller differences in health among migrants even suggest that migration possibly attenuates area inequalities in health. In line with our results,

Table 3 Age-specific prevalence rates and odds ratios (ORs) comparing migrants with non-migrants from the area of origin for the risk of having a longstanding health problem, The Netherlands 2006

Age (years) and migrant group	Prevalence rate[a] (%)		Number of respondents	OR migrants vs. non-migrants (95 % confidence interval)		Area-level variance[b]
	Migrants	Non-migrants		Limited control[c]	Full control[d]	
18–24/Areas of origin:			8,136			0.00
Deprived	7.01	8.25		0.76 (0.40–1.43)	0.74 (0.39–1.40)	
Non-deprived	10.79	8.65		1.20 (0.84–1.71)	1.00 (0.69–1.46)	
25–34/Areas of origin:			9,751			0.13
Deprived	11.23	13.85		0.81 (0.58–1.13)	0.85 (0.61–1.19)	
Non-deprived	11.98	11.85		0.99 (0.71–1.38)	0.92 (0.66–1.28)	
35–44/Areas of origin:			11,522			0.04
Deprived	11.74	20.71		0.52 (0.34–0.78)*	0.55 (0.36–0.83)*	
Non-deprived	21.10	14.62		1.69 (1.16–2.45)*	1.48 (1.02–2.16)*	
45–54/Areas of origin:			10,777			0.03
Deprived	35.18	31.52		1.04 (0.69–1.56)	1.08 (0.71–1.63)	
Non-deprived	29.38	21.00		1.56 (1.03–2.39)*	1.34 (0.87–2.05)	
55–64/Areas of origin:			9,544			0.06
Deprived	26.08	38.97		0.56 (0.33–0.93)*	0.56 (0.33–0.93)*	
Non-deprived	37.87	29.44		1.44 (0.88–2.37)	1.37 (0.83–2.26)	
65–84/Areas of origin:			11,930			0.02
Deprived	58.01	45.55		1.71 (1.04–2.79)*	1.72 (1.05–2.82)*	
Non-deprived	47.66	39.16		1.39 (0.85–2.26)	1.35 (0.83–2.20)	
All/Areas of origin:			61,687			0.02
Deprived	25.85	27.57		0.79 (0.66–0.93)*	0.80 (0.67–0.95)*	
Non-deprived	27.39	21.37		1.30 (1.11–1.53)*	1.17 (1.00–1.37)	

* The association is statistically significant with $p \leq 0.05$, two-sided test

[a] The age-specific prevalence rates are age-standardised (calculated by 5-year intervals) using the Dutch population for the year 2008 as the standard population

[b] Proportion of variance explained by the random area-level component in the regression model with full control

[c] Control variables include gender and age only

[d] Control variables include gender, age, family type, education, equivalent household income, and employment status

Connolly et al. (2007) found that at older ages migration is narrowing mortality differentials between areas. Similarly, Martikainen et al. (2008) only found a small effect on area inequalities in health for participants aged 45–64 years and suggested such a small effect at ages 25–44 years. Our results suggest that the role of migration may strongly vary within the latter age group and that a distinction should be made between those younger versus older than about 35 years.

Among people aged 35–44 years, migration seems to maintain the size of inequalities in health between deprived and non-deprived neighbourhoods. Especially in this age group, migrants moving into deprived areas are much unhealthier than those moving into non-deprived areas. Our results suggest an important role of demographic and socio-economic factors. In this age group, migrants moving out of non-deprived areas had a lower income level compared with migrants moving out of deprived areas. In addition, in this age group, the proportion of people who receive welfare was approximately three times larger for the migrants moving out of non-deprived areas. Welfare recipients have poor health (Taylor and Barusch 2004; Vozoris and Tarasuk 2004) and struggle with numerous health problems (e.g. poorer physical functioning, increased risk of cardiovascular disease, anxiety, pain), have a higher level of psychological distress, reduced psychological well-being and are more likely to experience mental disorders (Kaplan et al. 2005; Caron et al. 2007; Baigi et al. 2008; Butterworth et al. 2011). A second explanation relates to marital and family status. For the age group 35–44 years, we found that migrants moving out of non-deprived areas were more likely to be single as compared with migrants moving out of deprived areas. Adults without a partner have a worse health and a higher chance

Table 4 Odds ratios (ORs) comparing deprived to non-deprived areas for the risk of having less than good perceived general health, The Netherlands 2006

Migration status	Number of respondents	OR deprived areas vs. non-deprived areas (95% confidence intervals)		Area-level variance[a]	*p* value of LR test[d]
		Limited control[b]	Full control[c]		
18–24 years	8,136			0.44	0.74
Migrants living in		1.27 (0.35–4.62)	1.16 (0.32–4.19)		
Non-migrants living in		1.54 (1.17–2.03)*	1.43 (1.09–1.88)*		
25–34 years	9,751			0.13	0.01
Migrants living in		0.79 (0.43–1.43)	0.74 (0.41–1.35)		
Non-migrants living in		1.83 (1.54–2.19)*	1.65 (1.38–1.98)*		
35–44 years	11,522			0.17	0.73
Migrants living in		2.74 (1.49–5.02)*	2.51 (1.37–4.62)*		
Non-migrants living in		2.56 (2.23–2.95)*	2.26 (1.96–2.60)*		
45–54 years	10,777			0.02	0.09
Migrants living in		1.34 (0.74–2.43)	1.22 (0.66–2.22)		
Non-migrants living in		2.35 (2.10–2.62)*	2.08 (1.86–2.32)*		
55–64 years	9,544			0.00	0.10
Migrants living in		0.96 (0.44–2.10)	0.95 (0.43–2.08)		
Non-migrants living in		1.92 (1.73–2.13)*	1.83 (1.65–2.03)*		
65–84 years	11,930			0.06	0.13
Migrants living in		0.83 (0.41–1.68)	0.81 (0.40–1.64)		
Non-migrants living in		1.42 (1.30–1.56)*	1.41 (1.29–1.54)*		
All	61,687			0.05	0.00
Migrants living in		1.15 (0.88–1.51)	1.08 (0.82–1.41)		
Non-migrants living in		1.84 (1.73–1.94)*	1.74 (1.64–1.83)*		

* The association is statistically significant with $p \leq 0.05$, two-sided test

[a] Proportion of variance explained by the random area-level component in the regression model with full control

[b] Control variables include gender and age only

[c] Control variables include gender, age, family type, education, equivalent household income, and employment status

[d] The likelihood ratio test of the models with full control, to assess whether the odds ratio of migrants is different from the odds ratio of non-migrants

of dying than adults with a partner (House et al. 1988; Joung et al. 1995; Schoenborn 2004). Furthermore, for this age group, a larger proportion of migrants moving out of non-deprived areas belonged to a one-parent family compared with migrants moving out of deprived areas. Belonging to a one-parent family is strongly associated with overall morbidity (Bijl et al. 1998).

Our results suggest that in many age groups, migrants moving out of deprived areas are healthier compared with people who stay behind in deprived areas. However, the opposite was true for elderly migrants who were unhealthier than the people who stayed in deprived areas. It has been shown that elderly people are more likely to move if they were ill (Bentham 1988). It is likely that an important part of elderly people who move out of deprived areas may do so because of poor health and the ensuing need to live close to health care facilities.

Implications

Given the relationship between migration and health, it is generally expected that selective migration contributes to inequalities in health between deprived and non-deprived areas. However, this study shows that in most age groups, including the elderly, selective migration does not seem to have enlarged these inequalities. It is only among middle-aged people that health-selective migration could have enlarged inequalities in health between deprived and non-deprived areas. We should, however, note that the number of middle-aged people that are migrating between deprived and non-deprived areas is relatively small, especially as compared with younger ages (Table 1). As a result, the effect of migration at ages 35–44 years on area inequalities in health, if any, can only be modest.

Table 5 Odds ratios (ORs) comparing deprived to non-deprived areas for the risk of having a longstanding health problem, The Netherlands 2006

Migration status	Number of respondents	OR deprived areas vs. non-deprived areas (95 % confidence intervals)		Area-level variance[a]	p-value of LR test[d]
		Limited control[b]	Full control[c]		
18–24 years	8,136			0.00	0.11
Migrants living in		1.68 (0.83–3.39)	1.55 (0.77–3.14)		
Non-migrants living in		0.94 (0.78–1.13)	0.88 (0.73–1.06)		
25–34 years	9,751			0.13	0.51
Migrants living in		1.02 (0.66–1.60)	0.96 (0.61–1.50)		
Non-migrants living in		1.19 (1.02–1.37)*	1.12 (0.97–1.30)		
35–44 years	11,522			0.04	0.20
Migrants living in		2.13 (1.24–3.67)*	1.98 (1.14–3.41)*		
Non-migrants living in		1.53 (1.36–1.71)*	1.37 (1.22–1.54)*		
45–54 years	10,777			0.03	0.03
Migrants living in		0.87 (0.49–1.56)	0.80 (0.45–1.44)		
Non-migrants living in		1.72 (1.55–1.91)*	1.55 (1.39–1.72)*		
55–64 years	9,544			0.06	0.68
Migrants living in		1.72 (0.85–3.47)	1.69 (0.83–3.43)		
Non-migrants living in		1.51 (1.36–1.68)*	1.45 (1.30–1.61)*		
65–84 years	11,930			0.02	0.04
Migrants living in		0.63 (0.32–1.26)	0.62 (0.31–1.23)		
Non-migrants living in		1.29 (1.18–1.40)*	1.27 (1.17–1.38)*		
All	61,687			0.02	0.17
Migrants living in		1.20 (0.95–1.50)	1.12 (0.89–1.40)		
Non-migrants living in		1.38 (1.32–1.45)*	1.31 (1.25–1.38)*		

* The association is statistically significant with $p \leq 0.05$, two-sided test

[a] Proportion of variance explained by the random area-level component in the regression model with full control

[b] Control variables include gender and age only

[c] Control variables include gender, age, family type, education, equivalent household income, and employment status

[d] The likelihood ratio test of the models with full control, to assess whether the odds ratio of migrants is different from the odds ratio of non-migrants

We conclude that, even though selective migration could in principle enlarge health inequalities it may more likely have the effect to reduce the unequal distribution of health within cities. These insights are important for health impact evaluations of neighbourhood improvement programmes such as the Dutch district approach. The success of such programmes in reducing inequalities in health between deprived and non-deprived areas may depend on the extent to which they would be able to change migration flows in such a way as to attract well-to-do people from elsewhere and prevent out-migration of residents with a favourable social position and good health. For this, it may be critical for neighbourhood programmes to retain well-to-do residents by improvement of living conditions and housing stock, especially for middle-aged people and their families.

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