Involuntary staying and self-rated health: A multilevel study on housing, health, and neighbourhood effects

Final manuscript
Urban Studies 2019 (online before print)
First Published March 27, 2019
DOI: 10.1177/0042098019827521

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Keywords:
Self-rated health;
Residential mobility;
Moving intentions;
Housing;
Neighbourhood effects;
Segregation

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Abstract

Involuntary staying, or a desire to move without the possibility to do so, is an under-studied topic. In this study, we examine involuntary staying among the residents of post-WWII Finnish housing estates; we study its frequency, association with self-rated health and role in the relationship between neighbourhood disadvantage and self-rated health. Involuntary staying and poor health are expected to be associated through long-term stress related to housing and health-based selection in inconvenient housing outcomes. Furthermore, we address the self-perceived reasons for involuntary staying and the interaction between involuntary staying and household income. Two types of involuntary staying are distinguished, depending on whether a resident wants to move within or away from one's current neighbourhood. The survey data (n = 7369) from a stratified cluster sample of the residents of 70 Finnish housing estate neighbourhoods are combined with the corresponding geo-referenced register data on these neighbourhoods' sociodemographic characteristics. Of the residents, 35% are found to be involuntary stayers, and over half of the involuntary stayers want to move away from their current neighbourhoods. Financial concern is the most common self-perceived reason for involuntary staying. Both types of involuntary staying are associated with low self-rated health after adjusting for potential confounders. Being trapped in the current neighbourhood partially mediates the adjusted association between neighbourhood disadvantage and self-rated health. The association between self-rated health and involuntary staying is not modified by household income. In conclusion, involuntary staying is common in the study population and furthers the understanding about neighbourhood inequalities in health.

1 Introduction

Although residential mobility is a central in urban policy (Imbroscio 2012) and labour markets (EESC 2007; Sánchez and Andrews 2011), little is known about involuntary staying (Wiseman 1980) or blocked mobility (Stokols and Shumaker 1982). When a move is preferred but considered impossible due to the lack of financial resources, for example, the situation of being trapped in the current residential setting arises. Unfulfilled housing preferences, such as those related to apartment size (Clark and Huang 2003), have been theorised to cause housing stress (Brown and Moore 1970), which may imply problems with health and well-being (see Shaw 2004). However, prior evidence on involuntary staying and its implications is limited. To address this gap, we demonstrate in this study that involuntary staying sheds new light on neighbourhood inequalities in health. The association between residing in a disadvantaged neighbourhood and various negative health outcomes is well documented (Pickett and Pearl 2001; Riva et al. 2007) but remains inadequately understood. Our study opens a novel theoretical perspective on the topic as we examine the role of *involuntary staying* in neighbourhood inequalities in health. In brief, we assume that involuntary staying and the related housing stress are more common in disadvantaged areas, which may partly explain why health problems also occur more frequently there. We develop this argument in more detail in Section 2.

Empirically, we focus on post-World War II (WWII) Finnish housing estates, which connects our study to the European housing estate literature, specifically the discussions on tenure mixing. During the first few decades after WWII, modernist suburban housing estates were built widely across Europe to meet the high demand for housing. Many of these neighbourhoods were originally considered attractive places to live but now suffer from a poor reputation and concentrated disadvantage (Musterd and Van Kempen 2007). However, not all estate neighbourhoods are disadvantaged; in the Finnish case, considerable sociodemographic variation exist among housing estates (Kemppainen and Saarsalmi 2015; Stjernberg 2015).

Finnish municipalities are relatively strong and autonomous, whereby they have forged different approaches to address urban questions, such as social segregation. For example, an early version of the tenure-mixing policy was formulated in Helsinki in the 1960s, following episodes of youth unrest in one social housing estate; subsequently, the City of Helsinki adopted the objective to safeguard social order through a mixed tenure structure (Schulman 2000). Due to variation in the tenure-mixing policies, considerable socioeconomic differences exist among these areas, which in turn have implications for the local social order (Kemppainen et al. 2018). Moreover, given the unequal regional development and the increasing urban segregation, estate neighbourhoods have also become more differentiated from one another over the last three decades (Vaattovaara and Kortteinen 2003; Stjernberg 2015). Thus, our choice of research areas provides a good possibility to study the spatial variation of disadvantage, the corresponding health implications and especially the role of involuntary staying in neighbourhood inequalities.

We examine two further questions unaddressed by the prior literature. First, we explore self-perceived reasons for involuntary staying to shed more light on the lived experience of – and the subjective reasoning on – being trapped in an inconvenient residential setting. Second, we examine whether household income modifies the association between self-rated health and involuntary staying. Specifically, low income narrows the range of available housing options, which should make involuntary staying more stressful and thus more harmful to health.

To sum up, we address the following research questions:

1. How common is involuntary staying, and what are the reasons given for it?
2. Are both kinds of involuntary staying (the desire to move either within or away from the current neighbourhood) associated with self-rated health?
3. Does household income modify the association between involuntary staying and self-rated health?
4. Does involuntary staying in the neighbourhood mediate the association between neighbourhood disadvantage and self-rated health?

2 Background

2.1 Prior studies on involuntary staying

Prior studies on involuntary staying are few and heterogeneous in terms of conceptualisations, designs and populations. However, their findings imply that involuntary staying is a fairly common experience. A study on four Scottish neighbourhoods found that in the most deprived area, 40% of the respondents were involuntary stayers, while the rate was 10–15% in the more affluent areas (Atkinson and Kintrea 2001). A study on 29 problematic estates in ten European countries reported that 9% comprised unsatisfied and trapped respondents (Musterd and Van Kempen 2007), while Strochschein (2012) found a rate of 10% among Canadian seniors. Finally, a study using the British Household Panel Survey noted that approximately 30% of the respondents were involuntary stayers (Coulter and Van Ham 2013). Further evidence on the frequency of involuntary staying in different populations and contexts is needed since the phenomenon is highly relevant in terms of public health, as we show in the next section.

2.2 Involuntary staying and self-rated health

Theoretically, involuntary staying is characterised by a long-term imbalance between the housing needs of a household and its current residential environment, which creates housing stress (Brown and Moore 1970; see also Bailey et al. 2013). In Brown and Moore's (1970) classic relocation model, the first phase is the decision to seek a new residence, which is driven by changed demands concerning the residential environment, that is, the apartment itself and the location factors. For example, a household's space requirements change over time, which has been found to be a strong trigger of relocation decisions (Rossi 1955; Clark and Huang 2003). The old location may also turn out to be inconvenient due to new employment in a more distant place, for example (Brown and Moore 1970). Further relevant housing stress factors include the material aspects of housing (e.g., cold, heat, mould) and issues concerning insecurity, the local social order, crime and service supply (Brown and Moore 1970; Morenoff and Sampson 1997; Chandola 2001; Shaw 2004; Kim 2008).

Over the long term, the housing imbalance disturbs a household's everyday life and creates housing stress, depending on the severity of this disturbance, the tolerance towards it (Brown and Moore 1970) and the capacity to adapt to the current situation. Given that housing is a major social determinant of health (Shaw 2014), enduring housing stress likely implies health problems. Theoretically, the perception that there is no escape to better conditions makes the experience of involuntary staying more stressful (see Magaletta and Oliver 1999). The health implications of accumulated stress exposure have been well established in the literature on allostatic load or cumulative physiological 'wear and tear' (Juster et al. 2001; Goldstein and McEwen 2002). Long-term stress is considered to have various negative health implications, including depression, diabetes and cardiovascular problems (Golstein and McEwen 2002; Brunner and Marmot 2006). Highly relevant from an urban studies perspective, the accumulated experience of neighbourhood

disadvantage over a person's life course was found to predict a higher subsequent allostatic load (Gustafsson et al. 2014).

We complement the housing stress approach by focusing on the selective nature of residential mobility, which is heavily driven by demographic factors (Clark and Huang 2003; Bailey et al. 2013). For example, young migrants tend to be healthier than their non-relocating counterparts (Bentham 1988; Norman et al. 2005). To extrapolate this line of thought, the relationship between involuntary staying and health can be approached from the perspective of *health-based selection* to different housing outcomes (Smith 1990; Smith and Easterlow 2005). Pre-existing health problems may hinder the realisation of the intention to leave unsatisfactory residential settings because of insufficient economic or psychosocial resources, among others (Smith 1990; Phinney 2013; Woodhead et al. 2015). This way, health problems may imply selection in suboptimal housing outcomes. Hence, the relationship between involuntary staying and health is reversed when compared with the housing stress approach, where involuntary staying is considered a cause of poor health.

Based on these perspectives, we expect that *both kinds of involuntary staying are related to low self-rated health. (H1)*

Prior empirical evidence on the relationship between involuntary staying and health is limited. Stokols et al. (1983) analysed survey data on 242 university employees and found that being trapped in low-quality residential settings was associated with health problems. Strohschein (2012) utilised a larger survey dataset on older residents and found that involuntary staying was associated with psychological distress and low self-rated health. Finally, using the UK Household Longitudinal Study, Woodhead et al. (2015) analysed the relationship between mental health and residential mobility. Their study found evidence of a possible bidirectional relationship between mental health problems and involuntary staying (see also Smith and Easterlow 2005; Phinney 2013), corroborating both the housing stress and the selection perspectives presented above.

The experience and the implications of involuntary staying may depend on other factors, most notably, household income. It is well known that financial resources constitute a key factor that determines the range of available options in the housing markets. As Hedman and Van Ham (2012, 89) aptly stated, "The more one earns, the larger the choice set of dwellings and neighbourhoods". Following this line of thought, we argue that due to lower-income households' smaller pool of realistic options in the housing markets, their involuntary staying is more stressful compared to more affluent households with more choices. Thus, we expect that *involuntary staying is more strongly related to low self-rated health among low-income households compared with their wealthier counterparts. (H2)*

2.3 Involuntary staying and health inequalities across neighbourhoods

The scant prior literature on involuntary staying has considered the phenomenon without further distinctions. Following Brown and Moore's (1970) conceptualisation of the residential environment in terms of apartment and location factors, we propose the following distinction that depends on *where a household desires to move*. First, a household may want to stay in its current neighbourhood but may prefer to move to a different apartment in the same area. In other words, the relevant search space may exclude other neighbourhoods (ibid.; see also Hedman and Van Ham 2012). If suitable apartments are unavailable within the household's price and preference range and if the situation endures for some time, housing stress is generated. This is the case of being *trapped in an inconvenient apartment*. Second, the contrary situation arises when the apartment itself is fine but location has become unsatisfactory, which leads to housing stress stemming from *being trapped in an inconvenient location or neighbourhood*.

The key motivation for this conceptual distinction stems from our desire to address health inequalities across neighbourhoods from the perspective of involuntary staying. We suggest that involuntary staying or more precisely, *being trapped in the neighbourhood, is an important factor in health-related neighbourhood differences*. As mentioned above, there is ample evidence on the relationship between neighbourhood disadvantage and various negative health outcomes (Pickett and Pearl 2001; Riva et al. 2007). It is well known that disadvantaged neighbourhoods are also often characterised by problems with social disorder (Sampson and Raudenbush 1999; Kemppainen et al. 2018), as well as low residential satisfaction (Kearns and Parkes 2003). Consequently, the push factors that generate the intentions to move away from disadvantaged neighbourhoods are likely stronger than in more affluent areas; at the same time, the average financial means to realise these intentions are weaker by definition (cf. Atkinson and Kintrea 2001). Thus, being *trapped in the neighbourhood* should be more common, the more disadvantaged the neighbourhood is.

The case of being *trapped in the apartment* is different. Based on prior literature, neighbourhood disadvantage is weakens emotional attachment to the area but is less likely to directly affect satisfaction with the apartment itself (Kearns and Parkes 2003). Consequently, this case does not appear as a plausible mechanism of spatial health inequalities. Hence, using the distinction presented above, we are able to tackle a previously omitted factor and respond to calls for further elucidation on the mechanism behind socioeconomic health inequalities among neighbourhoods (see Lawder et al. 2014; cf. Van Ham et al. 2012).

Based on these considerations, we expect that *being trapped in the neighbourhood mediates neighbourhood inequalities in health (H3).*

3 Data and methods

3.1 Data

We utilise survey and register data from a random sample of Finnish housing estate residents. The data from a recent large survey project (PREFARE 2012–2015/Academy of Finland) were combined with the corresponding contextual register data. The survey data came from a stratified clustered random sample of the Finnish-speaking residents aged 25–74 years, who resided in the multi-storey buildings of the suburban housing estates built in the 1960s and the 1970s. The contextual register data were obtained from the Grid Database (Statistics Finland 2009), including geo-referenced information on the sociodemographic and housing structure of statistical grids (250 m x 250 m) covering the entire country. Conducted in 2013, the survey used postal and online collection methods, with a total response rate of 39% (gross sample: 19,844, respondents: 7728). The dwellers of one-storey buildings were excluded as they did not belong to our target population. Furthermore, the 14 respondents residing in one estate were excluded due to the small number of cases. This resulted in a sample of 7603 respondents, from which item non-response was subtracted to obtain the final sample of 7369 respondents.

The unit non-response was analysed using auxiliary data on gender, age, marital status, education, income, unemployment and housing tenure. These data were obtained from the Ministry of Economic Affairs and Employment, Statistics Finland, the Tax Administration and the Population Register Centre. This information was entered into a logistic non-response model, together with estate fixed effects, to model non-response (Laaksonen et al. 2015); male gender, young age, low socioeconomic position and rental tenure were found to predict non-response. There were also significant estate differences in the response rate. The final weighting scheme used in the analyses accounted for the varying inclusion probability at the neighbourhood and the individual levels, as well as the variation in the response propensity at the individual level.

In the present study, a housing estate consists of one or more adjacent statistical grids and is defined by the following criteria (Kemppainen et al. 2018):

1. located outside the city centre,
2. at least half of the population lives in multi-storey apartment buildings constructed in the 1960s and the 1970s,
3. at least five of these buildings are located within a maximum distance of 250 m from each other and
4. has at least 300 residents.

In total, 318 estate neighbourhoods in the country met the criteria for inclusion. Given the fixed number of sample units determined by the data collection budget, we balanced the number of estates and the number of sample units within each and decided to sample 71 estates. Sixty-six estates were selected using the stratified random sampling, with the strata specified based on the unemployment rate in the estate and the municipality's population size. The stratification rationale was to reach the entire socio-geographic scale of these neighbourhoods. Additionally,

five well-known disadvantaged estates were chosen to enable mixed-method case studies. Following a standard survey practice, each of these five estates constituted a unique stratum so that their relative weight was deflated to represent only themselves, whereby their selection procedure did not distort the results. After excluding one estate due to its low number of respondents (see above), we arrived at a sample of 70 estates, with an average of 109 respondents per estate.

3.2 Measures

In our survey, the moving intentions were operationalised by asking whether the respondent had considered moving. The response options were "No" (*voluntary stayer [VS]*), "I'd like to move to another apartment in the same area, but the possibilities are now low" (*trapped in the apartment [TA]*), "I'd like to move to another area, but the possibilities are now low" (*trapped in the neighbourhood [TN]*), and "I will move this year" (*intended move [IM]*).

The self-perceived reason for the inability to move was measured with an item specifying five categories (financial situation, children's school, daycare, commuting to work and relatives needing care). Additionally, open-ended reasons were classified, and all those related to health (e.g., "Mental health reasons"), functional ability ("The building should have an elevator, the stairs exhaust me") and ageing ("I'm old, [and] in poor physical condition") were assigned to the "trapped due to health" category to address reverse causation when regressing self-rated health on moving intentions.

We approached health in terms of self-rated health, which indicates the general health status in a relatively valid and reliable manner (Lundberg and Manderbacka 1996; Jylhä 2009). Self-rated health was measured with the item, "Compared with others of your age, how is your general health status?", accompanied by a five-point response scale, ranging from "good" to "poor". Following a typical practice, the variable was dichotomised, and the categories "good" and "fairly good" were combined to indicate the state of good subjective health (e.g., Ahnquist et al. 2012; Carlson 2016; Lyytikäinen and Kemppainen 2016). This choice of the cut-off reflects Carlson's (2016) argument that health is a positive state instead of a mere absence of illness, where the respondents who choose the "average" mid-option are assumed to "experience some kind of health problem" (ibid., 4). However, as the dichotomisation may be debated, we also estimated ordinal logit models (see Section 4.6).

We included an extensive set of control variables at both individual and neighbourhood levels to account for potential confounders. A dummy for women indicated gender, while age was categorised into ten-year ranges. The highest level of education was classified into basic, secondary and tertiary; current unemployment was indicated with a dummy. The monthly net household income was divided into three roughly equal categories from the cut-offs of 1600 EUR and 2800 EUR. Additionally, there were measures for each respondent's household structure, distinguishing among the following options: living alone, with a partner, with a partner and

child(ren), alone with child(ren), or other. The tenure type was indicated as owner-occupation, private rental, public rental or other; the height of the building was categorised as 2–4, 5–7, or 8 or more storeys. Finally, room stress was measured by indicating the number of persons per room. Regarding education, income, household type, tenure type and room stress, the cases with item non-response were assigned to a separate category per variable and were included in the regression models to retain statistical power. In the other variables, the cases with missing values were excluded. Robustness checks were made excluding all missing cases (see Section 4.6).

The sociodemographic neighbourhood indicators were constructed using the Grid Database (Statistics Finland 2009). Socioeconomic disadvantage was measured using a standardised factor score variable, based on each neighbourhood's education, income and unemployment level. Population density was calculated as the number of persons per grid and was categorised into three equal classes. Age structure was indicated with two standardised factor score variables, and the share of rental apartments was operationalised in proportion to all apartments. The type of the larger urban area surrounding the estate was characterised by the following classes: capital region, other larger cities, medium-sized cities and others. Finally, as the register data did not indicate residential instability, we constructed a survey proxy on the proportion of residents who had lived in the estate for less than one year.

3.3 Statistical analyses

The frequency of involuntary staying in the study population and its self-perceived reasons were estimated using the weighting scheme presented above. The associations among self-rated health, involuntary staying and neighbourhood disadvantage were analysed using logistic regression and logistic random intercept models. First, a crude logistic regression model of involuntary staying predicting good self-rated health was estimated (Model 1), followed by an adjusted model that included individual-level control variables and neighbourhood fixed effects (Model 2). Interaction analyses were conducted based on Model 2.

Model 2: $logit(good\_srh) = b_0 + b_1 TA + b_2 TN + b_3 IM + \sum b_c \boldsymbol{X_c} + e,$

where *TA* and *TN* denote the two kinds of involuntary stayers, while *IM* refers to those with moving intentions; $\boldsymbol{X_c}$ is a vector of control variables (gender, age, health-related involuntary staying, number of persons per room, education, unemployment, income, household composition, tenure, building height and a neighbourhood dummy variable); and *e* signifies the individual-level residual.

The intermediate role of involuntary staying in the relationship between neighbourhood disadvantage and self-rated health was approached with a series of models. We began by estimating a crude logistic random intercept model (Model 3), after which we included the individual- and the neighbourhood-level control variables (Model 4). Next, the variables related to

involuntary staying were incorporated individually (Models 5 and 6) to test their roles as intermediate variables.

Model 6: $logit(good\_srh_{ij}) = b_0 + b_1\, NBDIS_j + b_2\, TA_{ij} + b_3\, TN_{ij} + b_4\, IM_{ij} + \sum b_c\, \boldsymbol{X_c} + u_j + e_{ij},$

where *NBDIS* denotes neighbourhood disadvantage in neighbourhood *j,* $\boldsymbol{X_c}$ is a vector of control variables (individual level – *i:* gender, age, health-related involuntary staying, number of persons per room, education, unemployment, income, household composition, tenure, building height; neighbourhood level – *j:* population density, residential instability, demographic structure, share of rental apartments, urban area), and u_j and e_{ij} are the neighbourhood- and the individual-level residuals, respectively.

We conducted the analyses using Stata 14. The cluster structure and the survey weights were incorporated in all analyses with the *svy* procedure. The logistic random intercept models were estimated with the *meglm* procedure, which enabled the correct use of weights at cluster and individual levels.

4 Results

4.1 Descriptive statistics

Table 1 provides the univariate statistics of the data.

Table 1. Univariate statistics.

Individual-level variables (n=7369)	Count, no weights	%, no weights	%, weights
Moving intentions	.	.	.
Voluntary stayer (VS)	4653	63.1	59.9
Trapped in the apartment (TA)	951	12.9	14.6
Trapped in the neighbourhood (TN)	1408	19.1	20.1
Intended move (IM)	357	4.8	5.4
Trapped due to health	17	0.2	0.2
Self-rated health	.	.	.
Good	1987	27.0	27.5
Fairly good	2428	32.9	32.8
Average	2287	31.0	30.2
Fairly poor	552	7.5	7.8
Poor	115	1.6	1.7
Woman	4507	61.2	52.3
Age	.	.	.
25-34	1241	16.8	21.8
35-44	736	10.0	14.7
45-54	1161	15.8	17.6
55-64	1904	25.8	22.9
65-74	2327	31.6	23.0
Persons per room			
0.5 or less	2425	32.9	30.0
0.6-0.9	1745	23.7	21.3
1 or more	2556	34.7	39.6
Missing	643	8.7	9.1
Education	.	.	.
Basic	1225	16.6	18.6
Secondary	2829	38.4	38.8
Tertiary	3044	41.3	38.8
Missing	271	3.7	3.7
Unemployed	500	6.8	8.6
Income	.	.	.
Low	2118	28.7	30.0
Mid	2598	35.3	33.6
High	2447	33.2	33.7
Missing	206	2.8	2.7
Household	.	.	.
Alone	2892	39.2	40.0
Partner	2912	39.5	36.0
Partner and child(ren)	878	11.9	13.7

Alone with child(ren)	389	5.3	5.3
Other	169	2.3	3.0
Missing	129	1.8	1.9
Tenure	.	.	.
Owner-occupied	4609	62.5	57.9
Private rental	985	13.4	16.9
Public rental	1525	20.7	21.6
Other	130	1.8	1.9
Missing	120	1.6	1.7
Building height	.	.	.
2-4 storeys	3689	50.1	50.5
5-7 storeys	2575	34.9	34.4
8 or more storeys	1105	15.0	15.1
Neighbourhood variables (n=70)	**Mean (SD) / Count**	**%**	.
Population per grid	297.2 (410.0)	.	.
Socio-economic disadvantage	0 (1.0)	.	.
Age structure	.	.	.
Families with children	0 (1.0)	.	.
Young adults	0 (1.0)	.	.
Rental apartments (%)	47.8 (19.0)	.	.
Urban structure	.	.	.
Helsinki region	28	40.0	.
Big cities	13	18.6	.
Medium cities	12	17.1	.
Other	17	24.3	.
Residential instability (%)	6.0 (3.2)	.	.

Table 2 presents the bivariate associations between different moving intentions and explanatory variables. In terms of individual-level factors, there are statistically significant differences regarding all the other background variables, except building height. For example, VSs are older than other residents and typically reside in owner-occupied dwellings, while TNs are characterised by a lower socioeconomic position and residence in public rental housing. TAs have a higher socioeconomic position than TNs. IMs are the youngest and most likely to have a high socioeconomic position. TAs and IMs face room stress more often than others. Considering the neighbourhood variables, most of the bivariate associations are significant, except for population density and residential instability. TNs more often face neighbourhood disadvantage than others, while TAs tend to reside in higher-status neighbourhoods.

Table 2. Bivariate results. Weighted column percentages/means and bivariate p-values (Chi-square/F-test).

	Voluntary stayer (VS)	Trapped in the apartment (TA)	Trapped in the neigh-bourhood (TN)	Intended move (IM)	p value
Woman	52.4	57.8	48.0	53.8	**
Age	.	.	.	.	***
25-34	16.2	28.9	27.9	41.2	.
35-44	12.5	19.6	16.4	20.4	.
45-54	16.0	20.8	20.6	14.7	.
55-64	25.2	18.2	21.5	15.6	.
65-74	30.0	12.6	13.7	8.1	.
Persons per room	.	.	.	.	***
0.5 or less	37.1	25.4	28.8	25.1	.
0.6-0.9	27.0	15.9	20.4	15.1	.
1 or more	35.8	58.8	50.8	59.8	.
Education	.	.	.	.	***
Basic	20.6	18.7	18.9	10.5	.
Secondary	40.8	37.3	42.8	33.4	.
Tertiary	38.6	44.1	38.3	56.1	.
Unemployed	7.6	7.2	11.8	10.7	***
Income	.	.	.	.	**
Low	30.7	27.2	35.8	25.5	.
Mid	35.0	33.1	34.4	32.7	.
High	34.3	39.8	29.8	41.8	.
Household	.	.	.	.	***
Alone	42.9	32.1	41.5	40.5	.
Partner	38.9	33.3	33.8	32.1	.
Partner and child(ren)	10.9	22.6	14.7	20.4	.
Alone with child(ren)	4.5	9.3	5.5	5.4	.
Other	2.8	2.8	4.5	1.5	.
Tenure	.	.	.	.	***
Owner-occupied	65.3	51.7	48.6	42.4	.
Private rental	14.1	21.0	19.5	30.1	.
Public rental	18.7	24.9	29.8	25.4	.
Other	1.8	2.4	2.0	2.1	.
Building height	.	.	.	.	ns
2-4 storeys	49.7	55.0	48.8	53.4	.
5-7 storeys	34.2	32.1	37.8	30.9	.
8 or more storeys	16.1	12.9	13.4	15.7	.
Population per grid (means)	397.43	390.14	437.78	410.77	ns

Socio-economic disadvantage (means)	-0.22	-0.51	0.03	-0.24	***
Age structure (means)	.	.	.	.	.
Families with children	-0.07	-0.06	0.10	-0.04	*
Young adults	0.05	0.26	0.21	0.35	***
Rental apartments (means)	45.26	44.47	48.95	48.63	***
Urban structure	.	.	.	.	*
Helsinki region	54.8	64.2	56.8	59.3	.
Big cities	12.2	7.8	12.1	8.6	.
Medium cities	16.1	16.5	16.4	16.5	.
Other	17.0	11.5	14.8	15.6	.
Residential instability (means)	6.04	6.15	5.76	6.19	ns
Unweighted count (100 %)	4653	951	1408	357	.

Note: * p ≤ 0.05, ** p ≤ 0.01, *** p ≤ 0.001, ns: not significant

4.2 How common is involuntary staying, and what are the reasons behind it?

According to our estimation (see the weighted estimates in Table 1), 35% of the estate residents are involuntary stayers, while 60% are voluntary stayers. Furthermore, around 5% plan to move soon. More than half of the involuntary stayers are trapped in the neighbourhood.

Table 3 presents the self-perceived reasons for involuntary staying by TAs and TNs. Their own financial situation is the most common reason in both groups, while the other reasons are clearly rarer. Among TAs, the housing market situation is a more commonly reported reason than among TNs.

Table 3. Self-preceived reasons for involuntary staying. Weighted column percentages.

	Trapped in the apartment (TA)	**Trapped in the neighbou-rhood (TN)**
Own economic situation	72.5	74.2
Housing market situation	11.0	4.4
Work commuting	3.5	4.9
Children & school	2.3	2.4
Relatives who need care	2.3	3.5
Health and functional ability	0.7	0.5
Other reasons	7.8	10.2
Unweighted count (100 %)	814	1327

Note: counts differ from those in table 1 due to non-response in the item on reasons for involuntary staying.

4.3 Is involuntary staying associated with self-rated health?

Table 4 presents the crude and the adjusted logistic regression findings on the association between involuntary staying and good self-rated health.

Table 4. Moving intentions and good self-rated health (DV). Logistic regression results.

DV: Good self-rated health	Model 1			Model 2 (with neighbourhood dummies)		
	OR	**95 % CI**		**OR**	**95 % CI**	
Moving intentions (ref: VS)	.	.	.	.	.	.
Trapped in the apartment (TA)	0.95	0.80	1.12	0.76	0.65	0.90
Trapped in the neighbourhood (TN)	0.70	0.59	0.83	0.70	0.58	0.84
Intended move (IM)	1.32	0.98	1.78	1.00	0.73	1.35
Trapped due to health	.	.	.	0.12	0.03	0.48
Woman	.	.	.	1.12	1.00	1.26
Age (ref: 25-44)	.	.	.	.	.	.
35-44	.	.	.	0.66	0.53	0.82
45-54	.	.	.	0.55	0.45	0.67
55-64	.	.	.	0.46	0.38	0.54
65-74	.	.	.	0.42	0.35	0.50
Persons per room (ref: 0.5 or less)	.	.	.	.	.	.
0.6-0.9	.	.	.	0.91	0.73	1.12
1 or more	.	.	.	0.80	0.69	0.94
Missing	.	.	.	1.14	0.89	1.45
Education (ref: Basic)	.	.	.	.	.	.
Secondary	.	.	.	1.20	1.01	1.42
Tertiary	.	.	.	1.46	1.23	1.73
Missing	.	.	.	1.23	0.86	1.75
Unemployed	.	.	.	0.76	0.62	0.93
Income (ref: Low)	.	.	.	.	.	.
Mid	.	.	.	1.57	1.36	1.82
High	.	.	.	2.15	1.75	2.63
Missing	.	.	.	1.19	0.81	1.75
Household (ref: Alone)	.	.	.	.	.	.
Partner	.	.	.	1.07	0.88	1.31
Partner and child(ren)	.	.	.	0.96	0.67	1.36
Alone with child(ren)	.	.	.	1.32	0.95	1.83
Other	.	.	.	0.57	0.42	0.79
Missing	.	.	.	1.17	0.58	2.35
Tenure (ref: Owner-occupied)	.	.	.	.	.	.
Private rental	.	.	.	1.06	0.86	1.30
Public rental	.	.	.	0.76	0.62	0.94
Other	.	.	.	1.11	0.70	1.75
Missing	.	.	.	0.68	0.33	1.43
Building height (ref: 2-4 storeys)	.	.	.	.	.	.
5-7 storeys	.	.	.	0.91	0.76	1.09
8 or more storeys	.	.	.	0.80	0.66	0.96

n	7369	7369

Note: OR=Odds Ratio; CI=Confidence Interval; DV=Dependent Variable.

In the crude model (Model 1), the odds ratio (OR) of good self-rated health among TNs is 0.70 (95% CI: 0.59–0.83) and remains virtually identical in the adjusted model (Model 2). For TAs, the results are statistically significant only in the adjusted model (OR: 0.76; 95% CI: 0.65–0.90) but not in the unadjusted one, which points towards suppression. A further analysis of the suppressor effect reveals age as the variable that boosts the explanatory power of TA. From the perspective of housing and health, additional observations can be made (Table 4), since room stress, public rental tenure and building height have independent associations with self-rated health. In brief, the results corroborate H1 because both kinds of involuntary staying are negatively related to self-rated health.

4.4 Does household income modify the association between involuntary staying and self-rated health?

Next, we analysed the modifying role of financial resources by extending Model 2 and added interaction terms, combining household income with TN and TA. To determine significance, we performed the likelihood ratio test for unweighted data by comparing the main effects model with the interaction model. The likelihood ratio test statistic is 2.18, and it follows the chi-square distribution with 6 degrees of freedom, yielding a p-value of 0.90. To conclude, the differences between the interaction model and the main effects model are not statistically significant, which implies that household income does not modify the adjusted association between involuntary staying and self-rated health. Hence, the results do not support H2.

4.5 Does involuntary staying mediate the association between a neighbourhood's socioeconomic status and self-rated health?

Table 5 lists the coefficients for neighbourhood disadvantage in our series of mixed logistic regression models introduced in Section 3.3 (Appendix Table 5e reports the full results). Coefficients are reported instead of ORs to facilitate the comparison across models. Compared with the null model, adding neighbourhood disadvantage as a predictor explains around half of the between-neighbourhoods variance. The crude association between neighbourhood disadvantage and self-rated health is largely attenuated by the control variables, which is observed when comparing the coefficients of Model 3 (-0.273; 95% CI: -0.343, - 0.203) and Model 4 (-0.127; 95% CI: -0.242, -0.012). Moreover, the control variables explain 17% of the remaining level-2 variance. As expected, adjusting for TA has no marked impact on the coefficient of neighbourhood disadvantage (Model 5), but adding TN to the model attenuates the adjusted association between neighbourhood disadvantage and self-rated health. Calculated directly from the coefficients, the attenuation is around 13%, which corroborates H3; being trapped in the neighbourhood partly mediates neighbourhood inequalities in self-rated health. TA and TN have only modest additional impact in terms of the explained level-2 variance.

Table 5. Neighbourhood SES, moving intentions and good self-rated health (DV). Logistic random intercept models. Coefficients of neighbourhood disadvantage in different models.

Model	Description	Neighbourhood disadvantage			Level-2 variance (x 100)	n
		Coeff.	95 % CI			
0	Null	.	.	.	16.259	7369
3	Crude	-0.273	-0.343	-0.203	8.608	7369
4	Adjusted	-0.127	-0.242	-0.012	7.138	7369
5	M4 + TA	-0.132	-0.247	-0.017	7.129	7369
6	M5 + TN	-0.115	-0.229	-0.001	7.030	7369

Note: models 4-6 adjust for the individual and neighbourhood level control variables presented in table 1. See supplementary files for full results. CI=Confidence Interval; DV=Dependent Variable.

4.6 Robustness checks

The following robustness checks were made for Models 1–6: (a) ordered logit models, (b) unweighted logit models, (c) exclusion of the classes of missing categories and (d) linear probability models. The results reported above are robust to these checks. The only noteworthy difference is the attenuation between Models 5 and 6, which is somewhat larger in the unweighted model, approximately 20% (Appendix Tables 4a–5d).

5 Discussion

In this study, our finding that approximately one-third of the housing estate residents are involuntary stayers is close to that of Coulter and Van Ham (2013), who studied the British general population. Our study's discrepancy with the research on European housing estates (Musterd and Van Kempen 2007) can plausibly be attributed to marked differences in the studies' conceptual and operational choices. Our result on the association between involuntary staying and self-rated health is in line with prior studies (Stokols et al. 1983; Strohschein 2012; Woodhead et al. 2015); furthermore, we have been able to extend these studies by observing that *both types of involuntary staying are related to low self-rated health scores (H1)*. Importantly, our study contributes to the literature on segregation and health inequalities among neighbourhoods by demonstrating that *involuntary staying in the neighbourhood may be a pathway through which neighbourhood disadvantage is associated with health (H3)*.

The finding concerning the role of involuntary staying in health inequalities across neighbourhoods needs careful interpretation. We motivated this specific part of the study from the perspective of contextual effects and housing stress; we theorised neighbourhood disadvantage to imply involuntary staying, which sets a penalty on self-rated health. Although the results corroborate this point of view, they do not exclude the selection approach. After all, it is possible that neighbourhood disadvantage hampers self-rated health via other mechanisms, which then leads to involuntary staying due to health-based selection. Now that we have opened a novel perspective on the matter of health inequalities across neighbourhoods, the next step is to collect suitable longitudinal data and shift the attention back to advanced model techniques (cf. Van Ham et al. 2012) to disentangle these questions in different study contexts. For example, studies in the UK would be highly interesting because its urban areas' health inequalities have been found to be larger than in Finland (Stafford et al. 2004).

In our study population, we find that a household's financial situation is by far the most common self-perceived reason for involuntary staying. However, the objective income level does not completely determine who is or is not an involuntary stayer. Rather, it seems that households' housing preferences adapt to their current socioeconomic positions, shaping how the financial situation and the range of desirable housing options are assessed. Thus, it is possible for a household to have a high income level but still consider itself unable to satisfy its current housing needs because its financial situation is perceived as inadequate (cf. Coulter and Van Ham 2013). It seems that the same logic applies to the health implications of involuntary staying since involuntary staying has a roughly constant negative relationship with self-rated health across income levels (H2). It seems that the *de facto* more extensive set of housing alternatives in the more advantaged positions does not make it easier when an individual feels trapped in one's current setting. Hence, the health implications of involuntary staying are not limited to the "poorer individuals […] 'trapped' in dissatisfactory dwellings" (Coulter and Van Ham 2013, 1053).

Being trapped in an apartment is found to be associated with a lower self-rated health only after controlling for age. Thompson and Levine (1997) present various cases of suppression, one of which is a stratified or an interactive case, where the suppressor variable moderates the association in question. Theoretically, this case is possible in our study. For example, it is intuitively appealing to theorise that with older age and more frail health, even low levels of stress could have negative health consequences. However, we have considered it best to focus only on the adjusted main effects and leave the question of the possible age interaction to further studies because addressing the role of ageing in a theoretically well-grounded manner needs more space than is allowed in this paper. Obviously, with the rapid population ageing, this question has considerable practical importance in addition to its relevance from various academic perspectives, including urban studies, ageing studies and research on residential mobility.

The results also point towards further vital open questions related to urban and housing policies. First, as outlined in the background (Section 2), Finland has a lengthy tradition of spatial social mixing, spearheaded by the Helsinki Region. Now, our study's results provide the basis to ask what mixed neighbourhoods imply in terms of involuntary staying and well-being. Possible advantages and disadvantages are involved. On one hand, to what extent do mixing policies alleviate involuntary staying by enabling less affluent households to dwell in better-off neighbourhoods or by moderating the concentration of social disadvantage? On the other hand, do some households prefer more homogeneous residential surroundings and, for different reasons, feel trapped in the administratively produced heterogeneous areas? These are some paths that forthcoming studies could tackle to shed new light on the different implications of mixing policies.

Second, our finding that roughly one-third of our study population feels trapped is of central policy importance, especially as the promotion of residential mobility is considered essential for functioning labour markets (EESC 2007). According to Sánchez and Andrews (2011), the Finnish residential mobility rate is one of the highest among the OECD countries due to several institutional factors, such as relatively low transaction costs in buying and selling property, the low rent control in private markets and a responsive housing supply. However, a non-negligible segment of the population still feels trapped, which is why we suggest that future studies examine both sociodemographic and geographic determinants of involuntary staying.

We wish to highlight a specific methodological aspect of this study. Prior large-scale studies on post-WWII European estates typically paint a somewhat problem-centred view about these neighbourhoods. For example, RESTATE studies (e.g., Musterd and Van Kempen 2007) are based on thirty European estate neighbourhoods that are considered problematic in some sense. Our sampling design targets the entire group of estates and thus provides a more representative and balanced perspective. We consider this an important step in correcting the prevailing one-sided and negative image of housing estate neighbourhoods.

This study's main limitations include the response rate and the cross-sectional design. We have analysed the determinants of the unit non-response using logistic regression on a fairly extensive set of auxiliary register variables on responders and non-responders and have implemented these results in the final weighting scheme. Although it is evident that this approach does not provide a panacea for the problem with decreasing and selective response behaviour in surveys, the survey findings on *associations* (e.g., socioeconomic health inequalities) show relative robustness despite non-response (Søgaard et al. 2004; Martikainen et al. 2007). The consistency that we find between the weighted and the unweighted models supports this view.

Furthermore, it is well known that the observational cross-sectional design seriously limits causal inference. First, reverse causality or a bidirectional relationship may be involved (e.g., Woodhead et al. 2015). Although we controlled for self-perceived health-related involuntary staying in our analyses, the remaining estimate can possibly have a bidirectional interpretation. After all, it is well-known that self-perceived reasons for a certain behaviour and its objective causes do not always coincide. For instance, Woodhead et al. (2015) suggest that mental health problems shape the perception of financial strain, which is a leading self-perceived reason for involuntary staying, as already noted. The question of missing variables or unobserved confounders poses another challenge in any observational study design. Although our group of control variables at both levels is relatively extensive, unobserved confounding is still possible (Morris et al. 2017). For example, personality traits may shape different aspects of health, moving intentions, as well as the capacity to realise these intentions. Future studies using panel data will provide some possibilities for advancing on this front (cf. Woodhead et al. 2015).

We acknowledge that the comparison of coefficients across logistic models may be difficult due to scaling artefacts. Thus, we have repeated the analyses using linear probability models, with consistent results. Moreover, our survey design targets a specific population group based on the type of built environment, as well as each resident's age and language. Further studies are necessary to gain a better understanding of how generalisable the findings are. Nonetheless, focusing on the modernist housing estates is a strength because these neighbourhoods are easily distinguishable from adjacent areas. Hence, the neighbourhood unit is well defined and firmly rooted in the study population's daily life.

To conclude, involuntary staying partly explains why neighbourhood disadvantage is related to a lower self-rated health. Hence, it provides an important new perspective about health, housing and neighbourhood inequalities.

Acknowledgements: The authors are grateful to the participants of the NODE conference in Stockholm (14th June 2016) for their feed-back. Academy of Finland funded the data collection (PREFARE 2012-2015). TK wishes to thank the following institution for funding: City of Helsinki, Kone Foundation, City of Turku/West-Finland Housing Association of Public Utility (Länsi-Suomen Yleishyödyllinen Asuntosäätiö).

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Appendix Table 4a. Moving intentions and good self-rated health. Ordered logistic regression results.

	Model 1			Model 2 (with neighbourhood dummies)		
	OR	95 % CI		OR	95 % CI	
Moving intentions (ref: VS)	.	.	.	.	.	.
Trapped in the apartment (TA)	0.94	0.81	1.09	0.75	0.64	0.87
Trapped in the neighbourhood (TN)	0.71	0.61	0.82	0.72	0.61	0.84
Intended move (IM)	1.39	1.09	1.77	1.04	0.80	1.36
Trapped due to health	.	.	.	0.12	0.05	0.29
Woman	.	.	.	1.15	1.03	1.27
Age (ref: 25-44)	.	.	.	.	.	.
35-44	.	.	.	0.65	0.56	0.77
45-54	.	.	.	0.57	0.48	0.66
55-64	.	.	.	0.47	0.40	0.55
65-74	.	.	.	0.41	0.35	0.49
Persons per room (ref: 0.5 or less)	.	.	.	.	.	.
0.6-0.9	.	.	.	0.89	0.77	1.03
1 or more	.	.	.	0.87	0.76	0.99
Missing	.	.	.	1.18	0.96	1.45
Education (ref: Basic)	.	.	.	.	.	.
Secondary	.	.	.	1.16	0.99	1.36
Tertiary	.	.	.	1.50	1.25	1.80
Missing	.	.	.	1.37	1.07	1.77
Unemployed	.	.	.	0.73	0.59	0.89
Income (ref: Low)	.	.	.	.	.	.
Mid	.	.	.	1.64	1.43	1.89
High	.	.	.	2.13	1.74	2.61
Missing	.	.	.	1.39	0.94	2.05
Household (ref: Alone)	.	.	.	.	.	.
Partner	.	.	.	0.97	0.81	1.16
Partner and child(ren)	.	.	.	0.98	0.71	1.36
Alone with child(ren)	.	.	.	1.34	0.97	1.84
Other	.	.	.	0.58	0.44	0.77
Missing	.	.	.	1.21	0.67	2.19
Tenure (ref: Owner-occupied)	.	.	.	.	.	.
Private rental	.	.	.	1.00	0.83	1.20
Public rental	.	.	.	0.70	0.58	0.84
Other	.	.	.	0.90	0.65	1.23
Missing	.	.	.	0.62	0.32	1.22
Building height (ref: 2-4 storeys)	.	.	.	.	.	.
5-7 storeys	.	.	.	0.91	0.79	1.04
8 or more storeys	.	.	.	0.85	0.73	0.99
n	7369			7369		

Footnote: Cut-offs / intercepts	Model 1			Model 2		
	Coef.	95 % CI		Coef.	95 % CI	
/cut1	-4.13	-4.41	-3.86	-4.41	-4.77	-4.05
/cut2	-2.33	-2.49	-2.17	-2.56	-2.80	-2.31
/cut3	-0.48	-0.62	-0.35	-0.57	-0.82	-0.33
/cut4	0.91	0.76	1.07	0.96	0.71	1.22

Appendix Table 4b. Moving intentions and good self-rated health. Unweighted logistic regression results.

	Model 1			Model 2 (with neighbourhood dummies)		
	OR	95 % CI		OR	95 % CI	
Moving intentions (ref: VS)	.	.	.	.	.	.
Trapped in the apartment (TA)	0.86	0.75	1.00	0.71	0.61	0.83
Trapped in the neighbourhood (TN)	0.66	0.59	0.74	0.63	0.55	0.72
Intended move (IM)	1.34	1.06	1.69	0.99	0.77	1.27
Trapped due to health	.	.	.	0.20	0.06	0.73
Woman	.	.	.	1.19	1.08	1.32
Age (ref: 25-44)	.	.	.	.	.	.
35-44	.	.	.	0.63	0.51	0.77
45-54	.	.	.	0.52	0.43	0.62
55-64	.	.	.	0.45	0.38	0.54
65-74	.	.	.	0.41	0.34	0.48
Persons per room (ref: 0.5 or less)	.	.	.	.	.	.
0.6-0.9	.	.	.	0.92	0.78	1.09
1 or more	.	.	.	0.84	0.72	0.97
Missing	.	.	.	1.24	1.01	1.51
Education (ref: Basic)	.	.	.	.	.	.
Secondary	.	.	.	1.09	0.95	1.26
Tertiary	.	.	.	1.34	1.15	1.56
Missing	.	.	.	1.11	0.79	1.57
Unemployed	.	.	.	0.80	0.66	0.98
Income (ref: Low)	.	.	.	.	.	.
Mid	.	.	.	1.55	1.36	1.78
High	.	.	.	2.21	1.86	2.63
Missing	.	.	.	1.24	0.92	1.69
Household (ref: Alone)	.	.	.	.	.	.
Partner	.	.	.	0.99	0.83	1.16
Partner and child(ren)	.	.	.	0.89	0.71	1.11
Alone with child(ren)	.	.	.	1.20	0.93	1.55
Other	.	.	.	0.73	0.52	1.02
Missing	.	.	.	1.17	0.63	2.20
Tenure (ref: Owner-occupied)	.	.	.	.	.	.
Private rental	.	.	.	1.00	0.85	1.18
Public rental	.	.	.	0.75	0.65	0.88
Other	.	.	.	1.10	0.74	1.62
Missing	.	.	.	0.60	0.30	1.18
Building height (ref: 2-4 storeys)	.	.	.	.	.	.
5-7 storeys	.	.	.	0.88	0.77	1.00
8 or more storeys	.	.	.	0.81	0.68	0.97
n	7369			7369		
AIC	9873.72			9477.22		

Note: AIC=Akaike's Information Criterion.

Appendix Table 4c. Moving intentions and good self-rated health. Logistic regression, missing classes excluded.

	Model 1			Model 2 (with neighbourhood dummies)		
	OR	95 % CI		OR	95 % CI	
Moving intentions (ref: VS)	.	.	.	.	.	.
Trapped in the apartment (TA)	0.95	0.79	1.15	0.76	0.64	0.91
Trapped in the neighbourhood (TN)	0.71	0.60	0.85	0.72	0.60	0.86
Intended move (IM)	1.42	1.07	1.90	1.08	0.79	1.47
Trapped due to health	.	.	.	0.11	0.03	0.46
Woman	.	.	.	1.10	0.98	1.23
Age (ref: 25-44)	.	.	.	.	.	.
35-44	.	.	.	0.65	0.53	0.81
45-54	.	.	.	0.57	0.45	0.73
55-64	.	.	.	0.46	0.39	0.55
65-74	.	.	.	0.42	0.35	0.50
Persons per room (ref: 0.5 or less)	.	.	.	.	.	.
0.6-0.9	.	.	.	0.90	0.72	1.12
1 or more	.	.	.	0.79	0.67	0.93
Missing	.	.	.	.	.	.
Education (ref: Basic)	.	.	.	.	.	.
Secondary	.	.	.	1.13	0.93	1.39
Tertiary	.	.	.	1.45	1.16	1.81
Missing	.	.	.	.	.	.
Unemployed	.	.	.	0.72	0.59	0.89
Income (ref: Low)	.	.	.	.	.	.
Mid	.	.	.	1.48	1.27	1.73
High	.	.	.	2.00	1.67	2.40
Missing	.	.	.	.	.	.
Household (ref: Alone)	.	.	.	.	.	.
Partner	.	.	.	1.13	0.92	1.38
Partner and child(ren)	.	.	.	1.02	0.73	1.41
Alone with child(ren)	.	.	.	1.37	0.98	1.93
Other	.	.	.	0.61	0.44	0.83
Missing	.	.	.	.	.	.
Tenure (ref: Owner-occupied)	.	.	.	.	.	.
Private rental	.	.	.	1.05	0.84	1.32
Public rental	.	.	.	0.75	0.61	0.92
Other	.	.	.	1.14	0.69	1.88
Missing	.	.	.	.	.	.
Building height (ref: 2-4 storeys)	.	.	.	.	.	.
5-7 storeys	.	.	.	0.90	0.75	1.08
8 or more storeys	.	.	.	0.73	0.60	0.88
n	6726			6726		

Appendix Table 4d. Moving intentions and good self-rated health. Linear probability models.

	Model 1			Model 2 (with neighbourhood dummies)		
	Coeff.	95 % CI		Coeff.	95 % CI	
Moving intentions (ref: VS)	.	.	.	.	.	.
Trapped in the apartment (TA)	-0.01	-0.05	0.03	-0.06	-0.09	-0.02
Trapped in the neighbourhood (TN)	-0.09	-0.13	-0.05	-0.08	-0.12	-0.04
Intended move (IM)	0.06	0.00	0.13	0.00	-0.06	0.06
Trapped due to health	.	.	.	-0.40	-0.56	-0.23
Woman	.	.	.	0.02	0.00	0.05
Age (ref: 25-44)	.	.	.	.	.	.
35-44	.	.	.	-0.09	-0.13	-0.04
45-54	.	.	.	-0.13	-0.17	-0.08
55-64	.	.	.	-0.17	-0.20	-0.13
65-74	.	.	.	-0.19	-0.22	-0.15
Persons per room (ref: 0.5 or less)	.	.	.	.	.	.
0.6-0.9	.	.	.	-0.02	-0.07	0.02
1 or more	.	.	.	-0.05	-0.08	-0.02
Missing	.	.	.	0.03	-0.03	0.08
Education (ref: Basic)	.	.	.	.	.	.
Secondary	.	.	.	0.04	0.00	0.08
Tertiary	.	.	.	0.08	0.05	0.12
Missing	.	.	.	0.05	-0.03	0.13
Unemployed	.	.	.	-0.06	-0.11	-0.02
Income (ref: Low)	.	.	.	.	.	.
Mid	.	.	.	0.11	0.07	0.14
High	.	.	.	0.17	0.13	0.21
Missing	.	.	.	0.04	-0.05	0.13
Household (ref: Alone)	.	.	.	.	.	.
Partner	.	.	.	0.02	-0.03	0.06
Partner and child(ren)	.	.	.	-0.01	-0.08	0.07
Alone with child(ren)	.	.	.	0.06	-0.01	0.13
Other	.	.	.	-0.12	-0.20	-0.05
Missing	.	.	.	0.03	-0.12	0.18
Tenure (ref: Owner-occupied)	.	.	.	.	.	.
Private rental	.	.	.	0.01	-0.03	0.06
Public rental	.	.	.	-0.06	-0.11	-0.01
Other	.	.	.	0.03	-0.07	0.12
Missing	.	.	.	-0.08	-0.24	0.09
Building height (ref: 2-4 storeys)	.	.	.	.	.	.
5-7 storeys	.	.	.	-0.02	-0.06	0.02
8 or more storeys	.	.	.	-0.05	-0.09	-0.01
n	7369			7369		

Appendix Table 5a. Neighbourhood SES, moving intentions and good self-rated health. Ordered logistic random intercept models.

Model	Description	Neighbourhood disadvantage			Level-2 variance (x 100)	n
		Coeff.	95 % CI			
0	Null	.	.	.	14.976	7369
3	Crude	-0.285	-0.345	-0.225	6.643	7369
4	Adjusted	-0.143	-0.242	-0.044	4.701	7369
5	M4 + TA	-0.148	-0.247	-0.049	4.720	7369
6	M5 + TN	-0.132	-0.229	-0.034	4.604	7369

Note: models 4-6 adjust for the control variables presented in table 1.

Appendix Table 5b. Neighbourhood SES, moving intentions and good self-rated health. Unweighted logistic random intercept models.

Model	Description	Neighbourhood disadvantage			Level-2 variance (x 100)	n	AIC
		Coeff.	95 % CI				
0	Null	.	.	.	7.858	7369	9861.514
3	Crude	-0.250	-0.306	-0.195	1.385	7369	9812.977
4	Adjusted	-0.121	-0.214	-0.027	0.828	7369	9494.502
5	M4 + TA	-0.127	-0.221	-0.033	0.839	7369	9488.614
6	M5 + TN	-0.101	-0.193	-0.008	0.638	7369	9440.360

Note: models 4-6 adjust for the control variables presented in table 1. AIC=Akaike's Information Criterion.

Appendix Table 5c. Neighbourhood SES, moving intentions and good self-rated health. Logistic random intercept models, missing classes excluded.

Model	Description	Neighbourhood disadvantage			Level-2 variance (x 100)	n
		Coeff.	95 % CI			
0	Null	.	.	.	18.169	6726
3	Crude	-0.274	-0.354	-0.193	10.427	6726
4	Adjusted	-0.129	-0.261	-0.027	8.825	6726
5	M4 + TA	-0.133	-0.265	-0.014	8.866	6726
6	M5 + TN	-0.117	-0.248	0.013	8.707	6726

Note: models 4-6 adjust for the control variables presented in table 1.

Appendix Table 5d. Neighbourhood SES, moving intentions and good self-rated health. Linear probability models with random intercepts.

Model	Description	Neighbourhood disadvantage	Level-2 variance (x 100)	n

		Coeff.	95 % CI			
0	Null	.	.	.	8.664	7369
3	Crude	-0.062	-0.078	-0.047	4.668	7369
4	Adjusted	-0.027	-0.052	-0.002	3.394	7369
5	M4 + TA	-0.028	-0.053	-0.003	3.387	7369
6	M5 + TN	-0.024	-0.049	0.001	3.316	7369

Note: models 4-6 adjust for the control variables presented in table 1.

Table 5e. Neighbourhood disadvantage, moving intentions and good self-rated health. Logistic random intercept models.

	Model 0			Model 3			Model 4			Model 5			Model 6		
	Coeff.	95 % CI		Coeff.	95 % CI		Coeff.	95 % CI		Coeff.	95 % CI		Coeff.	95 % CI	
Individual-level variables															
Moving intentions (ref: VS)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Trapped in the apartment (TA)	.	.	.	.	.	.	.	.	.	-0.167	-0.327	-0.007	-0.271	-0.435	-0.107
Trapped in the neighbourhood (TN)	.	.	.	.	.	.	.	.	.	.	.	.	-0.362	-0.547	-0.178
Intended move (IM)	.	.	.	.	.	.	0.144	-0.166	0.454	0.112	-0.196	0.420	-0.005	-0.311	0.301
Trapped due to health	.	.	.	.	.	.	-2.273	-3.619	-0.927	-2.219	-3.567	-0.870	-2.095	-3.461	-0.728
Woman	.	.	.	.	.	.	0.110	-0.005	0.224	0.115	-0.001	0.232	0.114	-0.001	0.230
Age (ref: 25-44)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
35-44	.	.	.	.	.	.	-0.401	-0.607	-0.194	-0.401	-0.608	-0.194	-0.417	-0.630	-0.204
45-54	.	.	.	.	.	.	-0.583	-0.787	-0.380	-0.586	-0.790	-0.381	-0.601	-0.808	-0.394
55-64	.	.	.	.	.	.	-0.740	-0.901	-0.578	-0.748	-0.912	-0.584	-0.786	-0.958	-0.613
65-74	.	.	.	.	.	.	-0.795	-0.960	-0.630	-0.810	-0.976	-0.643	-0.873	-1.049	-0.697
Persons per room (ref: 0.5 or less)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0.6-0.9	.	.	.	.	.	.	-0.085	-0.300	0.129	-0.096	-0.309	0.117	-0.097	-0.309	0.115
1 or more	.	.	.	.	.	.	-0.233	-0.391	-0.076	-0.231	-0.388	-0.074	-0.218	-0.376	-0.061
Missing	.	.	.	.	.	.	0.137	-0.103	0.378	0.141	-0.100	0.382	0.128	-0.113	0.369
Education (ref: Basic)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Secondary	.	.	.	.	.	.	0.170	0.002	0.339	0.170	0.002	0.338	0.182	0.015	0.349
Tertiary	.	.	.	.	.	.	0.362	0.197	0.527	0.360	0.193	0.527	0.378	0.211	0.545
Missing	.	.	.	.	.	.	0.162	-0.189	0.513	0.159	-0.194	0.512	0.208	-0.142	0.559
Unemployed	.	.	.	.	.	.	-0.275	-0.484	-0.065	-0.280	-0.489	-0.070	-0.275	-0.482	-0.069
Income (ref: Low)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Mid	.	.	.	.	.	.	0.456	0.310	0.603	0.456	0.311	0.601	0.452	0.306	0.598
High	.	.	.	.	.	.	0.772	0.572	0.972	0.773	0.573	0.973	0.764	0.560	0.967
Missing	.	.	.	.	.	.	0.209	-0.167	0.584	0.206	-0.170	0.582	0.176	-0.207	0.559
Household (ref: Alone)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Partner	.	.	.	.	.	.	0.053	-0.147	0.253	0.063	-0.135	0.262	0.070	-0.132	0.272
Partner and child(ren)	.	.	.	.	.	.	-0.067	-0.412	0.277	-0.049	-0.393	0.295	-0.042	-0.395	0.311
Alone with child(ren)	.	.	.	.	.	.	0.256	-0.073	0.584	0.275	-0.048	0.599	0.278	-0.048	0.603
Other	.	.	.	.	.	.	-0.568	-0.878	-0.258	-0.566	-0.878	-0.254	-0.552	-0.868	-0.235
Missing	.	.	.	.	.	.	0.125	-0.544	0.794	0.136	-0.537	0.809	0.157	-0.537	0.850
Tenure (ref: Owner-occupied)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Private rental	.	.	.	.	.	.	0.029	-0.172	0.231	0.036	-0.166	0.237	0.055	-0.154	0.264
Public rental	.	.	.	.	.	.	-0.304	-0.512	-0.096	-0.294	-0.499	-0.089	-0.272	-0.482	-0.061
Other	.	.	.	.	.	.	0.094	-0.352	0.540	0.099	-0.348	0.546	0.111	-0.344	0.565
Missing	.	.	.	.	.	.	-0.327	-1.061	0.406	-0.333	-1.073	0.406	-0.379	-1.118	0.360
Building height (ref: 2-4 storeys)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5-7 storeys	.	.	.	.	.	.	-0.099	-0.273	0.074	-0.101	-0.273	0.072	-0.098	-0.272	0.076
8 or more storeys	.	.	.	.	.	.	-0.214	-0.394	-0.034	-0.217	-0.400	-0.034	-0.224	-0.408	-0.041
Neighbourhood variables															
Population per grid (ref: 250 or less)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
251-420	.	.	.	.	.	.	-0.066	-0.239	0.108	-0.065	-0.238	0.108	-0.074	-0.246	0.097
421 or more	.	.	.	.	.	.	-0.120	-0.360	0.120	-0.123	-0.364	0.118	-0.125	-0.367	0.117
Socio-economic disadvantage	.	.	.	-0.273	-0.343	-0.203	-0.127	-0.242	-0.012	-0.132	-0.247	-0.017	-0.115	-0.229	-0.001
Age structure	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Families with children	.	.	.	.	.	.	-0.035	-0.123	0.053	-0.036	-0.123	0.051	-0.030	-0.114	0.055
Young adults	.	.	.	.	.	.	0.062	-0.024	0.148	0.064	-0.023	0.150	0.072	-0.014	0.158
Rental apartments (%)	.	.	.	.	.	.	0.202	-0.474	0.877	0.193	-0.478	0.865	0.181	-0.481	0.843
Urban structure (ref: Helsinki region)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Big cities	.	.	.	.	.	.	-0.088	-0.345	0.169	-0.091	-0.349	0.166	-0.111	-0.370	0.148
Medium cities	.	.	.	.	.	.	-0.013	-0.281	0.255	-0.011	-0.279	0.257	-0.024	-0.295	0.246
Other	.	.	.	.	.	.	-0.103	-0.345	0.139	-0.105	-0.345	0.136	-0.123	-0.365	0.119
Residential instability (%)	.	.	.	.	.	.	-2.262	-4.626	0.103	-2.245	-4.606	0.117	-2.472	-4.829	-0.116
Intercept	0.396	0.295	0.498	0.375	0.299	0.450	0.635	0.202	1.067	0.659	0.227	1.090	0.791	0.338	1.245
n	7369			7369			7369			7369			7369		
Level-2 variance	0.1626			0.0861			0.0714			0.0713			0.0703		