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Neighbourhood effects on psychiatric disorders among Finnish adolescents: The moderating impact of family background

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ABSTRACT

We study whether childhood neighbourhood context affects mental health in adolescence in Finland. We also examine heterogeneous effects by family background. By exploiting register data for 1999–2018, we use sibling fixed effects models to gain more robust evidence on the existence of neighbourhood effects. We do not find evidence of an association between neighbourhood characteristics and psychiatric disorders within families. Differences in the effects by family background were not consistent, and variation was mainly found in random effects models. In general, observed family characteristics were strongly associated with psychiatric disorders. This means that interventions should be targeted to children at risk rather than certain neighbourhoods.

1. Introduction

Various social and environmental risks and resources are unequally distributed spatially in cities. This can be expected to affect children growing up in different neighbourhoods, for example, the eventual socioeconomic mobility and attainment of children (e.g., Chetty and Hendren 2018). Previous research on neighbourhood effects on adolescents has mainly concentrated on socioeconomic outcomes, particularly education (for a review, see Nieuwenhuis and Hooimeijer 2016). Adolescent health outcomes, on the other hand, have been analysed less often (for a review, see Visser et al., 2021), although there is a large body of evidence on the association between the place of residence and health in the adult population (see reviews by Oakes et al., 2015; Arcaya et al., 2016; Jokela 2020). Nonetheless, it is important to understand the association, and potential causality, between health outcomes among children and place of residence when policy interventions are designed and targeted to individuals, schools, or neighbourhoods.

In this study our principal research question is whether neighbourhood context in childhood is related to mental health problems in adolescence in Finland. Secondly, we examine possible heterogeneous effects by adolescent's family background, namely parental income and education. The study contributes to the debate on neighbourhood effects and origins of social inequalities in developed countries by providing evidence from a country characterised by moderate income inequality and residential segregation. We contribute to literature in several ways.

First, we aim to obtain more robust evidence by using sibling fixed effects models. This method helps in addressing the problem of selective residential mobility in identification of causal neighbourhood effects (see van Ham et al., 2012; Jokela 2020). As sibling fixed effects models are able to account for unobserved family-level characteristics shared by the siblings (e.g., D'Onofrio et al., 2016), application of these models provides evidence that is more consistent with causal inference than less advanced methodologies. We will compare results from sibling fixed effects models with random effects models in order to see the possible difference.

Second, we take into account the neighbourhood exposure of children since early childhood. Measuring the neighbourhood context only at one point in time may measure the cumulative exposure inaccurately due to moves during childhood (Kleinepier et al., 2018; Hedman et al., 2019; Jivraj et al., 2020). Thus, among the strengths of our study is the rich longitudinal data including the total population in Finland. The majority of the previous studies are cross-sectional and only few are based on longitudinal data (e.g., reviews by Minh et al., 2017 and Visser et al., 2021).

Third, we use various measures of neighbourhood characteristics. In addition to socioeconomic disadvantage or advantage, the (in)stability

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of the neighbourhood has been proposed as a relevant characteristic (Goldstein et al., 2019). Accordingly, we measure two dimensions of neighbourhood context in this article: 1) neighbourhood socioeconomic status, separately advantage and disadvantage, and 2) neighbourhood instability. The characteristics are likely to be interrelated but could theoretically point to different mechanisms behind the potential neighbourhood effects.

Fourth, we examine heterogeneity in the effects by children's family background, as family resources such as parental education or income can moderate the impact of living environments on children's outcomes. Several theories and prior research propose that disadvantages in childhood and youth may be more detrimental to some individuals than others (e.g., Grätz 2015; Wodtke et al., 2016; Erola and Kilpi-Jakonen 2017; Bernardi and Triventi 2020; Bussemakers and Kraaykamp 2020). Parental economic and social resources can greatly affect the association between adverse childhood circumstances, including living in a disadvantaged neighbourhood, and different outcome measures.

While mental health disorders seem to cluster within cities, it can be expected that the neighbourhood has a relatively small effect on children's outcomes compared to parental resources and characteristics. This is likely to be the case especially in Finland with relatively modest differences across neighbourhoods (e.g., Andersen et al., 2016; Tammaru et al., 2019) and high standards of education regardless of the neighbourhood. However, we believe that evidence from diverse institutional and cultural settings is important in order to avoid conclusions based too much on contexts with more pronounced inequality and to help in assessing to what extent the policy environment and other macro-level factors could possibly shape such effects.

2. Theoretical framework and existing evidence

2.1. Mental health in childhood and family background

Mental health disorders are an increasing health problem among children and youth (e.g., Filatova et al., 2019 on depression among Finns aged 5–25). There is also a social gradient in the incidence of mental health problems so that children from lower socioeconomic classes are more likely to develop them (Reiss 2013). Social causation thesis asserts that low socioeconomic status increases the risk of health problems through, for example, worse access to health care, unhealthy behaviour and living environment, and stress and anxiety related to poverty and unemployment (Jokela 2014, 2015), while mental health problems are also an obstacle for education and employment, leading to low socioeconomic status as suggested by social selection thesis (e.g., Vaalavuo and Bakkum 2020; Haula and Vaalavuo 2021).

Previous results have shown that low level of parental education and income are associated with mental health problems in childhood and youth (for a review, see Reiss 2013), also in Finland (Korhonen et al., 2017; Haula and Vaalavuo 2021). Two mechanisms have been proposed (e.g., Elstad 1998; Murali and Oyebode 2004). First, according to the *stress model*, poor socioeconomic resources and low social position have been assumed to induce stress among parents which results in inadequate parenting practices and patterns of family interaction that contribute to the development of mental disorders. Second mechanism assumes *social selection* in terms of poor mental health: parents with mental health problems tend to end up in disadvantaged social positions, and poor parental health is linked with children's ill-health due to genetic liability and risky health behaviours. For example, Mikkonen et al. (2016) found that particularly maternal depression increases the likelihood of adolescent depression. Also, access to health services may vary according to socioeconomic resources which may contribute to the recovery from mental health problems. Previous literature has shown that low socioeconomic resources are linked with less frequent use of health care when needs are taken into account (e.g., Blomgren and Virta 2020).

2.2. Neighbourhood effects

A rapidly expanding body of literature examines how neighbourhoods affect individuals' outcomes over and above the effects of individual characteristics and family background. However, methodological issues make it a challenging area of research (e.g., van Ham et al., 2012). Nonetheless, theoretical considerations on the mechanisms underlying the association between neighbourhood characteristics and individual outcomes are compelling. Galster (2012) has grouped potential neighbourhood-effect mechanisms under social-interactive, environmental, geographical, and institutional mechanisms. Regarding the effects of growing up in a disadvantaged neighbourhood on mental health, Goldstein et al. (2019) list four neighbourhood attributes linked to depression in the literature: socioeconomic disadvantage, instability, lack of social cohesion, and income inequality. They expect these characteristics to have effects mainly via social-interactive mechanisms affecting social ties, exposure to stressful life events and lack of social and material support.

According to Goldstein et al. (2019), most studies of neighbourhood effects on mental health have focused on adults or young children, and they may have missed the developmental period of greatest risk. Indeed, many psychiatric disorders tend to emerge during adolescence (e.g., Paus et al., 2008). Previous research on neighbourhood effects on mental health among young people has not produced consistent evidence. For example, Ivert et al. (2013) and Goldstein et al. (2019) did not find neighbourhood effects, and studies taking into account school characteristics found them to have stronger effects than neighbourhood characteristics (Dunn et al., 2015; Coley et al., 2018). On the other hand, Sharp et al. (2021) found that ADHD symptoms increased with time among children living in less affluent areas when they belonged to lower socioeconomic groups or experienced family conflicts, while Barr (2018) found that neighbourhood disorder, but not disadvantage, was associated with a higher prevalence of depression among adolescents. A Swedish study that followed children for ten years estimated that around 5 percent of the variance in psychiatric disorders could be attributed to the neighbourhood level (Sundquist et al., 2015).

However, these studies have limitations. First, strong causal research methods have not always been applied. Neighbourhood destinations of households are not random, but they are affected by preferences and needs related to the current and anticipated life situation, constraints such as an urgent need to find housing, and the availability of financial resources and information (e.g., Hedman and van Ham 2012; Vaalavuo et al., 2019). Also, health has been shown to be modestly associated with internal migration (Vaalavuo and Sihvola 2020). Individual and household characteristics such as age, education, marital status, ethnicity, household composition and size, and housing tenure have been found to affect neighbourhood selection (e.g., Kan 1999; Clark and Huang 2003; Feijten 2005; Rabe and Taylor 2010). Therefore, it is essential to control for the non-random selection of households into neighbourhoods when analysing neighbourhood effects with observational data.

Second, cross-level interactions between individual and neighbourhood characteristics have been rarely analysed, except for conducting separate analyses by sex, even though it is likely that possible neighbourhood effects are not similar for everyone. Finally, many of the previous studies have used national samples which combine both urban and rural areas, while it is likely that the meaning and the perceived size of neighbourhood differs in these areas. Therefore, although the existing research does not always suggest neighbourhood effects on adolescent mental health to exist, the evidence is not yet conclusive and should be more carefully studied in various institutional contexts.

2.3. The moderating role of family background

In their review, Minh et al. (2017) state that mechanisms through which neighbourhood effects operate are related to differences in

children's family environments and early childhood development (see also Wodtke et al., 2016; Visser et al., 2021). They conclude that neighbourhood effects are unlikely generalizable across all people, but some are more vulnerable than others. For example, Sharp et al. (2021) found that family background moderates the association between childhood ADHD and neighbourhood characteristics. This calls for taking into account heterogeneity between children of less and more advantageous family backgrounds, as the extent to which neighbourhood characteristics influence adolescent mental health outcomes may vary by family resources.

Two categories of mechanisms can be postulated to describe how the moderating effect of family background could operate (Fig. 1). In both sets of mechanisms, the focus is on differential neighbourhood effects according to family resources in which family resources can either amplify or suppress the neighbourhood effect on mental health. In the first set (Fig. 1A), neighbourhood differences in mental health are more pronounced among children with less affluent family background, while in the second set (Fig. 1B) the differences are larger among children of well-off families. For reference, the situation of no interaction is also presented in Fig. 1: in such case, favourable neighbourhood characteristics benefit all children equally irrespective of their background.

According to the first set of mechanisms (Fig. 1A), better family resources may *buffer* against the negative effect of unfavourable neighbourhood characteristics. In such cases, family resources such as higher economic security, social connections, and informational resources can be utilized for the benefit of the children and despite the low resources in the neighbourhood. This idea of '*compensatory advantage*' has been mainly analysed in educational transmission literature (Bernardi 2014; Bernardi and Boado, 2014; Bernardi and Triventi, 2020; Tanskanen et al., 2016), but also in adolescents' labour market outcomes after disability pension (Kailaheimo-Lönnqvist 2021). In the context of the current study, the theory would propose that mental health of children from well-off families is less affected by disadvantaged living environments (noted as d in Fig. 1A), as suggested also by the findings of Sharp et al. (2021).

When it comes to children from low socioeconomic background, they are not only more likely to develop psychiatric disorders, but also adverse living environments affect them more negatively as the '*double jeopardy*' hypothesis of multiple disadvantages asserts (Jackson 2009). The same process is also known as the theory of '*cumulative disadvantage*' which suggests that early disadvantages are likely to accumulate over time leading to increasing gaps in outcomes, such as mental health, as children grow older (DiPrete and Eirich, 2006). Wodtke et al. (2016) found that living in disadvantaged neighbourhoods was more negatively associated with high school graduation among children with disadvantaged family background; the same phenomenon may be true for children's mental health outcomes (b in Fig. 1A). While Sharp et al. (2021) only used a sample of 190 children, their finding points in the same direction: the association between disadvantageous neighbourhoods and worse mental health development was only found among socioeconomically disadvantaged children.

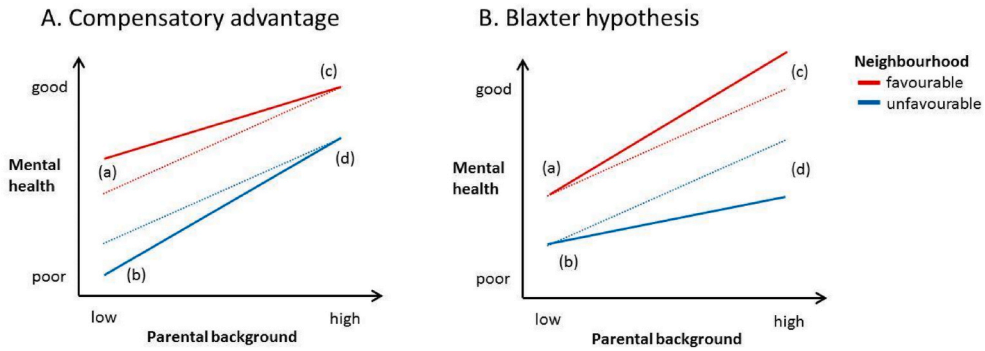
On the other hand, while the negative effect of unfavourable neighbourhood characteristics may be accumulated by disadvantaged family background, living in favourable neighbourhoods may *compensate* (Erola and Kilpi-Jakonen 2017) for the lack of parental resources among these children (a in Fig. 1A). For example, richer and more highly educated neighbours may provide better access to resources or beneficial role models that may be important for children from low-status families. However, for children from advantageous backgrounds, favourable living environments do not provide any additional benefit (c in Fig. 1A) since they are already advantaged (*ceiling effect*).

The second set of mechanisms proposes that neighbourhood may matter more in the top of the social strata (Fig. 1B). This alternative notion of heterogeneity in terms of family background suggests that the chances of benign outcomes later in life are already initially smaller among children with disadvantaged backgrounds. Therefore, other circumstances, such as the neighbourhood, are less decisive for these children, whereas children of affluent backgrounds have more to lose. In addition, adverse living surroundings could inhibit children from benefiting fully from their parents' resources. Following this assumption, labelled as the *'floor effect'* in studies on parental separation (e.g., Bernardi and Radl 2014) and as the *'Blaxter effect'* in health research (Jackson 2009), unfavourable neighbourhood characteristics should be more harmful for adolescent mental health among children of well-off families (d in Fig. 1B). As the risk of mental ill-health is already elevated among children with lower backgrounds, the relative effect of the neighbourhood should be smaller or non-existent (a and b in Fig. 1B). On the other hand, living in favourable neighbourhoods may provide an added benefit for children from advantaged family backgrounds (c in Fig. 1B), as taking full advantage of the neighbourhood characteristics may require assistance from the family. Thus, advantaged neighbourhoods may also act in a *multiplicative* way (also referred to as a Matthew effect, Merton 1968) so that the effect of a favourable living environment is amplified by an affluent family of origin.

3. Data and methods

3.1. Data and analysis sample

We use administrative register data for the entire population of Finland spanning from 1999 to 2018. The data comprise socioeconomic and demographic variables processed by Statistics Finland from data collected from various governmental sources including e.g., detailed information on income, labour market status, education, family structure, place of residence, and country of birth, and of health care use from Care Register for Health Care from Finnish Institute for Health and



Note: The dotted line represents no interaction between neighbourhood characteristics and family background.

Fig. 1. Alternative hypotheses for the moderating impact of family background.

Welfare. Individuals can be linked to their biological parents and siblings as well as other individuals living in the same household. The data was anonymised and used in Statistics Finland's remote system for data confidentiality and security.

In the main analyses we included children born in 1992–2001 and followed their family and neighbourhood characteristics from age 7 to 13, and children's possible mental health problems from the age of 14 till the age of 17. We restricted our analysis to those individuals who lived in the three largest cities in Finland (Helsinki, Tampere and Turku) or in their surrounding regions (altogether 38 municipalities) for the entire period between ages 7 and 13. This restriction to the most urbanised regions was made to create a sample of individuals with reasonable similarity in access to health care and in the type of a neighbourhood we measure, and to reduce validity problems in the neighbourhood measurement (i.e., excluding very large and sparsely populated areas). Children without information on both parents' id were removed from the analysis sample (n = 4,662). In total we had 196,241 children in the analysis of which almost 40 per cent did not have a sibling in the data. This left us with a sample of 115,627 individuals with one or more siblings and all the relevant data available. Annex Table A1 compares background characteristics of children with and without siblings.

3.2. Neighbourhood characteristics

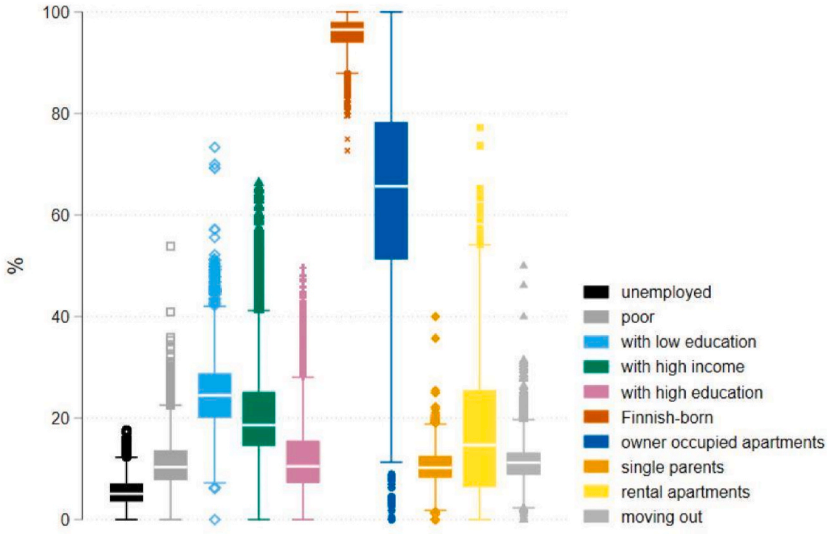
The data include information on the place of residence at the end of the calendar year at a postcode level (n = 508 in 1999, n = 524 in 2014). The postcode areas, with an average of 3,708 inhabitants, are used as the neighbourhood units. We use three indicators to characterize neighbourhoods based on the sum of standardized variables: 1) *neighbourhood advantage* is based on the share of individuals with a university-level degree (for population aged 18–64), in the top income quintile, born in Finland, and living in an owner-occupied dwelling; 2) *neighbourhood disadvantage* measures neighbourhood's poverty rate (share of people with equivalised household disposable income below 60% of the nation's median income, excluding students), unemployment rate (for population aged 18–64), and share of individuals with the lowest level of education (for population aged 18–64); 3) *neighbourhood instability* includes indicators on the share of individuals living in single-parent families, living in rental apartments, and moving out of the neighbourhood. See Annex Table A2 for summary statistics on the indicators. These neighbourhood characteristics were measured annually throughout childhood from age 7 to 13 and the mean of the neighbourhood characteristics between these years is used in the analysis.

Fig. 2 illustrates the variation across neighbourhoods in each of these (non-standardized) variables for the entire period during which neighbourhood characteristics are measured (see also Annex Table A2). The most variation was found for housing type, while there was less variation in the share of unemployed and native-born Finns. Annex Figures A1-13 describe the distribution of each standardized variable in the study population. It should be noted that most of the variation in the neighbourhood characteristics between siblings is induced by residential mobility and around 20 percent of the study population experience a move (see Annex Table A3). Around five percent of the total variation in neighbourhood characteristics in the study population is within families, but when we only look at movers, the share is more than 11 percent (see Annex Table A2).

3.3. Psychiatric disorders

Our outcome variable is a child's psychiatric disorder between ages 14 and 17. As a measure of psychiatric disorders, we use detailed data from the Health Care Register that includes all in- and outpatient visits in public special health care. Public health care in Finland is a universal system financed through taxes and user fees. Our data includes visits to hospitals and is thus restricted to more severe psychiatric cases.

We use the ICD-10 codes of main diagnoses to distinguish visits with psychiatric diagnoses. We include the following three classes of diagnoses in our measure of mental health problems: 1) mental and behavioural disorders due to psychoactive substance use (F10–F19), 2) mood and affective disorders (F30–F39), and 3) anxiety, stress etc. (F40–F49). These are included as they are more likely to be affected by the child's living environment. We created a dummy variable indicating whether the person had any of these diagnoses between ages 14 and 17. In addition, we distinguished between internalizing (F30–F39 and F40–F49) and externalizing (F10–F19) disorders, while they are commonly overlapping (results shown in Appendix). Children with psychiatric diagnosis before the age of 14 were omitted from the analysis (n = 3,638). We have not included behavioural and emotional disorders that commonly start in childhood or adolescence (F90–F98) in our measure of psychiatric disorders as the age of onset is usually before the age of 14.



Note: Box plot graphs of unstandardized neighbourhood characteristics in the municipalities included in the study.

Fig. 2. Neighbourhood context: variation in neighbourhood characteristics (1999–2014).

Table 1 describes the study population with and without a psychiatric diagnosis between ages 14 and 17.6.1 per cent of the study population had a psychiatric diagnosis between ages 14 and 17. Diagnoses were more common among girls, later birth cohorts, those with a Finnish background, and those with a parent with mental health problems, of primary education, and of lower household income status.

3.4. Control variables

We control for the child's year of birth, gender, and household income in all models.

Household income quintile is based on a household's equivalised disposable income (total income after taxes and social transfers). Income quintiles are calculated based on the analysis sample and based on the average income when the child was aged 7–13. We use the OECD modified equivalence scale to take into account household's size and composition. The value of 1 is assigned to the household's first adult, 0.5 to all other adults, and 0.3 to all household members under the age 14.

In the random effects models (see more about the analytical strategy in the Method section), also immigrant background (grouped into Finnish background, second generation immigrant, or foreign-born), living in a single-parent family (at any point when the child was aged 7–13), parents' highest level of education (when the child was aged 7–13), mother's age at birth, and parents' psychiatric diagnosis (when the child was aged 7–13, all psychiatric diagnoses under ICD-10 class F are taken into account) are included as control variables. Parental education refers to the highest education of either mother or father. It has three categories: primary education (compulsory schooling), secondary education, and post-secondary or tertiary education.

4. Methods

We start by examining the associations with descriptive methods. This is followed by our main analysis that covers both sibling random effects analysis (RE) and sibling fixed effects analysis (FE). Traditional OLS or random effects estimates may be misleading as important unobserved factors accounting for selection to neighbourhoods may be missing from the model. One way to control for the selection is to use fixed effects models.

In sibling fixed effect models, any factors that are shared by siblings, observed or not, are automatically controlled for but cannot be estimated (Amato and Anthony 2014; Elstad and Bakken 2015; Grätz 2015; D'Onofrio et al., 2020; Kailaheimo-Lönnqvist 2021). Sibling fixed effects models allow controlling for many family-level characteristics such as parental education and less easily controlled characteristics such as parenting styles. Thus, sibling fixed effects models offer a more reliable way to measure the influence of neighbourhood since selection to neighbourhoods is largely determined by family background. The

Table 1
Background characteristics of adolescents with and without a psychiatric diagnosis at age 14–17 (only those with siblings included).

	No psychiatric diagnosis	With psychiatric diagnosis	Total study population	Share with a psychiatric diagnosis
Year of birth				
1992	9,292	477	9,769	4.9%
1993	9,726	572	10,298	5.6%
1994	11,569	701	12,270	5.7%
1995	12,430	769	13,199	5.8%
1996	12,672	828	13,500	6.1%
1997	12,729	840	13,569	6.2%
1998	11,774	834	12,608	6.6%
1999	10,965	747	11,712	6.4%
2000	9,137	627	9,764	6.4%
2001	8,285	653	8,938	7.3%
Gender				
Male	57,298	2,134	59,432	3.6%
Female	51,281	4,914	56,195	8.7%
Immigrant background				
Finnish background	103,219	6,871	110,090	6.2%
Second generation immigrant	4,289	139	4,428	3.1%
Foreign-born	1,071	38	1,109	3.4%
Has lived in single-parent household				
Never when aged 7-13	79,189	4,046	83,235	4.9%
At any point when aged 7-13	29,390	3,002	32,392	9.3%
Parents' psychiatric diagnosis				
No, mother	102,808	6,218	109,026	5.7%
Yes, mother	5,771	830	6,601	12.6%
No, father	103,620	6,387	110,007	5.8%
Yes, father	4,959	661	5,620	11.8%
Income quintile				
1 (lowest)	20,287	1,591	21,878	7.3%
2	21,725	1,693	23,418	7.2%
3	22,578	1,485	24,063	6.2%
4	22,647	1,268	23,915	5.3%
5 (highest)	21,342	1,011	22,353	4.5%
Parents' highest level of education				
Primary education	4,829	426	5,255	8.1%
Secondary education	57,326	4,000	61,326	6.5%
Tertiary education	46,424	2,622	49,046	5.3%
Parents' average earnings (EUR)				
Mother	21,741	19,742	21,619	
Father	37,178	32,772	36,911	
Parents' average age				
Mother	39.9	39.7	39.9	
Father	42.1	41.9	42.1	
Mean number of siblings	2.3	2.3	2.3	
Total number of observations	*108,579*	*7,048*	*115,627*	*6.1%*

estimated effects in the fixed effects models are based on the characteristics that *distinguish* siblings (D'Onofrio et al., 2020; Grätz 2015), such as age and differences in exposure. We estimate the following regression model:

$$Y_{ij} = \alpha + \beta_1 Neigh_{ij} + \beta_2 X_{ij} + f_j + \varepsilon_{ij}$$

in which Y_{ij} is the outcome of interest, i.e. psychiatric diagnosis between ages 14 and 17, for individual i with parents j. β_1 is the coefficient for neighbourhood indicator $Neigh_{ij}$ and X_{ij} is a vector for individual characteristics. Sibling fixed effects (i.e., systematic family-level differences) are represented by f_j for all characteristics shared by siblings so that β_1 and β_2 capture the effects of differences between siblings in the neighbourhood and individual characteristics. ε_{ij} is the error term.

Estimates in the sibling fixed effects models are based on the differences between siblings in exposure to different neighbourhood characteristics, thus variation in the neighbourhood exposure is necessary. Annex Table A2 shows that there is variation at exposure to different neighbourhoods between siblings (measured as the average difference between sibling-pairs). As most variation comes from siblings that move, Annex Table A3 describes differences between movers and non-movers. Around a fifth of our study population experience a move in their childhood (age 7–13). Moving is more common among foreign-born children, children living in single-parent families and children from lower socioeconomic backgrounds.

While our dependent variable is a binary variable (a dummy for having a psychiatric diagnosis between ages 14 and 17), we use linear probability models that are easy to interpret and provide coefficients that can be compared across models. A growing body of literature has established that the use of linear models in estimating effects on binary outcomes is safer especially when there are interaction terms or fixed effects (Gomila 2020).

5. Results

We start by describing the association between psychiatric disorders and neighbourhood characteristics in Table 2. The results show that there were only small differences in the average shares of different groups in the neighbourhood when comparing adolescents with and without a psychiatric disorder. However, all the differences were to the expected direction so that those with a psychiatric diagnosis lived in neighbourhoods with more disadvantage, less advantage, and more instability.

Continuing with our random effects (RE) and fixed effects (FE) models, the results in Table 3 compare the effects of standardized neighbourhood characteristics on psychiatric disorders in adolescence. The results show that neighbourhood characteristics were linked with children's mental health problems in the RE models but not in the FE models. In the RE models, neighbourhood advantage was associated with a decreased likelihood of having mental health problems in adolescence, while neighbourhood disadvantage and instability were associated with increased likelihood of having mental health problems. Taking into account the limited range of standardized neighbourhood variables (from around −2 to 3, see Annex Table A2), these associations can be considered of significant size. However, the estimates are reduced in the FE models, which do not suggest neighbourhood effects to exist. When it comes to individual-level determinants, gender, parents' psychiatric disorder, and having lived in a single-parent household had the strongest association with mental health problems.

Next, we analysed whether neighbourhood effect was different for children from different family backgrounds by stratifying the analysis presented on Table 3 by household income quintile and parental education. Analysis on heterogeneous effects in Table 4A (parental education) and 4B (household income quintile) shows that the neighbourhood characteristics were not associated with the mental health problems similarly for everyone. When all family-level constant characteristics were taken into account in the FE models, there were no statistically significant neighbourhood effects by family background. While the effect sizes are in some cases considerable, they remain quite unreliable due to large standard errors. Also, the results regarding education and income groups pointed to somewhat different conclusions. Modest differences between groups can be observed, but a clear pattern is hard to detect.

As a sensitivity analysis, we run the analyses separately for internalizing and externalizing disorders (Appendix). As most of the psychiatric diagnoses under study belong to the former group, the results are very close to our general results. As for externalizing disorders, i.e. disorders related to substance abuse (F10–F19), there are some differences. Overall, the effects are small and not statistically significant in the FE models (Annex Table A4b). However, among the children of highly educated parents, neighbourhood disadvantage was negatively associated with a diagnosis in the FE models, while neighbourhood advantage

Table 2
Neighbourhood characteristics at age 7–13 among adolescents with and without a psychiatric diagnosis at age 14–17 (only those with siblings included).

1) Neighbourhood disadvantage at age 7–13				
	Poverty rate	**Unemployment rate**	**Share with low education**	
No psychiatric diagnosis at age 14–17 (n = 108,579)	11.5%	5.1%	22.8%	
With psychiatric diagnosis at age 14–17 (n = 7,048)	11.9%	5.2%	23.3%	
2) Neighbourhood advantage at age 7–13				
	Share with the highest education	**Share in the top income quintile**	**Share of native-born Finns**	**Share of homeowners**
No psychiatric diagnosis at age 14–17 (n = 108,579)	14.0%	21.5%	95.0%	67.3%
With psychiatric diagnosis at age 14–17 (n = 7,048)	13.7%	20.9%	94.5%	64.9%
3) Neighbourhood instability at age 7–13				
	Share living in single-parent families	**Share living in rental apartments**	**Share moving out annually**	
No psychiatric diagnosis at age 14–17 (n = 108,579)	10.3%	15.6%	10.9%	
With psychiatric diagnosis at age 14–17 (n = 7,048)	10.8%	17.4%	11.2%	

Table 3
General results on mental health problems in adolescence comparing random-effects and fixed-effects models with different neighbourhood characteristics.

	Neighbourhood advantage		Neighbourhood disadvantage		Neighbourhood instability	
	RE	FE	RE	FE	RE	FE
Neighbourhood	**−0.0077*** **	**−0.0029**	**0.0052*** **	**0.0031**	**0.0091*** **	**0.0026**
	(0.0012)	(0.0069)	(0.0010)	(0.0053)	(0.0009)	(0.0057)
Household income quintile (ref. 1)						
2	−0.0007	−0.0006	−0.0006	−0.0006	−0.0005	−0.0006
	(0.0024)	(0.0042)	(0.0024)	(0.0042)	(0.0024)	(0.0042)
3	−0.0068**	0.0013	−0.0066**	0.0015	−0.0066**	0.0014
	(0.0025)	(0.0054)	(0.0025)	(0.0054)	(0.0025)	(0.0054)
4	−0.0130***	0.0031	−0.0129***	0.0033	−0.0132***	0.0032
	(0.0027)	(0.0066)	(0.0027)	(0.0066)	(0.0027)	(0.0066)
5	−0.0180***	0.0041	−0.0186***	0.0041	−0.0196***	0.0041
	(0.0030)	(0.0082)	(0.0030)	(0.0082)	(0.0029)	(0.0082)
Female	0.0513***	0.0498***	0.0514***	0.0497***	0.0514***	0.0498***
	(0.0014)	(0.0018)	(0.0014)	(0.0018)	(0.0014)	(0.0018)
Year of birth	0.0030***	0.0022***	0.0032***	0.0023***	0.0033***	0.0022***
	(0.0003)	(0.0005)	(0.0003)	(0.0005)	(0.0003)	(0.0005)
Parental education (ref. primary)						
Secondary	−0.0153***		−0.0156***		−0.0144***	
	(0.0038)		(0.0038)		(0.0038)	
Tertiary	−0.0163***		−0.0168***		−0.0165***	
	(0.0040)		(0.0040)		(0.0040)	
Mother's age at birth	−0.0003		−0.0003		−0.0004*	
	(0.0002)		(0.0002)		(0.0002)	
Parents' psychiatric diagnosis	0.0455***		0.0457***		0.0454***	
	(0.0025)		(0.0025)		(0.0025)	
Immigrant background (ref. Finnish)						
Second generation immigrant	−0.0544***		−0.0529***		−0.0575***	
	(0.0043)		(0.0043)		(0.0043)	
Foreign-born	−0.0489***		−0.0480***		−0.0516***	
	(0.0077)		(0.0077)		(0.0077)	
Has lived in a single-parent family						
Yes	0.0302***		0.0305***		0.0285***	
	(0.0018)		(0.0018)		(0.0018)	
Constant	−5.9244***	−4.3157***	−6.2993***	−4.5177***	−6.5507***	−4.3947***
	(0.5822)	(0.9903)	(0.5827)	(1.0582)	(0.5831)	(1.0126)
Observations	*115,627*	*115,627*	*115,627*	*115,627*	*115,627*	*115,627*

Note: Standard errors in parentheses. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

Table 4
Heterogeneity results on mental health problems in adolescence comparing random-effects and fixed-effects models with different neighbourhood characteristics, by parental education and household income quintile.

	A. Parental education			B. Household income quintile				
	Primary education	Secondary education	Tertiary education	Q1	Q2	Q3	Q4	Q5
	RE	RE	RE	RE	RE	RE	RE	RE
Neighbourhood advantage	0.0025	−0.0100***	−0.0060***	−0.0094**	−0.0092**	−0.0098***	−0.0031	−0.0076***
	(0.0064)	(0.0017)	(0.0016)	(0.0031)	(0.0028)	(0.0026)	(0.0023)	(0.0021)
	FE	FE	FE	FE	FE	FE	FE	FE
	−0.0096	−0.0083	0.0083	−0.0285	0.0227	0.0388	−0.0042	−0.0188
	(0.0313)	(0.0098)	(0.0104)	(0.0184)	(0.0288)	(0.0324)	(0.0265)	(0.0179)
	RE	RE	RE	RE	RE	RE	RE	RE
Neighbourhood disadvantage	−0.0028	0.0067***	0.0040**	0.0031	0.0058**	0.0065**	0.0037	0.0076***
	(0.0046)	(0.0013)	(0.0015)	(0.0022)	(0.0021)	(0.0020)	(0.0020)	(0.0021)
	FE	FE	FE	FE	FE	FE	FE	FE
	0.0158	0.0079	−0.0092	0.0195	−0.0254	−0.0376	0.0154	0.0186
	(0.0233)	(0.0073)	(0.0085)	(0.0134)	(0.0204)	(0.0243)	(0.0211)	(0.0175)
	RE	RE	RE	RE	RE	RE	RE	RE
Neighbourhood instability	0.0071	0.0091***	0.0090***	0.0110***	0.0117***	0.0099***	0.0050**	0.0072***
	−0.0051	−0.0013	−0.0014	(0.0022)	(0.0020)	(0.0019)	(0.0019)	(0.0020)
	FE	FE	FE	FE	FE	FE	FE	FE
	−0.0018	0.0051	0.0035	0.0282	−0.0106	−0.0322	−0.0091	0.0263
	(0.0275)	(0.0079)	(0.0090)	(0.0155)	(0.0223)	(0.0254)	(0.0215)	(0.0169)
Observations	*5,255*	*61,326*	*49,046*	*21,878*	*23,418*	*24,063*	*23,915*	*22,353*

Note: Controlled for the same variables as in Table 3. Standard errors in parentheses. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

was positively associated with a diagnosis (Annex Table A5b).

6. Conclusions

The existence of neighbourhood effects and the mechanisms behind them are increasingly fascinating researchers. The evidence is relevant for decision-makers in the cities as well: for example, to what extent mental health promotion should be targeted spatially. As socioeconomic segregation can be a potential threat to social cohesion and equality of opportunities, understanding the role of place in population health is

ever more important. The neighbourhood's social environment could be expected to be particularly salient for adolescents (Sharkey and Faber 2014). A focus on mental health issues, on the other hand, is justified due to the rise in service use for psychiatric disorders among adolescents (Gyllenberg et al., 2018) and the long-lasting negative impact of mental health problems in adolescence (Lundborg et al., 2014; Hakulinen et al., 2019; Haula and Vaalavuo 2021).

In this article, we set out to examine the association between neighbourhood characteristics and mental health problems among teenagers. Furthermore, we investigated whether family resources moderate the association. Using high-quality Finnish register data on the total population, we were able to rely on a very large sample of observations allowing the use of sibling models. Prior research on neighbourhood effects on mental health has produced inconsistent results, some studies discovering effect on adults (Wight et al., 2013), some on certain socioeconomic groups among children (Sharp et al., 2021), and some using specific neighbourhood characteristics but not others (Barr 2018). In their review of literature, Bishop et al. (2020) note that while the existing evidence is theoretically incoherent and fragmented, studies have found a relationship between health and health behaviour and neighbourhood context also during transition to adulthood.

Our results show that when family-level unobserved constant characteristics are *not* taken into account, neighbourhood instability and socioeconomic status are related to children's mental health problems, but when they are, the connections are weaker. The results on heterogeneity were mixed when comparing random and fixed effects models, different socioeconomic measures and different neighbourhood indicators. However, when looking only at the externalizing disorders, we found, against our expectation, that it was the children of highly educated parents that had a higher likelihood of experiencing substance use related disorders when growing up in advantageous neighbourhoods and lower likelihood in disadvantageous neighbourhoods. This could reflect highly educated parents' protective behaviour or access to services across neighbourhoods of different types. Investigating different disorder groups separately makes sense and can point to different mechanisms on how neighbourhoods can affect children. However, this is data demanding and sample sizes tend to be small.

Our findings are both good and bad news; on the one hand, our results show that there is no evidence of a strong association between neighbourhood characteristics under study and psychiatric disorder within families. This suggests that a child's living environment, measured by the neighbourhood socioeconomic characteristics or instability, does not generally affect the child's mental health problems in Finland. Thus, it seems that every neighbourhood is safe enough in general from this perspective. On the other hand, our findings indicate that family background is closely linked with children's mental health problems. This suggests that the support for reducing children's mental health problems should be targeted according to family background rather than neighbourhood type. Relying on evidence from a randomized controlled trial, Moving to Opportunity, in the US, Osypuk et al. (2012) also found that residential mobility to low-poverty neighbourhoods produced mental health benefits only among girls without pre-existing health vulnerability. However, some authors argue that improving neighbourhoods would have public health benefits, so the debate is far from settled (Jivraj et al., 2020, based on a review of literature).

However, our study also has limitations and it remains an observational study without strict claims for causal inference. Neighbourhoods were examined on a yearly basis from the age of 7 till the age of 13, and the estimate comes from the differences in neighbourhood exposure among siblings. Consequently, most of the variation in neighbourhood characteristics in the analysis comes from those families that moved to a different type of neighbourhood during the observation period. Mainly such moves can introduce substantial differences between siblings in the neighbourhood exposure because neighbourhood characteristics change much less during childhood among those who do not move than among movers (Kleinepier and van Ham 2017). This limits the statistical power of the analysis and may also introduce some bias if the reasons for the moves are significant also in terms of the risk of mental health problems and not related to the constant family-level factors taken into account in the analysis.

Second, in addition to the neighbourhood, children's school and school mates may also have an effect, and some studies suggest that they have a stronger impact than neighbourhood (e.g., Duncan et al., 2001). Opposing evidence also exists: Huang et al. (2020) argue that neighbourhood socioeconomic disadvantage predicts mental health and behavioural outcomes among adolescents better than school environment. Unfortunately, our data does not include information about schools.

Third, our measure of mental health is quite severe, and thus milder or undiagnosed mental health issues are not covered. The used measure of psychiatric disorders restricts our analysis to more severe psychiatric problems and excludes milder problems or mental health issues that have not been identified or diagnosed in public special health care. The failure to acknowledge unmet mental health care needs among children and youth, especially in lower socioeconomic groups, is a limitation in our empirical analyses. Moreover, the use of private insurances and services among children, especially of higher income families, is increasingly common. The results should be interpreted with these limitations in mind. Furthermore, mental health is measured by the age of 17 even though some mental health problems usually occur later on (Kessler et al., 2007); future studies should extend the observation period to investigate longer-term effects of childhood living environment.

Fourth, like all methods, sibling fixed effect models also have their limitations. First, the method assumes that parents treat their children exactly the same and that children respond to this treatment similarly (Carbonneau et al., 2002; Jenkins et al., 2003). Thus, unobserved factors that are not shared among siblings can lead to bias. Second, sibling fixed effects models can only be estimated in families with two or more children, and it is possible that some life events influence singletons differently from those with siblings (Francesconi et al., 2010). However, our robustness analysis shows that results from an OLS model are quite similar both among singletons and those with siblings (Annex Table A6).

In their literature review on neighbourhoods and health, Jivraj et al. (2020) have noted that prior research on neighbourhood effects show a bias towards studies from the US. We believe that evidence from other institutional and societal contexts is needed as American experiences cannot be extrapolated to the other side of the Atlantic to wealthy and generous welfare states with lower levels of poverty, income inequality, and residential segregation. As urbanization is still affecting our societies, and cities are rapidly changing amid other societal processes, the investigation into neighbourhood effects remains relevant across the globe.

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Appendix

Annex table A1
Comparing children with and without siblings.

	No siblings	With siblings	Total	Share in the sibling sample
Year of birth				
1992	10,090	9,769	19,859	49.2%
1993	9,549	10,298	19,847	51.9%
1994	7,729	12,270	19,999	61.4%
1995	6,418	13,199	19,617	67.3%
1996	5,523	13,500	19,023	71.0%
1997	5,479	13,569	19,048	71.2%
1998	5,734	12,608	18,342	68.7%
1999	7,057	11,712	18,769	62.4%
2000	9,053	9,764	18,817	51.9%
2001	9,885	8,938	18,823	47.5%
Gender				
Male	39,190	59,432	98,622	60.3%
Female	37,327	56,195	93,522	60.1%
Psychiatric diagnosis at age 14–17				
No	70,650	108,579	179,229	60.6%
Yes	5,867	7,048	12,915	54.6%
Immigrant background				
Finnish background	73,222	110,090	183,312	60.1%
Second generation immigrant	2,124	4,428	6,552	67.6%
Foreign-born	1,171	1,109	2,280	48.6%
Parents' psychiatric diagnosis				
No, mother	70,540	109,026	179,566	60.7%
Yes, mother	5,977	6,601	12,578	52.5%
No, father	71,578	110,007	181,585	60.6%
Yes, father	4,939	5,620	10,559	53.2%
Income quintile				
1	14,321	21,878	36,199	60.4%
2	14,945	23,418	38,363	61.0%
3	14,832	24,063	38,895	61.9%
4	15,405	23,915	39,320	60.8%
5	17,014	22,353	39,367	56.8%
Parents' highest level of education				
Primary education	4,654	5,255	9,909	53.0%
Secondary education	42,635	61,326	103,961	59.0%
Tertiary education	29,228	49,046	78,274	62.7%
Parents' average earnings (EUR)				
Mother	21,811	21,619		
Father	33,132	36,911		
Parents' average age				
Mother	40.6	39.9		
Father	42.8	42.1		
Average number of moves				
Between postcode areas	0.35	0.27		
Between cities	0.10	0.08		
All observations in the analytical sample*	**76,517**	**115,627**	**192,144**	**60.2%**

Note: All observations refer to our analytical sample, see data & methods.

Annex table A2
Neighbourhood characteristics and sibling differences.

	Mean	Standard deviation	Standardized mean	Standardized min	Standardized max	Average difference between sibling-pairs	Share of total variation explained by within-family variation	Share of total variation explained by within-family variation (only movers)
Poverty rate	0.12	0.04	−0.04	−2.65	4.47	0.21		
Unemployment rate	0.05	0.02	−0.06	−2.40	5.14	0.28		
Share with low education (18–64)	0.23	0.06	−0.02	−2.44	5.99	0.32		
Neighbourhood disadvantage	***:***	***:***	***−0.04***	***−2.09***	***3.25***	***0 .18***	***5%***	***13%***
Share in top income quintile	0.21	0.09	0.03	−2.26	4.57	0.12		
Share with highest education (18–64)	0.14	0.08	0.00	−1.72	4.72	0.20		
Share of native-born Finns	0.95	0.04	0.04	−4.64	1.38	0.15		

(*continued on next page*)

Annex table A2 (*continued*)

	Mean	Standard deviation	Standardized mean	Standardized min	Standardized max	Average difference between sibling-pairs	Share of total variation explained by within-family variation	Share of total variation explained by within-family variation (only movers)
Share of home-owners	0.67	0.17	0.06	−3.97	2.03	0.24		
Neighbourhood advantage	***:***	***:***	***0.03***	***−2.55***	***2.37***	***0 .10***	***4%***	***11%***
Share living in single-parent families	0.10	0.03	−0.05	−3.53	8.11	0.18		
Share living in rental apartments	0.16	0.12	−0.04	−1.30	4.09	0.15		
Share of in/out mobility	0.11	0.03	−0.06	−2.40	6.37	0.18		
Neighbourhood instability	***:***	***:***	***−0.05***	***−2.01***	***2.52***	***0.13***	***4%***	***13%***

Note: Standardization (mean set at 0 and standard deviation at 1) has been conducted for a full sample of children, while these statistics refer to a sub-sample (our analysis sample of siblings) only. Consequently, the standardized mean differs slightly from 0.

Annex Table A3

Comparing children who did not move and who did move at age 7–13 (only those with siblings).

	Did not move	Moved	Total study population	Share of movers
Year of birth				
1992	7,309	2,460	9,769	25%
1993	7,744	2,554	10,298	25%
1994	9,357	2,913	12,270	24%
1995	10,195	3,004	13,199	23%
1996	10,558	2,942	13,500	22%
1997	10,690	2,879	13,569	21%
1998	10,192	2,416	12,608	19%
1999	9,469	2,243	11,712	19%
2000	7,989	1,775	9,764	18%
2001	7,327	1,611	8,938	18%
Gender				
Male	46,914	12,518	59,432	21%
Female	43,916	12,279	56,195	22%
Psychiatric diagnosis at age 14–17				
No	85,776	22,803	108,579	21%
Yes	5,054	1,994	7,048	28%
Immigrant background				
Finnish background	86,847	23,243	110,090	21%
Second generation immigrant	3,267	1,161	4,428	26%
Foreign-born	716	393	1,109	35%
Has lived in single-parent household				
Never when aged 7-13	70,601	12,634	83,235	15%
At any point when aged 7-13	20,229	12,163	32,392	38%
Parents' psychiatric diagnosis				
No, mother	86,313	22,713	109,026	21%
Yes, mother	4,517	2,084	6,601	32%
No, father	86,906	23,101	110,007	21%
Yes, father	3,924	1,696	5,620	30%
Income quintile				
1	15,897	5,981	21,878	27%
2	17,490	5,928	23,418	25%
3	18,914	5,149	24,063	21%
4	19,696	4,219	23,915	18%
5	18,833	3,520	22,353	16%
Mother's highest level of education				
Primary education	9,653	3,817	13,470	28%
Secondary education	53,788	14,747	68,535	22%
Tertiary education	27,389	6,233	33,622	19%
Father's highest level of education				
Primary education	13,613	5,185	18,798	28%
Secondary education	48,836	13,083	61,919	21%
Tertiary education	28,381	6,529	34,910	19%
Parents' average earnings (EUR)				
Mother	22 176	19 576		
Father	37 886	33 325		
Parents' average age				
Mother	40.31131	38.42148		
Father	42.43283	40.69396		
Mean number of sibling	2.341099	2.309231		
Total number of observations	***90,830***	***24,797***	***115,627***	***21%***

Annex Table A4
Regression results for internalizing (a) and externalizing disorders (b) separately.

a. Internalizing disorders (F30–F39 and F40–F49)	Neighbourhood advantage		Neighbourhood disadvantage		Neighbourhood instability	
	RE	FE	RE	FE	RE	FE
Neighbourhood	−0.0075***	−0.0036	0.0046***	0.0036	0.0088***	0.0032
	(0.0011)	(0.0066)	(0.0009)	(0.0051)	(0.0009)	(0.0055)
Household income quintile (ref. 1)						
2	−0.0009	−0.0001	−0.0008	0.0000	−0.0007	−0.0000
	(0.0023)	(0.0040)	(0.0023)	(0.0040)	(0.0023)	(0.0040)
3	−0.0067**	0.0011	−0.0066**	0.0013	−0.0066**	0.0012
	(0.0024)	(0.0052)	(0.0024)	(0.0052)	(0.0024)	(0.0052)
4	−0.0132***	0.0035	−0.0132***	0.0037	−0.0134***	0.0036
	(0.0026)	(0.0063)	(0.0026)	(0.0063)	(0.0026)	(0.0063)
5	−0.0166***	0.0068	−0.0174***	0.0069	−0.0182***	0.0068
	(0.0029)	(0.0079)	(0.0029)	(0.0079)	(0.0028)	(0.0079)
Female	0.0528***	0.0510***	0.0528***	0.0510***	0.0528***	0.0510***
	(0.0013)	(0.0017)	(0.0013)	(0.0017)	(0.0013)	(0.0017)
Year of birth	0.0028***	0.0019***	0.0029***	0.0020***	0.0031***	0.0019***
	(0.0003)	(0.0005)	(0.0003)	(0.0005)	(0.0003)	(0.0005)
Parental education (ref. Primary)						
Secondary	−0.0123***		−0.0127***		−0.0114**	
	(0.0037)		(0.0037)		(0.0037)	
Tertiary	−0.0122**		−0.0128***		−0.0124**	
	(0.0039)		(0.0039)		(0.0038)	
Mother's age at birth	−0.0001		−0.0001		−0.0002	
	(0.0002)		(0.0002)		(0.0002)	
Parent's psychiatric	0.0439***		0.0441***		0.0438***	
diagnosis	(0.0024)		(0.0024)		(0.0024)	
Immigrant background (ref. Finnish)						
Second generation	−0.0518***		−0.0501***		−0.0547***	
immigrant	(0.0042)		(0.0041)		(0.0042)	
Foreign-born	−0.0479***		−0.0469***		−0.0506***	
	(0.0074)		(0.0074)		(0.0074)	
Has lived in a single-	0.0268***		0.0271***		0.0252***	
parent family	(0.0017)		(0.0017)		(0.0017)	
Constant	−5.4592***	−3.7589***	−5.8070***	−3.9942***	−6.0637***	−3.8554***
	(0.5594)	(0.9515)	(0.5599)	(1.0166)	(0.5603)	(0.9729)
Observations	115,671	115,671	115,671	115,671	115,671	115,671

b. Externalizing disorders (F10–F19)	Neighbourhood advantage		Neighbourhood disadvantage		Neighbourhood instability	
	RE	FE	RE	FE	RE	FE
Neighbourhood	−0.0006	0.0019	0.0008*	−0.0012	0.0010***	−0.0019
	(0.0004)	(0.0025)	(0.0003)	(0.0019)	(0.0003)	(0.0021)
Household income quintile (ref. 1)						
2	0.0003	0.0006	0.0003	0.0006	0.0003	0.0006
	(0.0008)	(0.0015)	(0.0008)	(0.0015)	(0.0008)	(0.0015)
3	−0.0001	0.0023	−0.0000	0.0023	−0.0001	0.0023
	(0.0009)	(0.0020)	(0.0009)	(0.0020)	(0.0009)	(0.0020)
4	−0.0006	0.0017	−0.0004	0.0017	−0.0005	0.0017
	(0.0009)	(0.0024)	(0.0009)	(0.0024)	(0.0009)	(0.0024)
5	−0.0020*	−0.0000	−0.0018	−0.0000	−0.0021*	−0.0001
	(0.0010)	(0.0030)	(0.0010)	(0.0030)	(0.0010)	(0.0030)
Female	−0.0000	0.0004	−0.0001	0.0004	−0.0000	0.0004
	(0.0005)	(0.0007)	(0.0005)	(0.0007)	(0.0005)	(0.0007)
Year of birth	0.0004***	0.0004*	0.0004***	0.0004	0.0004***	0.0004*
	(0.0001)	(0.0002)	(0.0001)	(0.0002)	(0.0001)	(0.0002)
Parental education (ref. Primary)						
Secondary	−0.0062***		−0.0062***		−0.0061***	
	(0.0013)		(0.0013)		(0.0013)	
Tertiary	−0.0079***		−0.0079***		−0.0079***	
	(0.0013)		(0.0028)		(0.0013)	
Mother's age at birth	−0.0001*		−0.0001*		−0.0001*	
	(0.0001)		(0.0001)		(0.0001)	
Parent's psychiatric	0.0045***		0.0045***		0.0045***	
diagnosis	(0.0009)		(0.0009)		(0.0009)	
Immigrant background (ref. Finnish)						
Second generation	−0.0052***		−0.0053***		−0.0057***	
immigrant	(0.0014)		(0.0014)		(0.0015)	
Foreign-born	−0.0051		−0.0053*		−0.0056*	
	(0.0027)		(0.0027)		(0.0027)	
Has lived in a single-	0.0052***		0.0052***		0.0050***	
parent family	(0.0006)		(0.0006)		(0.0006)	
Constant	−0.7462***	−0.7852*	−0.7852*	−0.7903***	−0.8105***	−0.7243
	(0.2022)	(0.3624)	(0.3624)	(0.2023)	(0.2025)	(0.3705)
Observations	117,493	117,493	117,493	117,493	117,493	117,493

Note: Standard errors in parentheses. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.
Note: Standard errors in parentheses. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

Annex Table A5
Regression results on heterogeneity for internalizing (a) and externalizing (b) disorders separately.

a. Internalizing disorders (F30–F39 and F40–F49)	A. Parental education			B. Household income quintile				
	Primary education	Secondary education	Tertiary education	Q1	Q2	Q3	Q4	Q5
	RE	RE	RE	RE	RE	RE	RE	RE
Neighbourhood advantage	0.0053	−0.0091***	−0.0067***	−0.0076**	−0.0101***	−0.0093***	−0.0033	−0.0077***
	(0.0061)	(0.0017)	(0.0015)	(0.0029)	(0.0027)	(0.0025)	(0.0022)	(0.0020)
	FE	FE	FE	FE	FE	FE	FE	FE
	−0.0097	−0.0068	0.0033	−0.0235	0.0207	0.0482	−0.0076	−0.0267
	(0.0297)	(0.0094)	(0.0101)	(0.0177)	(0.0277)	(0.0314)	(0.0252)	(0.0174)
	RE	RE	RE	RE	RE	RE	RE	RE
Neighbourhood disadvantage	−0.0057	0.0057***	0.0045**	0.0013	0.0060**	0.0059**	0.0034	0.0077***
	(0.0044)	(0.0013)	(0.0014)	(0.0021)	(0.0021)	(0.0020)	(0.0019)	(0.0020)
	FE	FE	FE	FE	FE	FE	FE	FE
	0.0187	0.0069	−0.0047	0.0191	−0.0241	−0.0339	0.0177	0.0243
	(0.0221)	(0.0069)	(0.0083)	(0.0129)	(0.0197)	(0.0235)	(0.0201)	(0.0170)
	RE	RE	RE	RE	RE	RE	RE	RE
Neighbourhood instability	0.0057	0.0089***	0.0086***	0.0104***	0.0117***	0.0092***	0.0051**	0.0071***
	(0.0048)	(0.0012)	(0.0013)	(0.0021)	(0.0019)	(0.0018)	(0.0018)	(0.0020)
	FE	FE	FE	FE	FE	FE	FE	FE
	−0.0056	0.0073	0.0030	0.0214	−0.0110	−0.0286	−0.0085	0.0333*
	(0.0261)	(0.0076)	(0.0087)	(0.0149)	(0.0215)	(0.0246)	(0.0205)	(0.0164)
Observations	*4,890*	*58,387*	*47,178*	*20,770*	*22,203*	*22,962*	*22,934*	*21,586*

b. Externalizing disorders (F10–F19)	A. Parental education			B. Household income quintile				
	Primary education	Secondary education	Tertiary education	Q1	Q2	Q3	Q4	Q5
	RE	RE	RE	RE	RE	RE	RE	RE
Neighbourhood advantage	−0.0033	−0.0017**	0.0009	−0.0024*	0.0000	−0.0009	−0.0003	0.0004
	(0.0026)	(0.0006)	(0.0005)	(0.0011)	(0.0010)	(0.0009)	(0.0008)	(0.0006)
	FE	FE	FE	FE	FE	FE	FE	FE
	0.0149	−0.0026	0.0072*	−0.0010	0.0015	0.0062	0.0023	0.0055
	(0.0146)	(0.0037)	(0.0034)	(0.0073)	(0.0109)	(0.0110)	(0.0098)	(0.0056)
	RE	RE	RE	RE	RE	RE	RE	RE
Neighbourhood disadvantage	0.0026	0.0016**	−0.0006	0.0020**	0.0002	0.0008	0.0007	−0.0002
	(0.0019)	(0.0005)	(0.0004)	(0.0008)	(0.0008)	(0.0007)	(0.0007)	(0.0006)
	FE	FE	FE	FE	FE	FE	FE	FE
	−0.0070	0.0015	−0.0061*	−0.0012	0.0002	−0.0115	0.0007	−0.0027
	(0.0108)	(0.0027)	(0.0028)	(0.0053)	(0.0077)	(0.0083)	(0.0078)	(0.0054)
	RE	RE	RE	RE	RE	RE	RE	RE
Neighbourhood instability	0.0031	0.0011*	0.0006	0.0015*	0.0010	0.0013	0.0006	0.0001
	(0.0021)	(0.0004)	(0.0004)	(0.0008)	(0.0007)	(0.0007)	(0.0006)	(0.0006)
	FE	FE	FE	FE	FE	FE	FE	FE
	−0.0050	−0.0038	0.0018	0.0042	−0.0038	−0.0060	0.0037	−0.0036
	(0.0127)	(0.0030)	(0.0029)	(0.0061)	(0.0084)	(0.0087)	(0.0079)	(0.0052)
Observations	*4,965*	*58,974*	*47,605*	*21,014*	*22,438*	*23,210*	*23,107*	*21,775*

Note: Controlled for the same variables as in Table 3. Standard errors in parentheses. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.
Note: Controlled for the same variables as in Table 3. Standard errors in parentheses. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

Annex table A6
Comparing OLS results among children with and without siblings.

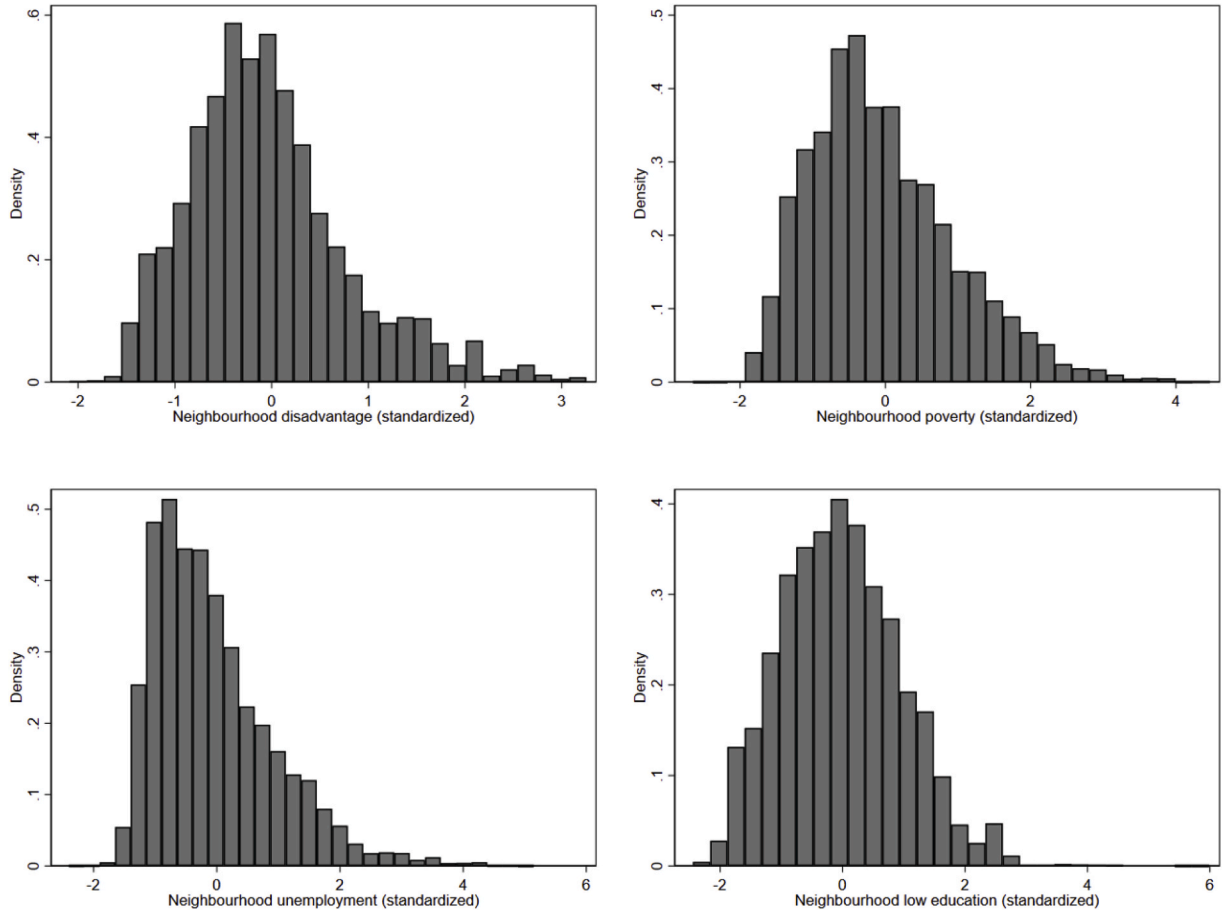
	Advantage		Disadvantage		Instability	
	Singletons	With siblings	Singletons	With siblings	Singletons	With siblings
Neighbourhood characteristics	**−0.0070*****	**−0.0070*****	**0.0027***	**0.0051*****	**0.0082*****	**0.0090*****
	(0.0015)	(0.0015)	(0.0012)	(0.0009)	(0.0012)	(0.0009)
Household income quintile (ref. 1)						
2	−0.0009	−0.0009	−0.0009	0.0004	−0.0007	0.0004
	(0.0031)	(0.0031)	(0.0031)	(0.0023)	(0.0031)	(0.0023)
3	−0.0104**	−0.0104**	−0.0107**	−0.0057*	−0.0101**	−0.0058*
	(0.0033)	(0.0033)	(0.0033)	(0.0024)	(0.0033)	(0.0024)
4	−0.0135***	−0.0135***	−0.0140***	−0.0121***	−0.0133***	−0.0125***
	(0.0035)	(0.0035)	(0.0035)	(0.0026)	(0.0035)	(0.0026)
5	−0.0199***	−0.0199***	−0.0214***	−0.0179***	−0.0208***	−0.0190***
	(0.0038)	(0.0038)	(0.0038)	(0.0028)	(0.0038)	(0.0028)
Woman	0.0660***	0.0660***	0.0661***	0.0515***	0.0660***	0.0515***
	(0.0019)	(0.0019)	(0.0019)	(0.0014)	(0.0019)	(0.0014)
Year of birth	0.0037***	0.0037***	0.0038***	0.0032***	0.0039***	0.0033***
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Parental education (ref. primary)						
Secondary	−0.0138***	−0.0138***	−0.0142***	−0.0157***	−0.0131**	−0.0144***

(*continued on next page*)

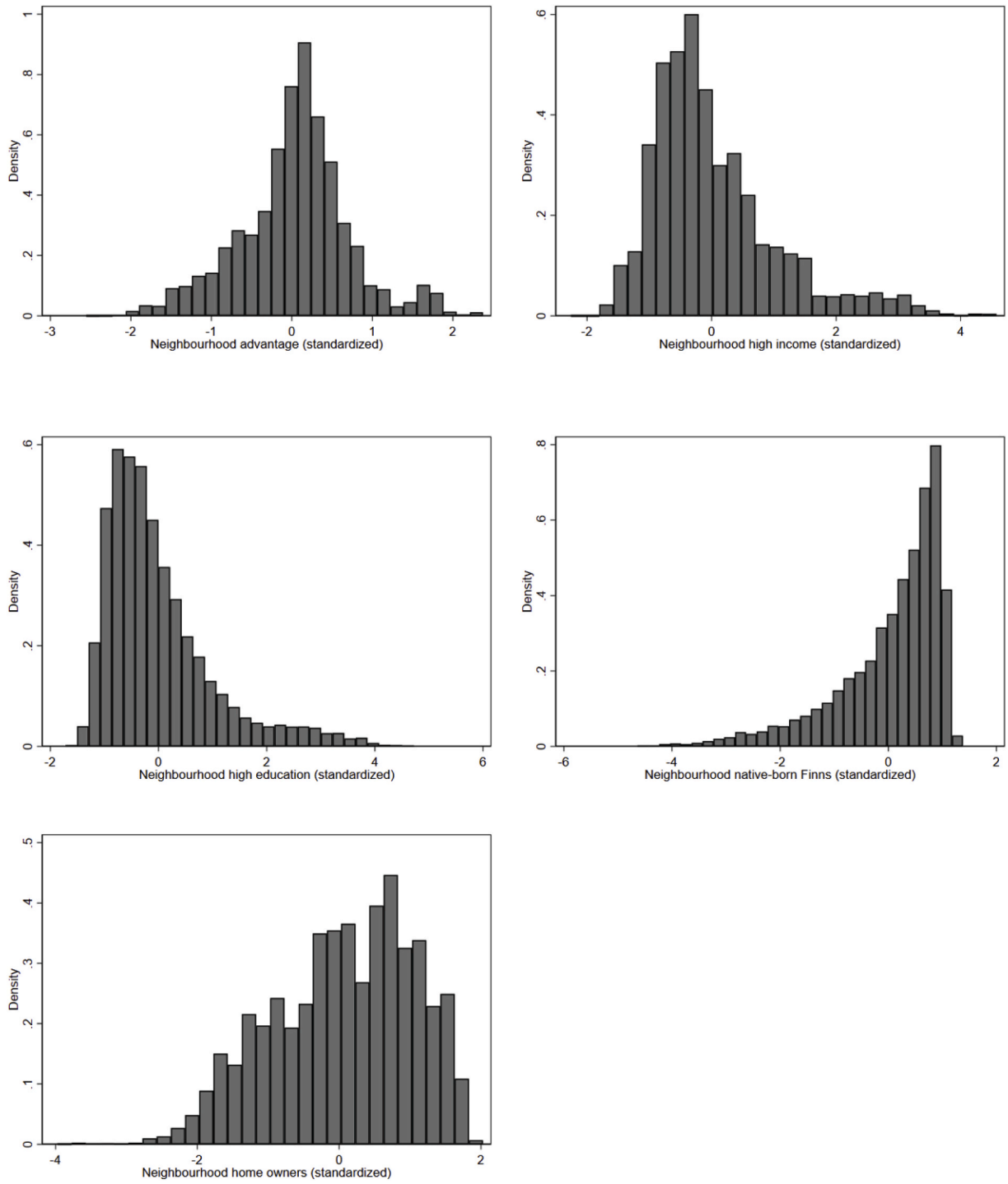
Annex table A6 (*continued*)

	Advantage		Disadvantage		Instability	
	Singletons	With siblings	Singletons	With siblings	Singletons	With siblings
	(0.0042)	(0.0042)	(0.0041)	(0.0036)	(0.0042)	(0.0036)
Tertiary	−0.0145***	−0.0145***	−0.0153***	−0.0167***	−0.0149***	−0.0164***
	(0.0044)	(0.0044)	(0.0044)	(0.0037)	(0.0044)	(0.0037)
Mother's age at birth	−0.0000	−0.0000	−0.0001	−0.0003	−0.0001	−0.0003*
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Parents' psychiatric diagnosis						
	0.0548***	0.0548***	0.0551***	0.0477***	0.0546***	0.0473***
	(0.0029)	(0.0029)	(0.0029)	(0.0024)	(0.0029)	(0.0024)
Immigrant background (ref. Finnish)						
Second generation immigrant	−0.0408***	−0.0408***	−0.0388***	−0.0527***	−0.0426***	−0.0574***
	(0.0059)	(0.0059)	(0.0059)	(0.0039)	(0.0060)	(0.0040)
Foreign-born	−0.0448***	−0.0448***	−0.0429***	−0.0482***	−0.0466***	−0.0518***
	(0.0079)	(0.0079)	(0.0079)	(0.0073)	(0.0079)	(0.0074)
Has lived in a single-parent family	0.0343***	0.0343***	0.0347***	0.0312***	0.0328***	0.0292***
Yes	(0.0022)	(0.0022)	(0.0022)	(0.0017)	(0.0022)	(0.0017)
Constant	−7.3315***	−7.3315***	−7.6121***	−6.2393***	−7.8002***	−6.4998***
	(0.6845)	(0.6845)	(0.6850)	(0.5656)	(0.6845)	(0.5660)
Observations	76,517	76,517	76,517	115,627	76,517	115,627

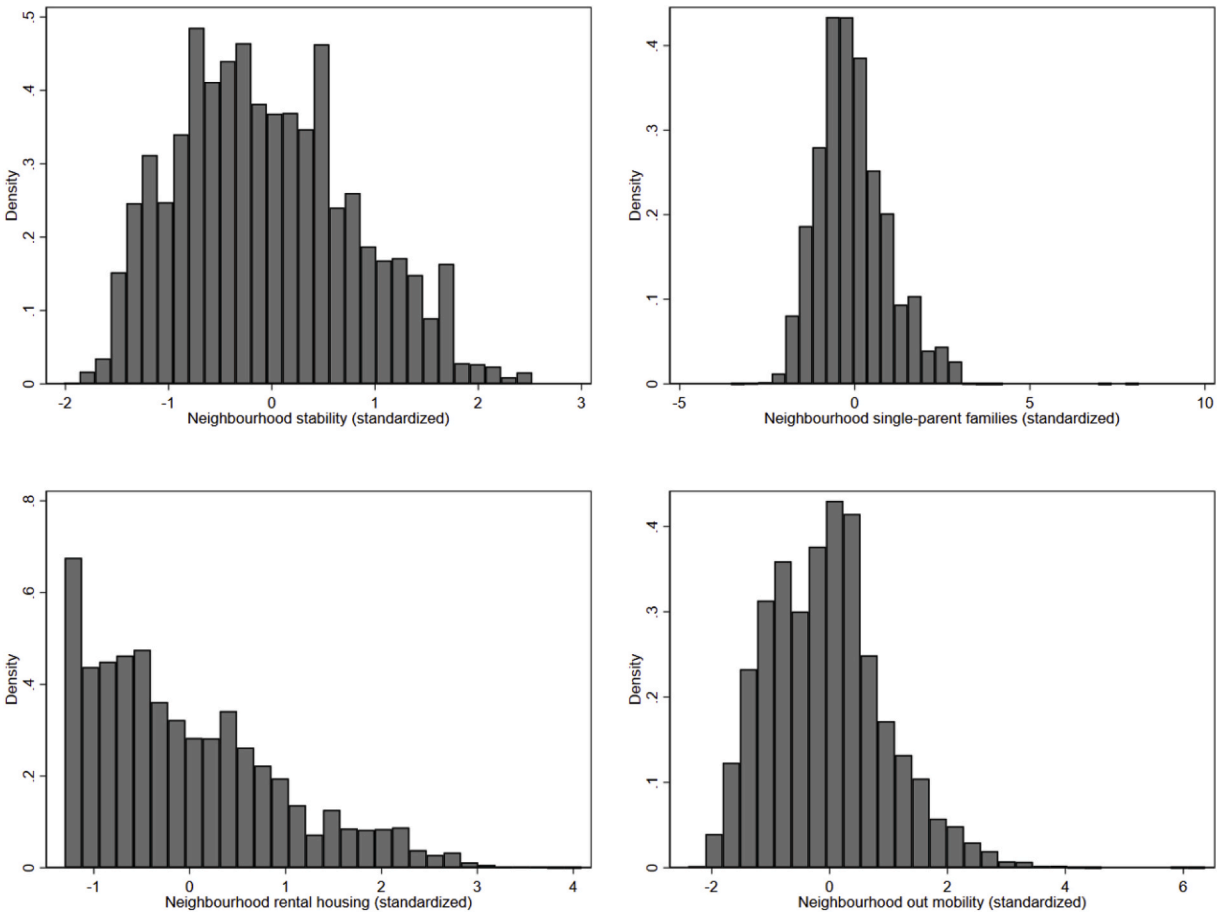
Note: Standard errors in parentheses. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.



Annex Fig. s 1–4. Distribution of neighbourhood disadvantage indicators in the study population.



Annex Fig. s 5–9. Distribution of neighbourhood advantage indicators in the study population.



Annex Fig. 10–13. Distribution of neighbourhood instability indicators in the study population.

References

Amato, P.R., Anthony, C.J., 2014. Estimating the effects of parental divorce and death with fixed effects models. J. Marriage Fam. 76 (2), 370–386.

Andersen, H.S., Andersson, R., Wessel, T., Vilkama, K., 2016. The impact of housing policies and housing markets on ethnic spatial segregation: comparing the capital cities of four Nordic welfare states. International Journal of Housing Policy 16 (1), 1–30.

Arcaya, M.C., Tucker-Seeley, R.D., Kim, R., Schnake-Mahl, A., So, M., Subramanian, S.V., 2016. Research on neighborhood effects on health in the United States: a systematic review of study characteristics. Soc. Sci. Med. 168, 16–29.

Barr, P.B., 2018. Early neighbourhood conditions and trajectories of depressive symptoms across adolescence and into adulthood. Adv. Life Course Res. 35, 57–68.

Bernardi, F., 2014. Compensatory advantage as a mechanism of educational inequality: a regression discontinuity based on month of birth. Sociol. Educ. 87 (2), 74–88.

Bernardi, F., Boado, H.C., 2014. Previous school results and social background: compensation and imperfect information in educational transitions. Eur. Socio Rev. 30 (2), 207–217.

Bernardi, F., Radl, J., 2014. The long-term consequences of parental divorce for children's educational attainment. Demogr. Res. 30 (1), 1653–1680.

Bernardi, F., Triventi, M., 2020. Compensatory advantage in educational transitions: trivial or substantial? A simulated scenario analysis. Acta Sociol. 63 (1), 40–62.

Bishop, A.S., Walker, S.C., Herting, J.R., Hill, K.G., 2020. Neighborhoods and health during the transition to adulthood: a scoping review. Health Place 63, 102336.

Blomgren, J., Virta, L.J., 2020. Socioeconomic differences in use of public, occupational and private health care: a register-linkage study of a working-age population in Finland. PloS One 15 (4), 1–18. https://doi.org/10.1371/journal.pone.0231792.

Bussemakers, C., Kraaykamp, G., 2020. Youth adversity, parental resources and educational attainment: contrasting resilience and a reproduction perspective. Res. Soc. Stratif. Mobil. 67, 100505.

Carbonneau, R., Eaves, L.J., Silberg, J.L., et al., 2002. Assessment of the within-family environment in twins: absolute versus differential ratings, and relationships with conduct problems. J. Child Psychol. Psychiatry Allied Discip. 43 (8), 1064–1074.

Chetty, R., Hendren, N., 2018. The impacts of neighborhoods on intergenerational mobility I: childhood exposure effects. Q. J. Econ. 133 (3), 1107–1162.

Clark, W.A.V., Huang, Y., 2003. The life course and residential mobility in British housing markets. Environ. Plann. 35 (2), 323–339.

Coley, et al., 2018. Locating economic risks for adolescent mental and behavioral health: poverty and affluence in families, neighborhoods, and schools. Child Dev. 89 (2), 360–369.

Duncan, G.J., Boisjoly, J., Harris, K.M., 2001. Sibling, peer, neighbor, and schoolmate correlations as indicators of the importance of context for adolescent development. Demography 38 (3), 437–447.

Dunn, et al., 2015. Disentangling the relative influence of schools and neighborhoods on adolescents' risk for depressive symptoms. Am. J. Publ. Health 105 (4), 732–740.

D'Onofrio, B.M., Class, Q.A., Rickert, M.E., et al., 2016. Translational epidemiologic approaches to understanding the consequences of early-life exposures. Behav. Genet. 46 (3), 315–328.

D'Onofrio, B.M., Sjölander, A., Lahey, B.B., Lichtenstein, P., Öberg, A.S., 2020. Accounting for confounding in observational studies. Annu. Rev. Clin. Psychol. 16 (1), 25–48.

Elstad, J.I., 1998. The psycho-social perspective on social inequalities in health. Sociol. Health Illness 20 (5), 598–618.

Elstad, J.I., Bakken, A., 2015. The effects of parental income on Norwegian adolescents' school grades: a sibling analysis. Acta Sociol. 58 (3), 265–282.

Erola, J., Kilpi-Jakonen, E., 2017. Compensation and other forms of accumulation in intergenerational social inequality. In: Erola, J., Kilpi-jakonen, E. (Eds.), Social Inequality across the Generations. Edward Elgar, pp. 3–24.

Feijten, P., 2005. Union dissolution, unemployment and moving out of homeownership. Eur. Socio Rev. 21 (1), 59–71.

Filatova, S., Upadhyaya, S., Kronström, K., Suominen, A., Chudal, R., Luntamo, T., Sourander, A., Gyllenberg, D., 2019. Time trends in the incidence of diagnosed depression among people aged 5–25 years living in Finland 1995–2012. Nord. J. Psychiatr. 73 (8), 475–481.

Francesconi, M., Jenkins, S.P., Siedler, T., 2010. Childhood family structure and schooling outcomes: evidence for Germany. J. Popul. Econ. 23 (3), 1073–1103. https://doi.org/10.1007/s00148-009-0242-y.

Galster, G.C., 2012. The mechanism(s) of neighbourhood effects: theory, evidence and policy implications. In: van Ham, M., Manley, D., Bailey, N., Simpson, L., Maclennan, D. (Eds.), Neighbourhood Effects Research: New Perspectives. Springer, Dordrecht, pp. 23–56.

Goldstein, Rise B., et al., 2019. Neighbourhood disadvantage and depressive symptoms among adolescents followed into emerging adulthood. J. Epidemiol. Community 73 (7), 590–597.
Gomila, R., 2020. Logistic or linear? Estimating causal effects of experimental treatments on binary outcomes using regression analysis. J. Exp. Psychol. Gen. online first 24 September 2020.
Grätz, M., 2015. When growing up without a parent does not hurt: parental separation and the compensatory effect of social origin. Eur. Socio Rev. 31 (5), 546–557.
Gyllenberg, D., Marttila, M., Sund, R., Jokiranta-Olkoniemi, E., Sourander, A., Gissler, M., Ristikari, T., 2018. Temporal changes in the incidence of treated psychiatric and neurodevelopmental disorders during adolescence: an analysis of two national Finnish birth cohorts. Lancet Psychiatry 5, 227–236.
Hakulinen, C., Elovainio, M., Arffman, M., Lumme, S., Pirkola, S., Keskimäki, I., Maderbacka, K., Böckerman, P., 2019. Mental disorders and long-term labour market outcomes: nationwide cohort study of 2 055 720 individuals. Acta Psychiatr. Scand. 140 (4), 371–381.
Haula, T., Vaalavuo, M., 2021. Mental health problems in youth and later receipt of social assistance: do parental resources matter? J. Youth Stud. https://doi.org/10.1080/13676261.2021.1923676.
Hedman, L., van Ham, M., 2012. Understanding neighbourhood effects: selection bias and residential mobility. In: van Ham, M., Manley, D., Bailey, N., Simpson, L., Maclennan, D. (Eds.), Neighbourhood Effects Research: New Perspectives. Springer, Dordrecht, pp. 79–99.
Hedman, L., Manley, D., Van Ham, M., 2019. Using sibling data to explore the impact of neighbourhood histories and childhood family context on income from work. PloS One 14 (5), 1–21.
Huang, Z., Edwards, J., Laurel-Wilson, M., 2020. The shadow of context: neighborhood and school socioeconomic disadvantage, perceived social integration, and the mental and behavioral health of adolescents. Health Place 66, 102425.
Ivert, A.-K., Torstensson, L.M., Merlo, J., 2013. Adolescents' utilisation of psychiatric care, neighbourhoods and neighbourhood socioeconomic deprivation: a multilevel analysis. PloS One 8 (11), e81127.
Jackson, M.I., 2009. Understanding links between adolescent health and educational attainment. Demography 46 (4), 671–694.
Jenkins, J., Rasbash, J., O'Connor, T., 2003. The role of the shared family context in differential parenting. Dev. Psychol. 39 (1), 99–113.
Jivraj, S., Murray, E.T., Norman, P., Nicholas, O., 2020. The impact of life course exposures to neighbourhood deprivation on health and well-being: a review of the long-term neighbourhood effects literature. Eur. J. Publ. Health 30 (5), 922–928.
Jokela, M., 2014. Are neighborhood health associations causal? A 10-year prospective cohort study with repeated measurements. Am. J. Epidemiol. 180 (8), 776–784.
Jokela, M., 2015. Does neighbourhood deprivation cause poor health? Within-individual analysis of movers in a prospective cohort study. J. Epidemiol. Community 69 (9), 899–904.
Jokela, M., 2020. Neighbourhoods, psychological distress, and the quest for causality. Current Opinion in Psychology 32, 22–26.
Kailaheimo-Lönnqvist, S., 2021. Like Parent, like Child? the Role of Resources and Life Events from an Intergenerational Perspective. PhD Dissertation. University of Turku, ISBN 978-951-29-8339-1. Available online: http://urn.fi/URN.
Kan, K.H., 1999. Expected and unexpected residential mobility. J. Urban Econ. 45 (1), 72–96.
Kessler, R.C., Amminger, G.P., Aguilar-Gaxiola, S., Alonso, J., Lee, S., Ustün, T.B., 2007. Age of onset of mental disorders: a review of recent literature. Curr. Opin. Psychiatr. 20 (4), 359–364.
Kleinepier, T., van Ham, M., 2017. The temporal stability of children's neighborhood experiences: a follow-up from birth to age 15. Demogr. Res. 36, 1813–1826.
Kleinepier, T., van Ham, M., Nieuwenhuis, J., 2018. Ethnic differences in timing and duration of exposure to neighbourhood disadvantage during childhood. Adv. Life Course Res. 36, 92–104.
Korhonen, A.K., Remes, H., Martikainen, P.T., 2017. Education as a social pathway from parental socioeconomic position to depression in late adolescence and early adulthood: a Finnish population-based register study. Soc. Psychiatr. Psychiatr. Epidemiol. 52 (1), 105–116.
Lundborg, P., Nilsson, A., Rooth, D.O., 2014. Adolescent health and adult labor market outcomes. J. Health Econ. 37, 25–40.
Merton, R.K., 1968. The Matthew effect in science. Science 159 (3810), 56–63.
Mikkonen, J., Moustgaard, H., Remes, H., Martikainen, P., 2016. Intergenerational transmission of depressive symptoms - the role of gender, socioeconomic circumstances, and the accumulation of parental symptoms. J. Affect. Disord. 204, 74–82.
Minh, A., Muhajarine, N., Janus, M., Brownell, M., Guhn, M., 2017. A review of neighbourhood effects and early child development: how, where, and for whom, do neighbourhoods matter? Health Place 46, 155–174.
Murali, V., Oyebode, F., 2004. Poverty, social inequality and mental health. Adv. Psychiatr. Treat. 10, 216–224.
Nieuwenhuis, J., Hooimeijer, P., 2016. The association between neighbourhoods and educational achievement, a systematic review and meta-analysis. J. Hous. Built Environ. 31, 321–347.
Oakes, J.M., Andrade, K.E., Biyoow, I.M., Cowan, L.T., 2015. Twenty years of neighborhood effect research: an assessment. Current Epidemiology Reports 2 (1), 80–87.
Osypuk, T.L., Tchetgen, E.J.T., Acevedo-Garcia, D., et al., 2012. Differential mental health effects of neighborhood relocation among youth in vulnerable families: results from a randomized trial. Arch. Gen. Psychiatr. 69 (12), 1284–1294. https://doi.org/10.1001/archgenpsychiatry.2012.449.
Paus, T., Keshavan, M., Giedd, J., 2008. Why do many psychiatric disorders emerge during adolescence? Nat. Rev. Neurosci. 9, 947–957.
Rabe, B., Taylor, M., 2010. Residential mobility, quality of neighbourhood and life course events. J. Roy. Stat. Soc. 173 (3), 531–555.
Reiss, F., 2013. Socioeconomic inequalities and mental health problems in children and adolescents: a systematic review. Soc. Sci. Med. 90, 24–31.
Sharkey, P., Faber, J.W., 2014. Where, when, why, and for whom do residential contexts matter? Moving away from the dichotomous understanding of neighborhood effects. Annu. Rev. Sociol. 40, 559–579.
Sharp, W., Mangalmurti, A., Hall, C., Choudhury, S., Shaw, P., 2021. Associations between neighborhood, family factors and symptom change in childhood attention deficit hyperactivity disorder. Soc. Sci. Med. 271, 112203.
Sundquist, J., Li, X., Ohlsson, H., Råstam, M., Winkleby, M., Sundquist, K., Kendler, K.S., Crump, C., 2015. Familial and neighbourhood effects on psychiatric disorders in childhood and adolescence. J. Psychiatr. Res. 66–67, 7–15.
Tammaru, T., Marcinczak, S., Aunap, R., van Ham, M., Janssen, H., 2019. Relationship between income inequality and residential segregation of socioeconomic groups. Reg. Stud. 1–12.
Tanskanen, A.O., Erola, J., Kallio, J., 2016. Parental resources, sibship size, and educational performance in 20 countries: evidence for the compensation model. Cross Cult. Res. 50 (5), 452–477.
Vaalavuo, M., Bakkum, B., 2020. Mental health problems at a critical juncture – exit from social assistance among young Finns. J. Soc. Pol. online first 23 September 2020.
Vaalavuo, M., Sihvola, M.-W., 2020. Are the sick left behind in the peripheries? Health selection in migration to growing urban centres in Finland. Eur. J. Popul. online first 4 November 2020.
Vaalavuo, M., van Ham, M., Kauppinen, T.M., 2019. Income mobility and moving to a better neighbourhood – an enquiry into ethnic differences in Finland. Eur. Socio Rev. 35 (4), 538–551.
van Ham, M., Manley, D., Bailey, N., Simpson, L., Malennan, D. (Eds.), 2012. Neighbourhood Effects Research: New Perspectives. Springer, Dordrecht.
Visser, K., Bolt, G., Finkenauer, C., Jonker, M., Weinberg, D., Stevens, G., 2021. Neighborhood deprivation effects on young people's mental health and well-being: a systematic review of literature. Soc. Sci. Med. 270, 113542.
Wight, R.G., Aneshensel, C.S., Barrett, C., et al., 2013. Urban neighbourhood unemployment history and depressive symptoms over time among late middle age and older adults. J. Epidemiol. Community 67, 153–158.
Wodtke, G.T., Elwert, F., Harding, D.J., 2016. Neighborhood effect heterogeneity by family income and developmental period. Am. J. Sociol. 121 (4), 1168–1222.