Neighborhood social composition and refugee mental health – quasi-experimental evidence of associations from a Danish population register study

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Abstract

Background. Refugees are at an elevated risk of some mental disorders with studies highlighting the contributing role of post-migration factors. Studies of migrant groups show neighborhood social composition, such as ethnic density, to be important. This is the first longitudinal study to examine this question for refugees and uses a novel quasi-experimental design.
Methods. We followed a cohort of 44 033 refugees from being first assigned housing under the Danish dispersal policy, operating from 1986 to 1998, until 2019. This comprised, in effect, a natural experiment whereby the influence of assigned neighborhood could be determined independently of endogenous factors. We examined three aspects of neighborhood social composition: proportion of co-nationals, refugees, and first-generation migrants; and subsequent incidence of different mental disorders.
Results. Refugees assigned to neighborhoods with fewer co-nationals (lowest *v.* highest quartile) were more likely to receive a subsequent diagnosis of non-affective psychosis, incident rate ratio (IRR) 1.25 (95% confidence interval (CI) 1.06–1.48), and post-traumatic stress disorder (PTSD), IRR 1.21 (95% CI I.05–1.39). A comparable but smaller effect was observed for mood disorders but none observed for stress disorders overall. Neighborhood proportion of refugees was less clearly associated with subsequent mental disorders other than non-affective psychosis, IRR 1.24 (95% CI 1.03–1.50). We found no statistically significant associations with proportion of migrants.
Conclusions. For refugees, living in a neighborhood with a lower proportion of co-nationals is related to subsequent increased risk of diagnosed mental disorders particularly non-affective psychosis and PTSD.

Introduction

There has been much interest in recent years in the role of neighborhood social context in helping to explain higher rates of mental disorders among migrant groups (Baker, Jackson, Jongsma, & Saville, 2021; Dykxhoorn, Lewis, Hollander, Kirkbride, & Dalman, 2020; Schofield et al., 2017, 2018). Refugees are at a particularly high risk of some mental disorders compared to other migrants (Blackmore et al., 2020; Dapunt, Kluge, & Heinz, 2017) and yet, as our recent review has shown, relatively little is known about the role of neighborhood factors for this group post-migration (Ermansons, Kienzler, Asif, & Schofield, 2023). While recent studies have looked at area deprivation as one factor associated with refugee mental health (Foverskov, White, Froslev, Sorensen, & Hamad, 2022; Foverskov et al., 2023) less attention has been paid to neighborhood social composition. Studies of migrant groups have shown neighborhood co-ethnic density to be an important factor, with living in a higher ethnic density neighborhood consistently associated with lower rates of psychosis (Baker et al., 2021) and more common mental disorders (Becares, Dewey, and Das-Munshi, 2018). This is particularly important as the type of neighborhood in which refugees live is uniquely subject to government policies, such as spatial dispersal policies aimed at reducing the concentration of refugees in particular urban areas. Several north-European countries have implemented spatial dispersal policies for refugees and asylum seekers, for example: Sweden, from 1985 to 1994 (Åslund & Rooth, 2007); and currently Denmark, since 1986 (Azlor, Damm, & Schultz-Nielsen, 2020); the Netherlands, since 1987 (Selm, 2000); Finland, since 1988 (Andersson et al., 2010); Switzerland, since 1988 (Couttenier, Petrencu, Rohner, & Thoenig, 2019); Germany, since 1991 (Bahar, Hauptmann, Özgüzel, & Rapoport, 2024), Norway, since 1994 (Bratsberg, Ferwerda, Finseraas, & Kotsadam, 2021); Ireland, since 2000 (Proietti & Veneri, 2021); and the UK, since

2000 (Bell, Fasani, & Machin, 2013). Given that these policies directly influence where refugees live, the characteristics of these neighborhoods are therefore potentially modifiable risk factors over which we can have some control. This is in line with socio-ecological and public mental health approaches focused on modifiable social determinants to improve our understanding of what matters for refugee mental health (Miller & Rasmussen, 2017; Purgato, Tol, & Bass, 2017).

Despite the potential relevance of social composition, only one neighborhood ethnic density study to date has looked specifically at refugees. A Norwegian population register study examined admissions to mental institutions over a 4-year period and found an association between lower rates of admissions and number of bed days and living in higher ethnic density areas (Finnvold & Ugreninov, 2018). However, the study was cross-sectional only and the authors were unable to rule out sample selection, as a possible explanation for these apparent protective effects, or look at mental disorders in any detail. It is recognized that there are important methodological difficulties distinguishing endogenous risk factors in all studies investigating the role of place in mental disorders (Arcaya et al., 2016). Often the type of neighborhood someone lives in may reflect their mental health which makes it difficult, if not impossible, to assign a causal role to neighborhood factors. Furthermore, these endogenous effects may differ between mental disorders which, in turn, makes comparison between disorders difficult. However, refugee dispersal policies in Denmark provide a rare opportunity to examine the effect of the neighborhood environment that can discount these endogenous effects. This is because of the unique opportunity presented by the Danish dispersal policy operating from 1986 to 1998 where housing allocation involved no face-to-face contact. After conditioning on a limited set of criteria, comprising all the information known to housing officials on arrival, the effect of neighborhood allocation can be analyzed independently of the characteristics of refugees themselves. As previous studies have shown, after adjusting for these criteria: presence of children in the household, marital status, country of origin, age and sex of household head, and arrival year; any remaining differences in neighborhood allocation are then effectively random (Damm, 2009c; Damm & Dustmann, 2014).

A further consideration is the mechanism behind observed effects associated with neighborhood composition such as ethnic density. This could reflect proximity to others of the same nationality, implying that this confers greater social support, or it might relate to proximity to other refugees reflecting, say, greater availability of services aimed at refugees. Equally, ethnic density might correspond to being in a neighborhood with a greater proportion of migrants which, in turn, may relate to lower levels of discrimination. One way to examine which aspects of neighborhood composition is most relevant would be to investigate each conceptualization in turn using a comparative design.

Our study uses the above quasi-experimental methodology to examine whether refugees living in areas with lower co-ethnic density, lower density of refugees overall, or lower density of migrants overall, are at greater risk of different types of mental disorder.

Method

Dispersal study design

From 1986 until 1998 refugees to Denmark were subject to a dispersal policy whereby housing allocation was determined solely on the basis of a brief questionnaire completed on arrival. See previous studies for further details (Damm, 2009b; Damm & Dustmann, 2014). Therefore, we can assume that refugees with similar responses are equally likely to be housed in areas with a higher or lower proportion of co-nationals.

Cohort definition

We followed a cohort comprising all refugees assigned housing in Denmark between 1986 and 1998, subject to the dispersal policy in force at that time. Refugees were defined as all those whose application for asylum had been approved (Damm & Dustmann, 2014), with year of arrival based on the year of receipt of a residence permit (Damm & Rosholm, 2010). Until 1997 refugee status was not formally recorded, therefore in these instances refugee status was ascertained based on sending country of origin and year of arrival. We use the same set of selection rules for determining this (see online Supplementary appendix Table A1) as previous Danish refugee studies (Damm, 2009c). We also incorporated data taken directly from the Danish Immigration agency giving further information about those officially granted asylum from 1993 onwards (Norredam, Olsbjerg, Petersen, Juel, & Krasnik, 2012) (see online Supplementary appendix Table A3).

Refugees reunifying with family members were not subject to the dispersal policy unless arriving shortly after a spouse, therefore we exclude the spouses and children of refugees arriving in Denmark more than 12 months later. Excluding this group avoids potentially biased estimates in those cases where the household heads themselves moved away from the assigned neighborhood during the first 12 months (Damm & Dustmann, 2014). We also excluded refugees from the former Yugoslavia as they were initially granted provisional asylum and subject to a special refugee dispersal policy (the Bosnian program) implemented in 1993 (Damm & Dustmann, 2014).

Outcomes

We linked the cohort with data from the Danish Psychiatric Central Register, including all psychiatric in-patient admissions and, since 1995, all out-patient visits (Mors, Perto, & Mortensen, 2011). Matching across registers was conducted using citizens' unique 'CPR' number (Pedersen 2011) which were subsequently encrypted prior to being made available to researchers on the Statistics Denmark secure data platform. Categories of mental disorders were determined using ICD-10 codes, and (before 1995) the equivalent ICD-8 codes, where relevant (see online Supplementary appendix Table A2 detailed listing of codes for each category). Broad categories were included where cohort disease prevalence meant the analysis was adequately powered. The following categories were used: any mental disorder (ICD codes F00–F99), any substance use disorder (F10–F19), non-affective psychosis (F20–F29), mood disorder – any (F30–F39), stress disorder – any (F40–F48), and post-traumatic stress disorder (PTSD) (F43.1). Date of onset was defined as the date of first contact with the subsequent discharge diagnosis.

Covariates

We conditioned on the following factors covered in the questionnaire, administered at the point of arrival, that may have influenced housing allocation: presence of children in the household (whether 2 years of age or under, or between 3 and 17 years of

age), marital status (married or not), country of origin, age and sex of household head, and year of arrival (Damm, 2009c).

Area units

Previous health studies following a similar dispersal design used area units based on parish boundaries, however, these are purely administrative constructs (Foverskov et al., 2023; Hamad et al., 2020). For this study, we used more detailed, theoretically derived area units, constructed to be homogenous in terms of population size and housing type and delineated by physical barriers (Damm & Schultz-Nielsen, 2008). The original boundaries made up two sets of units comprising a minimum of 600 or 150 households. We chose the former to maximize statistical power for our analysis. The median population size of these neighborhood units during the exposure period, comprising only those areas to which refugees were assigned, was 2,415 people. This comprised 1,931 area units nested within 253 municipalities. For each cohort member, we looked at the neighborhood corresponding to the address where they were first assigned housing, ignoring any subsequent moves, therefore following an 'intention to treat' design.

Neighborhood exposures

We measured neighborhood social composition based on: firstly, the proportion of co-nationals (Edin, Fredriksson, & Åslund, 2003) defined as the neighborhood proportion of people born in the same country of origin as the individual cohort member; secondly, the neighborhood proportion of refugees overall; and thirdly, the neighborhood proportion of any 1st generation migrants.

Typically, areas with a high proportion of refugees or migrants are also more deprived which may lead to confounding with rates of mental disorder (Kirkbride, Jones, Ullrich, & Coid, 2014; Schofield et al., 2017). Similarly, level of urbanicity is associated both with proportion of refugees and migrants and higher rates of mental disorder (Krabbendam et al., 2021). We therefore adjusted for both in our analysis. We used a measure of deprivation based on the proportion of people in the neighborhood in a low-income household, defined as household income (equivalized) below 60% of the median in Denmark for that year. We also used an alternative deprivation measure applying the same index as previous refugee studies using similar Danish register data (Foverskov et al., 2023; Hamad et al., 2020). This was derived from area measures of median family income, low educational attainment, unemployment rate, and welfare benefits for the neighborhood [see (Foverskov et al., 2023) for details]. We adjusted for deprivation quartiles using both measures but found little difference in the overall results, therefore we present the former adjusted results here based on the more parsimonious measure. We used a measure of urbanicity based on the number of people resident per km^2 in line with previous Danish register studies (Schofield et al., 2017; Vassos, Pedersen, Murray, Collier, & Lewis, 2012). All neighborhood exposures were ascertained one year prior to the cohort member arriving.

Statistical analysis method

To test our quasi-experimental design, we examined whether there was a statistically significant ($p < 0.05$) association between neighborhood allocation and individual attributes, after adjusting for the above information known to housing officials. We ran a series of multivariable regressions, adjusting for this information, with neighborhood social composition as outcome and education attainment, recorded prior to arrival in Denmark, as a possible predictor.

We then measured the extent of spatial patterning for each outcome using the median rate ratio. This measures the median relative change in incidence when comparing identical subjects from two randomly selected different neighborhoods ordered by rate (Austin, Stryhn, Leckie, & Merlo, 2018). Another way of conceptualizing this is as the median increase in incidence for all possible hypothetical moves from low to higher incidence neighborhoods, holding other factors constant.

In the main analysis, we assessed incidence of mental disorders from the 15th birthday or 1st January after cohort members were assigned housing, whichever came later; and we followed them until they either died, emigrated, or 1st March 2019, whichever came first. As a sensitivity analysis, we re-ran the analysis with a delayed follow-up period, excluding all those diagnosed within two years after they were assigned housing, in order to rule out any possible influence of prevalent cases at the point of arrival.

We used multilevel Poisson regression to model effects at two levels: individual cohort members nested within neighborhoods. We also repeated this using cox regression with shared frailty at neighborhood level, and this made no difference to overall results. Therefore, the former model only is presented here. All analyses were adjusted for age, gender, and calendar time as well as the above covariates that may have influenced housing allocation. Age and calendar time were included as time varying covariates, splitting each record into age bands and time periods using the Lexis expansion method (Clayton & Hills, 1993). Age was categorized using the following cut points: 15, 17, 19, 21, 23, 25, 30, 35, 40, 45, 50, and 55 or older. Calendar time was categorized into 5-year time bands, except for the 1990s where 2-year age bands were used to account for changes to the ICD system, giving the following cut points: 1987, 1990, 1992, 1994, 1996, 1998, 2000, 2005, 2010, 2015 and 2020.

We also adjusted for county level effects using a fixed effects model. Counties were responsible for health services until the administrative reform in 2007, therefore county fixed effects can capture county differences in health services (Damm, 2009a). Furthermore, refugees were almost evenly distributed across counties during 1986–1998, the period covered by this study. During this time Denmark was divided into 15 counties and 271 municipalities. By adjusting for county fixed effects as opposed to municipality fixed effects, used in previous studies (Foverskov et al., 2023; Hamad et al., 2020), our analysis achieved greater statistical power.

Ethical approval

Ethical approval is not required to use the register-based data in Denmark. However, access to use the data required the completion of a detailed application form from the Danish Data Protection Agency, the Danish National Board of Health and Statistics Denmark

Availability of data and materials

The data analyzed in this study were made available exclusively to us in an anonymized form on the servers of Statistics Denmark. Thus, the data are not free to be shared but require access to be granted by the relevant authorities in Denmark.

Results

The cohort comprised 44 033 who met the inclusion criteria and were subsequently followed for 684 060 person years. The majority were from countries in the Middle East (59%) with a sizeable minority from Africa, mostly Somalia (19%) (see Table 1). Males were slightly over-represented (59%) and around a third of the cohort were under 18 on arrival. Around 1-in-5 had a secondary care diagnosed mental disorder (Table 2), with stress-related disorders the most common (12%) and non-affective (i.e. schizophrenia-related) psychosis the least common (4%). Comparing incidence rates with the general population, refugees were around twice as likely to receive a diagnosis of non-affective psychosis, incidence rate ratio (IRR) 2.00 (95% confidence interval (CI) 1.87–2.14), and stress-related disorder, IRR 2.07 (95% CI 1.99–2.15). Mood-related disorders showed only a small comparative increase, IRR 1.18 (95% CI 1.12–1.25), and a diagnosis of post-traumatic stress disorder (PTSD) appeared to be largely confined to the refugee population.

Testing our quasi-experimental design, we found no statistically significant association between prior education attainment and social composition of the assigned neighborhood (online Supplementary appendix Table A4).

We then assessed the overall contribution of assigned neighborhood to subsequent incidence of any psychiatric disorder. We first ran a null model, without including neighborhood composition but adjusted for information known to housing officials,

Table 1. Cohort characteristics on arrival

Characteristic	N	Percentage
Country of origin		
Iraq	9558	22
Iran	6580	15
Vietnam	3551	8
Sri Lanka	4172	9
Lebanon	9805	22
Ethiopia	319	1
Afghanistan	1848	4
Somalia	8226	19
Age Category		
0–17	14 495	33
18–24	9293	21
25–34	11 943	27
35–44	4111	9
45–54	1432	3
55–59	499	1
60+	2260	5
Sex		
Female	18 009	41
Married	16 367	37
Children (age 0–2)	10 439	24
Children (age 3–17)	20 631	47

Total N = 44 033.

Table 2. Cohort prevalence and incidence rate ratio (IRR) of mental disorders

Mental disorders	N	Prevalence (%)	IRR*	95% CI
Any mental disorder	8136	18	1.42	1.38–1.47
Substance misuse	732	1.7	0.58	0.53–0.64
Non-affective psychosis	1770	4	2.00	1.87–2.14
Mood disorder – any	2249	5.1	1.18	1.12–1.25
Stress disorder – any	5188	12	2.07	1.99–2.15
PTSD	2695	6.1	19.1	17.5–20.8

*Compared with rest of registered Danish population and adjusted for individual age, gender, and calendar time.

time-varying covariates and county of assignment. We used this to calculate the median risk ratio (MRR), a measure of spatial patterning which can be interpreted as the median increase in incidence for any hypothetical move from a neighborhood with a lower rate of psychiatric disorder to a higher rate (Table 3). This was highest for non-affective psychosis, MRR 1.19 (95% CI 1.08–1.46), and lowest for mood disorders, MRR 1.08 (95% CI 1.01–2.18).

Effect of neighborhood social composition

We ran three sets of models: firstly, without adjustment for neighborhood confounders (model 1), then adjusted for deprivation only (model 2), and then adjusted for deprivation and urbanicity (model 3). These made little difference to the overall results therefore we concentrate on model 3 results here (Table 4) with the rest included in the appendix (online Supplementary Tables A5-A7). We compare lowest v. highest quartiles of each neighborhood predictor unless stated otherwise. We also ran a sensitivity analysis, with a 2-year delayed follow-up period, and found this made no difference to the overall results. Results for the original analysis with follow-up after housing allocation are therefore presented here.

Looking at rates of any psychiatric disorder, we found only a small association with neighborhood social composition. For example, in the fully adjusted models, refugees assigned to neighborhoods with a lower proportion of co-nationals (lowest v. highest quartile) were slightly more likely to receive a

Table 3. Median rate ratio[a] (MRR) of mental disorder across neighborhood units

Mental disorder	MRR	95% CI
Any mental disorder	1.10	1.05–1.18
Non-affective psychosis	1.19	1.08–1.46
Mood disorder – any	1.08	1.01–2.18
Stress disorder – any	1.15	1.10–1.25
PTSD	1.12	1.04–1.37

[a]This measures the median relative change in incidence when comparing identical subjects from two randomly selected different neighborhoods ordered by rate (Austin et al., 2018).

Table 4. Relation between different aspects of social composition of first assigned neighborhood and subsequent rates of mental disorder for refugees – fully adjusted models*

Mental disorder	Density of co-nationals		Density of refugees		Density of migrants	
Density (quartiles)	IRR (95% CI)	*P* value	IRR (95% CI)	*P* value	IRR (95% CI)	P value
Any mental disorder						
1 (lowest)	1.07 (0.98–1.16)	0.12	1.08 (0.98–1.19)	0.11	1.05 (0.93–1.18)	0.43
2	1.03 (0.96–1.12)	0.4	1.06 (0.97–1.15)	0.18	1.04 (0.94–1.14)	0.45
3	0.98 (0.91–1.06)	0.65	1.05 (0.97–1.14)	0.21	0.99 (0.91–1.08)	0.81
4 (highest)	1		1		1	
Non-affective psychosis						
1 (lowest)	1.25 (1.06–1.48)	0.01	1.24 (1.03–1.50)	0.02	1.02 (0.80–1.29)	0.89
2	1.31 (1.12–1.54)	0	1.12 (0.94–1.33)	0.2	0.93 (0.77–1.13)	0.46
3	1.14 (0.98–1.34)	0.09	1.07 (0.92–1.26)	0.38	0.91 (0.77–1.08)	0.26
4 (highest)	1		1		1	
Mood disorder – any						
1 (lowest)	1.14 (0.98–1.33)	0.08	1.09 (0.92–1.29)	0.32	1.14 (0.93–1.40)	0.2
2	1.15 (1.00–1.33)	0.05	1.03 (0.88–1.20)	0.72	0.93 (0.78–1.11)	0.43
3	0.99 (0.86–1.13)	0.84	0.97 (0.84–1.12)	0.69	0.98 (0.85–1.15)	0.85
4 (highest)	1		1		1	
Stress disorder – any						
1 (lowest)	1.06 (0.96–1.17)	0.27	1.09 (0.97–1.23)	0.16	1.01 (0.87–1.17)	0.93
2	1.03 (0.94–1.14)	0.54	1.10 (0.98–1.22)	0.09	1.09 (0.96–1.23)	0.18
3	1.00 (0.91–1.09)	0.93	1.12 (1.01–1.23)	0.03	1.01 (0.91–1.12)	0.87
4 (highest)	1		1		1	
PTSD						
1 (lowest)	1.21 (1.05–1.39)	0.01	1.11 (0.94–1.30)	0.22	1.06 (0.87–1.29)	0.56
2	1.14 (1.00–1.30)	0.06	1.08 (0.94–1.25)	0.27	1.12 (0.96–1.31)	0.15
3	1.12 (0.98–1.27)	0.09	1.15 (1.01–1.30)	0.04	1.00 (0.87–1.15)	0.96
4 (highest)	1		1		1	

*Adjusted for characteristics that may have influenced housing allocation: presence of children in the household, marital status, country of origin, age and sex of household head, and year of arrival; as well as individual age, gender, and calendar time; neighborhood deprivation (income quartile) and urbanicity (population density quartile). Note: Neighborhood social composition ascertained for year prior to arrival of cohort member.

subsequent diagnosis of any psychiatric disorder, IRR 1.07 (95% CI 0.98–1.16).

Our findings were similar when we looked at neighborhood proportion of refugees, IRR 1.08 (95% CI 0.98–1.19), and for neighborhood proportion of migrants there was no appreciable difference. Adjusting for area deprivation and urbanicity meant that estimated effects of proportion of migrants no longer reached the usual threshold for statistical significance.

In contrast, much clearer associations were observed when we looked at specific categories of psychiatric disorder, particularly non-affective psychosis and PTSD. For example, in the fully adjusted model, refugees assigned to neighborhoods with a lower proportion of co-nationals were more likely to receive a subsequent diagnosis of non-affective psychosis, IRR 1.25 (95% CI 1.06–1.48) (lowest v. highest quartile), with a similar increase for the second lowest v. highest quartile. We also found a clear, although smaller, association with PTSD, IRR 1.21 (I.05–1.39). A relatively small effect was observed for mood disorders, IRR 1.14 (0.98–1.33) with no association observed for stress disorders

overall. The effect of being assigned to a neighborhood with a lower proportion of refugees was less clear. An association was observed with non-affective psychosis but only for those in the lowest quartile v. the highest, IRR 1.24 (1.03–1.50). For other disorders associations with neighborhood refugee density failed to reach the usual threshold for statistical significance. When we looked at neighborhood proportion of (first generation) migrants we found no statistically significant association with mental disorders in our analysis. We also looked at the proportion of first generation 'non-western' 'Defined as 'all countries outside the EU member states as well as Andorra, Iceland, Liechtenstein, Monaco, Norway, San Marino, Switzerland, Vatican State, Canada, USA, Australia and New Zealand' as this applied during the study exposure period.' migrants, as defined by statistics Denmark (Jervelund et al., 2017), and similarly found this made no difference to any subsequent mental health outcomes (results available on request).

Looking at the graphs (Fig. 1) showing these associations in the fully adjusted models it is apparent that associations are
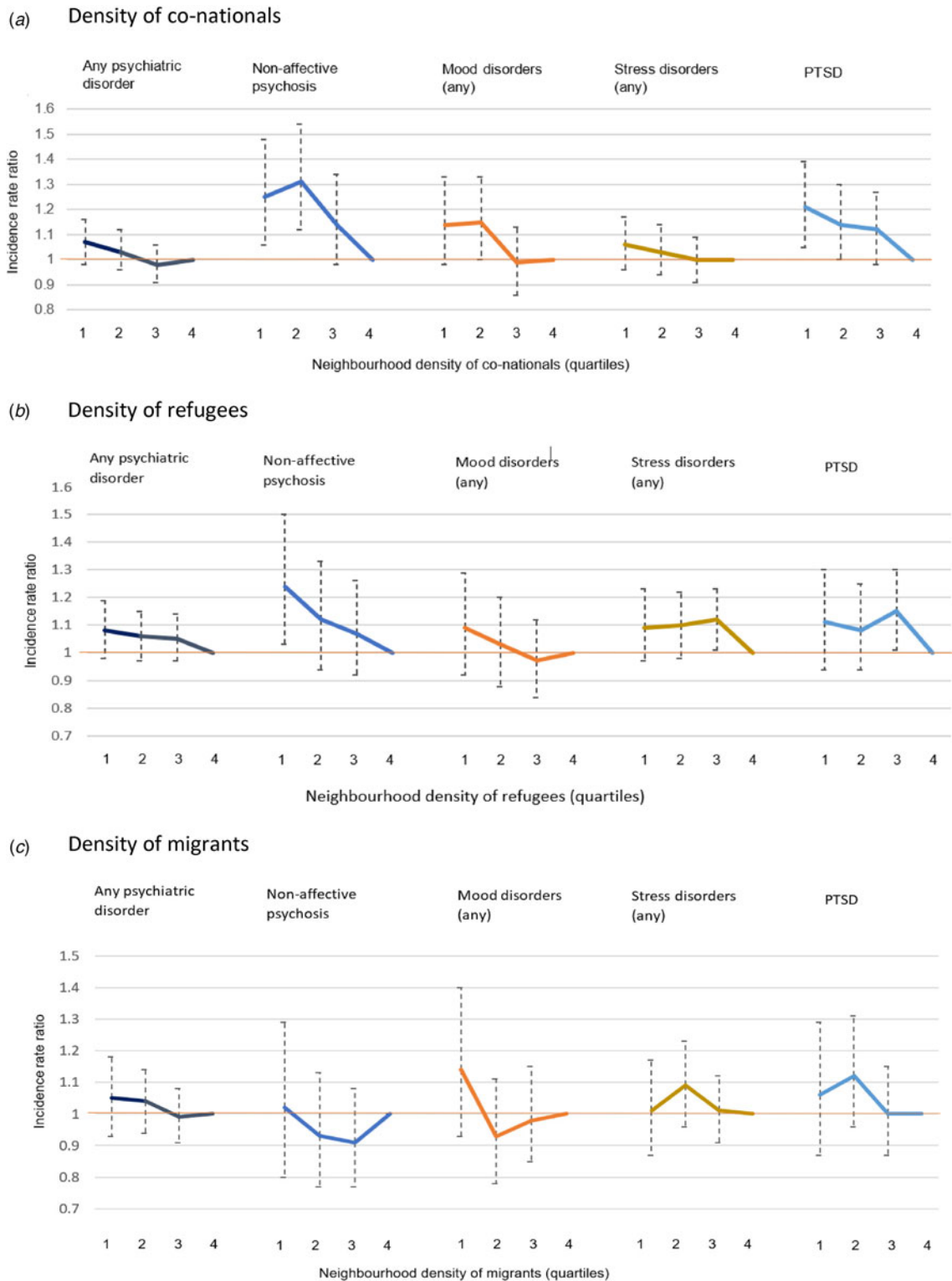
Figure 1. Relation between neighborhood social composition and incidence of mental disorder for refugees. (a) Density of co-nationals, (b) density of refugees, and (c) density of migrants.

strongest for density of co-nationals, with an apparent dose–response effect moving from more to less dense quartiles. There is some comparable effect for density of refugees, although this is largely confined to non-affective psychosis alone, and there are no clear associations with migrant density.

Discussion

Main findings

Using a quasi-experimental design following refugees assigned housing under the Danish dispersal policy (1986–1998) we

found that being assigned to a neighborhood with a lower density of co-nationals was associated with higher subsequent rates of a range of mental disorders. This was clearest for non-affective psychosis and PTSD, less so for more common mood-related disorders, and made no apparent difference for stress-related disorders generally. Associations with neighborhood refugee density were comparable but smaller, while neighborhood migrant density showed no associations.

Methodological considerations

Our study looks at rates of psychiatric diagnoses alone and cannot tell us directly about underlying disorder. We therefore cannot rule out the possibility that our results may reflect differences in help seeking behavior. For example, if refugees in areas with more co-nationals felt discouraged from seeking psychiatric help due to greater felt stigma (Eylem et al., 2020) this could appear as an ethnic density effect. However, this seems highly unlikely as, if this were the case, this should be most apparent for more common mental disorders, i.e. depression- and stress-related disorders, where help seeking is more socially patterned, and least likely for psychosis, where sufferers are more likely to be picked up by services whatever their intentions. In fact, our study results show the opposite: ethnic density effects are clearest for psychosis implying that patterns in help seeking alone cannot explain these findings.

It is also important to bear in mind that although we look at refugees from a range of sending countries, our study is limited to a particular time and place and the Danish refugee experience is in some ways qualitatively different from other parts of Europe. As our results show, the density of co-nationals was particularly

Table 5. Neighborhood social composition

Neighborhood quartile based on density of	Percentage in each quartile			Average number (*n*)*
	Mean	Minimum	Maximum	Mean
Co-nationals				
1 (lowest)	0	0	0	0
2	0.08	0	0.2	2
3	0.5	0.2	0.9	12
4 (highest)	3	0.9	33	72
Refugees				
1 (lowest)	0	0	0	0
2	1	0	1	24
3	2	1	4	48
4 (highest)	10	4	36	240
Migrants (1st gen.)				
1 (lowest)	1	0	2	24
2	3	2	4	72
3	7	4	10	168
4 (highest)	19	10	49	456

*Calculated assuming a median neighborhood cluster size of 2400 inhabitants.
Note: Neighborhood social composition ascertained for year prior to arrival of cohort member members.

low, i.e. in the most-dense quartile this was just 3% (see Table 5) or around 70 from the same nationality per 2400 people. This makes it all the more striking that this makes such an important difference to subsequent rates of some psychiatric disorders.

A feature of the present study is that we were able to rule out endogenous effects when looking at the role of neighborhood social composition. However, our intention-to-treat study design limits us to only looking at neighborhood of first assignment. Given that those experiencing adverse neighborhood effects may subsequently move then the duration of exposure is therefore reduced. Where this has occurred, this is likely to mean that underlying ethnic density effects are therefore even greater than reported here. It is also worth noting that a substantial number remain in the same area. In a previous study, following a similar dispersal design it was found that around 50% still lived in the same municipality of assignment 8 years after assignment, see online appendix (online Supplementary Table A1) (Damm & Dustmann, 2014).

Comparison with previous research

These results are in line with previous studies of migrants in general where rates of mental disorders are inversely associated with neighborhood ethnic density (Baker et al., 2021; Becares et al., 2018). Comparing different psychiatric disorders, the present study mirrors findings from previous ethnic density studies where the effect is most apparent for non-affective psychosis, i.e. schizophrenia-related disorders, and less so for more common mental disorders (Becares et al., 2018; Shaw et al., 2012). Comparing effect sizes with our previous migrant ethnic density studies, also using the Danish population register to look at rates of psychosis, these are similar for comparable percentage difference in density (Schofield et al., 2017, 2023).

Previous migrant studies mirror our findings with regard to the specificity of neighborhood social context. That is, where studies define ethnic density in terms of shared national origin then associations are much clearer (Das-Munshi, Becares, Dewey, Stansfeld, & Prince, 2010; Dykxhoorn et al., 2020; Schofield et al., 2017) compared with studies where ethnic density is more broadly defined as proportion of non-white residents (Boydell et al., 2001) or proportion of combined migrant groups (Menezes, Georgiades, & Boyle, 2011; Zammit et al., 2010). What stands out in the present study is that when we look at neighborhood density of combined migrant groups there is no apparent association with rates of mental disorder among refugees in contrast with previous migrant studies (Menezes et al., 2011; Zammit et al., 2010).

Our results are, however, in line with the previous Norwegian study of psychiatric hospital admissions comparing refugees within and outside of ethnic enclaves (Finnvold & Ugreninov, 2018). Defining ethnic enclaves as areas where the proportion of people from their country of origin is twice the national average, they found this to be associated with reduced psychiatric hospitalization and hospital stays for some refugee groups.

Interpretation and conclusion

The specificity of our findings with regard to neighborhood composition of co-nationals, weaker associations with refugee density and no effect for migrant density, has important implications for refugee mental health. The fact that proximity to other migrants

itself is not protective would imply that simply living in an ethnic-ally diverse neighborhood has limited mental health benefits, although this may be associated with reduced discrimination and racism. It is also notable that when we re-ran our analysis restricting migrants to only those from 'non-western' countries this made no difference to our results. Similarly, a reduced protective effect in areas with increased refugee density would imply that simply living in an area where there may be more resources aimed at refugees is less important for refugee mental health. What does seem to matter is proximity to co-nationals which may well imply, as others have suggested, increased social support and social capital (L; Becares and Nazroo, 2013; Shaw et al., 2012). The specificity of this effect may, in turn, reflect the defining experience of collective trauma, as others have described (Alfadhli, Güler, Cakal, & Drury, 2019; Matos, Costa, Park, Indart, & Leal, 2021), that distinguishes the refugee experience from that of other migrants.

Our findings are clearest for non-affective psychosis and PTSD as opposed to more common mental disorders, such as depression and other stress-related disorders. As we argue, this may well be because these are more likely to be picked up by services and less dependent on help-seeking. The small association with mood disorders may reflect an ethnic density effect for the sub-group with affective psychosis (Schofield et al., 2023). Ours is the first refugee study to look at neighborhood composition and rates of PTSD and it is notable that we found a marked association with density of co-nationals but, in contrast, no association with stress-related disorders in general. This is unlikely to be because of greater case-finding in these areas, as living in an area with a higher proportion of refugees alone was *not* associated with increased rates of PTSD.

Both PTSD and psychosis account for a large proportion of mental health problems among refugees. Therefore, our study results imply that more attention should be paid to neighborhood social composition as a potentially protective factor for refugee mental health. As we say in the introduction, given the prevalence of dispersal policies across Europe this is a modifiable risk factor over which we have a considerable degree of control. Therefore, we argue, future dispersal policies should take into account the potential mental health consequences implied by our study results.

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