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Neighbourhood ethnic density and psychosis – Is there a difference according to generation?

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ABSTRACT

Background: For different migrant groups living in an area with few people from the same ethnic background is associated with increased psychosis incidence (the ethnic density effect). We set out to answer the question: are there generational differences in this effect?

Methods: Analysis of a population based cohort (2.2 million) comprising all those born 1st January 1965, or later, living in Denmark on their 15th birthday. This included 90,476 migrants from Africa, Europe (excluding Scandinavia) and the Middle East, with 55% first generation and the rest second-generation migrants. Neighbourhood co-ethnic density was determined at age 15 and we adjusted for age, gender, calendar period, parental psychiatric history and parental income.

Results: For first-generation migrants from Africa, there was no statistically significant difference ($p = 0.30$) in psychosis rates when comparing lowest with highest ethnic density quintiles, whereas the second generation showed a 3.87-fold (95% CI 1.77–8.48) increase. Similarly, for migrants from the Middle East, the first generation showed no evidence of an ethnic density effect ($p = 0.94$) while the second showed a clear increase in psychosis when comparing lowest with highest quintiles, incidence rate ratio (IRR) 2.43 (95% CI, 1.18–5.00). For European migrants, there was some limited evidence of an effect in the first generation, (IRR) 1.69 (95% CI, 1.19–2.40), with this slightly raised in the second: IRR 1.80 (95% CI, 1.27–2.56).

Conclusions: We found strong evidence for an ethnic density effect on psychosis incidence for second-generation migrants but this was either weak or absent for the first generation.

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1. Introduction

Migrant groups are consistently shown to have an increased risk of psychotic illness which persists from one generation to the next (Bourque et al., 2011; Cantor-Graae and Pedersen, 2013; Cantor-Graae and Selten, 2005). In recent years, therefore, much research attention has been paid to the post-migration social environment, and it has been repeatedly shown that living in a low 'ethnic density' area (with few people from the corresponding ethnic group) is associated with

increased psychosis incidence (Boydell et al., 2001; Kirkbride et al., 2007a; Schofield et al., 2011a, b; Veling et al., 2008). However, it is not known how this might contribute to the increased risk persisting from one generation to the next.

The ethnic density effect has been linked to both the process of acculturation, the meeting of migrant and host cultures and the consequent psychological stress, and also the experience of discrimination (Becares et al., 2009; Halpern and Nazroo, 2000; Jurcik et al., 2013; Shaw et al., 2012). Both factors, it is argued, could be more salient for the second generation (Mahy et al., 1999; McIntyre et al., 2016; Nakash et al., 2012; Smith et al., 2009; Williams et al., 2007). Studies of generational differences have an important role to play generally in helping us understand the increased risk of psychosis among migrant groups (Bourque et al., 2011). Therefore, investigating generational

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differences in the effect of neighbourhood ethnic density could help further our understanding of processes behind this, as yet, little understood risk factor for psychosis.

However, to date no studies have addressed this question. This is perhaps not surprising given the inherent sample size problems when investigating members of minority ethnic groups in areas where their ethnic group is under-represented. A further problem is differential exposure where the exposure period is likely shorter for the first generation compared to those born in the host country. One solution would be to use a whole population cohort design ensuring the first generation has a minimum exposure period.

This is the first nationwide population based study that sets out to disentangle the effect of ethnic density between first and second generation migrants. We could achieve this using whole population cohort data covering migrants to Denmark for a period of up to thirty years or more, linked to information about their neighbourhood at age 15. In this way, we set out to answer the question: are there generational differences in the association between ethnic density at age 15 and later incidence of non-affective psychosis?"

2. Method

2.1. Sample

We used data from the Danish Civil Registration System, including demographic details and links to parental data and place of residence as well as a unique personal identification number allowing data to be linked across population registers (Pedersen et al., 2006). We followed all those born after 1st January 1965 and living in Denmark on their 15th birthday until they either died, migrated, were diagnosed with a non-affective psychotic illness or 1st of July 2013 (whichever came first). Further details on this cohort are reported in a previously published study (Schofield et al., 2017).

2.2. Measures

We linked this to the Danish Psychiatric Central Register (Munk-Jørgensen and Mortensen, 1997) which covers all psychiatric in-patient admissions and also, from 1995, all psychiatric out-patient visits. Non-affective psychosis was defined as ICD-10 codes F20–F29 and their ICD-8 equivalents (ICD-8 295.x9, 296.89, 297.x9, 298.29–298.99, 299.04, 299.05, 299.09, 301.83) based on clinical diagnoses assigned at discharge. Date of onset was defined as the first day of first contact with this diagnosis, and we excluded anyone with a diagnosis prior to their 15th birthday.

Ethnic group is not recorded in Danish registry data therefore we use, as a proxy, region of origin based on the cohort members' country of birth as well as their parents' country of birth and date of migration. This is in line with previous studies using Danish register data (Schofield et al., 2017; Cantor-Graae et al., 2003; Cantor-Graae and Pedersen, 2007). Similarly, at an area level, as a proxy for own-group ethnic density we use own-migrant group density based on the proportion of people who were born, or whose parents were born, in the same region as the defined migrant group. We categorised region of origin as Africa, Europe (not Scandinavia) and the Middle East as previously (Cantor-Graae et al., 2003; Schofield et al., 2017). First generation migrants were designated as persons born abroad and whose parents were also born abroad; all in the same region. We incorporated *both* parents' birth region as this has been shown most relevant to psychosis risk (Cantor-Graae and Pedersen, 2007). We therefore excluded instances where parents' birth region differed.

Parental country of birth was missing, for at least one parent, for 23% of those born in the regions we looked at. In these instances, we assumed missing parental birth region was the same as that of the cohort member. We could assume parents with missing data were not born in Denmark as this would have been recorded (Pedersen et al., 2006).

Their birth region could still differ from the cohort member although this was rare among those for whom we did have parental data (3%) and could therefore be discounted.

Second generation migrants were designated as those born in Denmark but with both parents born outside of Denmark. Region of origin for this group was based on the birth region of both parents and, again, we excluded instances where parents were born in different regions. For the second generation, because region of origin was entirely determined by parental place of birth we also excluded anyone with missing parental data (1.4%).

2.2.1. Neighbourhood level measures

These were based on Danish parishes, originally derived from ecclesiastical boundaries dating back to the middle ages, which continue to play a role in demarcating communities and school districts (OECD, 2016). These were adapted to make units more homogenous in size, as we describe in more detail in our previous study, resulting in a total of 1167 parish units with a median size of 3564 people (Schofield et al., 2017).

For each parish and migrant region, neighbourhood ethnic density was defined as the proportion of all migrants from that region living in the parish in the year the cohort member was 15, divided into quintiles. We chose neighbourhood at age 15 to reflect the childhood social environment, at a point when residential history would most likely be stable and to maximise the sample size. We used the definition of migrant groups outlined above but combining both first and second generations. We had complete reference to both parents for all those born in Denmark in 1960 or later (Pedersen et al., 2006). Because immigration into Denmark was very low prior to 1960, mainly from adjoining countries (Nannestad, 2004), we therefore assumed parish members born in Denmark with missing parental data were Danish.

2.2.2. Exclusions

We excluded all foreign born adoptees to avoid confounding where this group might be at a higher risk of psychosis and more likely to live in low ethnic density areas (Cantor-Graae and Pedersen, 2013). We defined these as anyone born outside Denmark where both (legal) parents were born in Denmark (1.28% of the cohort).

2.2.3. Parental information

To account for possible confounding where parental mental illness influences the neighbourhood where cohort members live at age 15 we adjusted for any record of a psychiatric disorder in either parent (Dean et al., 2010). We also adjusted for parental socio-economic background based on combined parental gross annual income when the child was aged 15. Where father's income was missing and the mother was categorised as a single parent we used mother's income only.

2.3. Statistical analysis

We used multilevel Poisson regression to model effects at: 1) individual, 2) year (in which aged 15) and 3) neighbourhood (parish) levels. The effect of ethnic density on psychosis incidence was modelled as a cross-level interaction between migrant group, neighbourhood co-ethnic density at age 15 and generational status (first or second generation). We went on to assess the overall linear trend by entering ethnic density quintiles as a continuous variable.

All analyses were adjusted for age, gender (and their interaction), calendar time, and a history of parental psychiatric disorder. Age and calendar time were included as time varying covariates (Clayton et al., 1993) with age categorised using the following cut-off points: 15, 20, 25, 30, 35, 40, 45, 50, and 55 or older and calendar time using 5 year bands, except for the 1990s where 2-year bands were used to account for changes to the ICD system.

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