



Contents lists available at ScienceDirect

Schizophrenia Research

journal homepage: www.elsevier.com/locate/schres

Ethnic density, urbanicity and psychosis risk for migrant groups – A population cohort study

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ARTICLE INFO

Article history:

Received 7 February 2017

Received in revised form 10 March 2017

Accepted 11 March 2017

Available online xxxx

Keywords:

Etiology

Social determinants

Ethnicity

Psychosis

ABSTRACT

Background: Rates of psychotic disorder are raised for many migrant groups. Understanding the role played by the social context in which they live may help explain why. This study investigates the effect of both neighbourhood ethnic density and urbanicity on the incidence of non-affective psychosis for migrant groups.

Method: Population based cohort of all those born 1965 or later followed from their 15th birthday (2,224,464 people) to 1st July 2013 (37,335,812 person years). Neighbourhood exposures were measured at age 15.

Results: For all groups incidence of non-affective psychosis was greater in lower ethnic density neighbourhoods. For migrants of African origin there was a 1.94-fold increase (95% CI, 1.17–3.23) comparing lowest and highest density quintiles; with similar effects for migrants from Europe (excluding Scandinavia): incidence rate ratio (IRR) 1.99 (95% CI, 1.56–2.54); Asia: IRR 1.63 (95% CI, 1.02–2.59); and the Middle East: IRR 1.68 (95% CI, 1.19–2.38). This initial analysis found no evidence for an urbanicity effect for migrant groups. Adjusting for ethnic density revealed a positive association between level of urbanicity and psychosis for two groups, with a statistically significant linear trend (average effect of a one quintile increase) for migrants from Europe: IRR 1.09 (95% CI, 1.02–1.16) and the Middle East: IRR 1.12 (95% CI, 1.01–1.23).

Conclusions: In this first nationwide population-based study of ethnic density, urbanicity and psychosis we show that lower ethnic density is associated with increased incidence of non-affective psychosis for different migrant groups; masking urban/rural differences in psychosis for some groups.

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1. Introduction

An elevated risk of psychosis among some migrant groups is well documented and, in some instances, estimated to be greater than most other risk factors with the exception of family history of psychosis (Bourque et al., 2011; Cantor-Graae and Pedersen, 2013; Cantor-Graae and Selten, 2005; McGrath et al., 2004). It is unlikely that this is due to selective migration (Pedersen et al., 2011; van der Ven et al., 2015) and international comparison studies have failed to show any corresponding increased incidence in the country of origin (Bhugra et al., 1996; Jablensky et al., 1992). Reviews show elevated rates persist

from first to second generation migrants pointing to the relevance of the social context post-migration (Bourque et al., 2011; Cantor-Graae and Selten, 2005).

An ethnic density effect has been observed where psychosis incidence is reduced for members of minority ethnic groups who live in areas where their ethnic group is well represented (Becares et al., 2009; Boydell et al., 2001; Kirkbride et al., 2007b; Veling et al., 2008). This provides arguably the most compelling evidence for the social environment having an important aetiological role (March et al., 2008). However, we can only draw limited conclusions from studies to date as the causal pathway is typically obscured, with exposure (neighbourhood) determined either near to or at the point of diagnosis. Only one study has looked at prior exposure (Zammit et al., 2010) showing higher rates of psychotic illness for foreign born pupils in schools with fewer foreign born pupils, but this was not able to distinguish between ethnic groups.

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A related issue is urbanicity, where urban birth and upbringing are repeatedly associated with increased risk of psychosis (Krabbendam and van Os, 2005; Pedersen, 2006; Vassos et al., 2012). Only one previous study has looked at this for migrant groups finding no relation (Cantor-Graae and Pedersen, 2007). The authors speculate this may be because higher ethnic density in urban areas has a protective effect but, to date, no study has examined how these two potentially opposing forces act. There is evidence that individual-level socio-economic background is also relevant (Kirkbride et al., 2014, Kirkbride et al., 2007a; Morgan et al., 2008; Werner et al., 2007). However, most studies cannot distinguish this from the effects of early or prodromal illness and, it is argued, more attention should be paid to parental socio-economic background (Cantor-Graae and Selten, 2005; Morgan et al., 2008).

Ideally studies would therefore follow subjects prospectively, charting neighbourhood exposure and parental background in childhood, and be on a scale that can differentiate between migrant groups. This is the first study to do this, using a nationwide population-based sample to examine the joint effects of neighbourhood ethnic density and urbanicity on risk of non-affective psychosis.

2. Method

2.1. Data Source

Since 1968 all those resident in Denmark have a unique personal identification number allowing data to be linked at an individual level across population registers. We used the Danish Civil Registration System dataset which includes demographic details and links to parents as well as continuous updates on place of residence and vital status (Pedersen et al., 2006).

2.2. Cohort

We followed all those born between 1st January 1965 and 31 December 1997 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).

2.3. Outcome

The cohort, and their parents, were linked to the Danish Psychiatric Central Register (Munk-Jørgensen and Mortensen, 1997) which covers all psychiatric in-patient admissions and, from 1995, out-patient visits. We defined non-affective psychosis as ICD-10 codes F20-F29 and their ICD-8 equivalents (ICD-8295.×9, 296.89, 297.×9, 298.29–298.99, 299.04, 299.05, 299.09, 301.83) following the method used previously (Pedersen et al., 2014). This was based on clinical diagnoses assigned at discharge, shown to have good diagnostic validity (Jakobsen et al., 2005; Uggerby et al., 2013). 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.

2.4. Definition of migrant group

We defined members of a migrant group as anyone born outside of Denmark (first generation) or born in Denmark but with both parents born outside Denmark (second generation). We used the country of origin of both parents as this has been shown to be most clearly related to psychosis risk, and categorised country of origin in the same way as previously (Cantor-Graae et al., 2003; Cantor-Graae and Pedersen, 2007). We retained the four largest groups: migrants from Africa, Europe (other than Scandinavia), Asia (Indian sub-continent, China and South East Asia) and the Middle East. Country of origin was missing for a total of 31,748 (1.4%) either because their place of birth was missing or they were born in Denmark and this was missing for either parent.

We excluded a further 94,489 (4.4%) born in Denmark with parents born in different regions and therefore not easily classified.

2.5. Neighbourhood effects

Neighbourhood units were based on Danish parishes which vary considerably in size hindering model convergence. For small parishes we therefore combined adjacent units to arrive at an optimum size, using AZtool, the algorithm devised to create UK census area units (Cockings et al., 2011; Martin, 2003). We set the algorithm to aim for an optimum parish size of 3000 inhabitants with no units <200, collapsing 2114 parishes into 1135 units. We also split very large parishes (over 6500) into two, randomly assigning parish members into either unit, giving a final total of 1167 parish units (median size 3564). These were then used to determine the neighbourhood social context based on all residents in the parish in any one year. For each parish and migrant group (defined above) ethnic density was defined as the proportion from that group 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 while maximising sample size by including first and second generation migrants. Among all persons born in Denmark 1960, or later, we had complete reference to both parents, although data was missing for those born earlier (Pedersen et al., 2006). Immigration into Denmark was very low prior to 1960, mainly comprising migrants from other Nordic and Western European countries (Nannestad, 2004). Therefore, for ethnic density we assigned all those with missing parental data as Danish. Urbanicity was also derived at parish level based on the population density (residents per km²) in the year the cohort member was 15, following previous studies (Pedersen, 2001; Vassos et al., 2012).

We also linked to the Integrated Database for Longitudinal Labour Market Research (Petersson et al., 2011) deriving a parish level socio-economic index based on the proportion of residents not-employed and median gross annual income, both proxy indicators used previously (Allardyce et al., 2005; Croudace et al., 2000; Harrison et al., 2003).

2.6. Parental history of psychiatric disorder and socio-economic background

Parental mental health may influence the type of neighbourhood cohort members live in at age 15 and act as a confounder. Any parental psychiatric history has been associated with increased risk of psychosis (Dean et al., 2010). Therefore, we adjusted for any record of a psychiatric disorder in either parent. Parental socio-economic background may also act as a confounder (Kirkbride et al., 2014) therefore we adjusted for combined parental gross annual income at age 15, divided into quartiles within each year.

2.7. Exclusions – foreign born adoptees

Foreign born adoptees are at a higher risk of psychosis compared to other migrants (Cantor-Graae and Pedersen, 2013) To avoid a possible confounding effect, with adoptees more likely in low ethnic density areas, we excluded all potential adoptees (1.28%), defined as all those who were foreign born but where both (legal) parents were born in Denmark.

2.8. Statistical analysis

We used multilevel Poisson regression to model effects at: 1) individual 2) year (aged 15) and 3) neighbourhood (parish) levels simultaneously. The relation between ethnic density and psychosis incidence was modelled as a cross-level interaction between migrant group and neighbourhood ethnic density. The relation with urbanicity was similarly modelled as a cross-level interaction. We tested for linear trends using the Wald test.

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