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DOI:

[10.1016/j.schres.2015.09.002](https://doi.org/10.1016/j.schres.2015.09.002)

[10.1016/j.schres.2015.09.002](https://doi.org/10.1016/j.schres.2015.09.002)

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*Document Version*

Peer reviewed version

*Citation for published version (Harvard):*

O'Donoghue, B, Yung, AR, Wood, S, Thompson, A, Lin, A, McGorry, P & Nelson, B 2015, 'Neighbourhood characteristics and the rate of presentation of young people at ultra-high risk for psychosis', *Schizophrenia Research*, vol. 169, no. 1-3, pp. 214–216. <https://doi.org/10.1016/j.schres.2015.09.002>, <https://doi.org/10.1016/j.schres.2015.09.002>

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Validated March 2016

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**Neighbourhood characteristics and the rate of identification of young people at  
Ultra-High Risk for Psychosis**

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**Abstract**

There is a higher incidence of psychotic disorders in more socially deprived neighbourhoods and a higher risk in migrants living in neighbourhoods of low ethnic density. Yet it is unclear at what stage these neighbourhood environmental factors exert an influence on the risk for psychosis. 166 Ultra high risk for psychosis young people were included in this study. Neighbourhood data were obtained from the Australian Bureau of Statistics. There was a trend for UHR individuals to reside in relatively more deprived areas and there was no association between the rate of identification of UHR migrants and neighbourhood ethnic density.

## **1. Introduction**

Two consistent findings in regards to the epidemiology of psychotic disorders are the higher incidence in more deprived neighbourhoods (Anderson et al., 2012; Kirkbride et al., 2012; Omer et al., 2014) and a higher rate amongst migrants (Bourque et al., 2011; McGrath et al., 2004), particularly in neighbourhoods of low ethnic density (Bosqui et al., 2014). The majority of research to date has focussed on the time of presentation of the first episode of psychosis and therefore the stage of development of the psychotic disorder in which these factors influence the risk of psychosis is unknown. It has been found that the level of social deprivation and migrant status do not influence the risk of transition in a cohort of Ultra High Risk (UHR) for psychosis individuals (O'Donoghue et al., 2015). This suggests that these environmental risk factors could exert their influence early in the aetiology of psychotic disorders, even before identification as UHR by clinical services. Therefore, an examination of the factors that distinguish UHR individuals from the general population and the areas in which they reside could yield insights into the time point at which these factors exert their influence. It has been found that UHR individuals were more likely to live in neighbourhoods with a higher proportion of single parent households and ethnic diversity compared to healthy controls (Kirkbride et al., 2014). Surprisingly, Kirkbride and colleagues found that UHR individuals were less likely to live in socioeconomically deprived areas compared to the control group.

Further knowledge on the neighbourhood characteristics associated with a higher rate of UHR could lead to an understanding of the role of environmental factors in the aetiology

of psychotic disorders and could also assist in planning for service provision and allocation of resources. Therefore, this study first aimed to determine if the rate of identification of UHR individuals was associated with the level of social deprivation in the neighbourhood of residence. Second, we aimed to determine if the rate of identification of UHR individuals who were migrants was associated with the proportion of migrants in the neighbourhood of residence.

## **2. Methodology**

### *2.1. Study Setting*

Orygen Youth Health (OYH) is a youth mental health service for people aged between 15 and 24 years. The catchment area of OYH covers a total of 57 postcode areas with a population of 131,790 young people aged from 15 to 24 (Statistics, 2001). The total population of the postcode areas ranged from 167 to 53,757 and the median was 13,527 persons.

### *2.2. Participants*

The Personal Assessment and Crisis Evaluation (PACE) clinic accepts young people between the ages of 15 and 24 who fulfil criteria for at least one of the three UHR groups: Attenuated psychotic symptoms (APS), brief limited intermittent psychotic symptoms (BLIPS) and trait and state risk factors (family history of psychotic disorder or schizotypal personality disorder in addition to functional deterioration or chronic low functioning) (Yung et al., 2007). Participants of this study were individuals who participated in research studies at the PACE clinic between 2000 and 2006 (Nelson et al., 2013). The participants of this study are the same cohort that were included in the study

that examined whether migrant status and the level of social deprivation in the area of residence were risk factors for transition (O'Donoghue et al., 2015). Only individuals who were residing in the catchment area were included.

### *2.3. Instruments and measures*

The Comprehensive Assessment of At-Risk Mental States (CAARMS) was used to determine whether individuals fulfilled UHR criteria (Yung et al., 2005). The level of social deprivation was determined from the Socio-Economic Indexes for Areas (SEIFA) (Statistics, 2001). The index of socio-economic disadvantage was used and this consists of measures of income, educational level, employment, occupation and housing in an area of residence. Postcode areas were organised into quartiles according to the level of social disadvantage. Lower scores represent an area that is more disadvantaged.

Individuals who were born outside of Australia were classified as 'first generation migrants' and those with one or both parents who were born outside of Australia were classified as 'second generation migrants'. Two determinants of the level of ethnic density at the neighbourhood level were obtained from census data. The first measure was based on the proportion of first generation migrants residing in the postcode area and the second was based on the proportion of the population with at least one parent who was a migrant. Neighbourhood levels were categorized into quartiles based on these factors and results are presented separately for each factor.

### *2.4. Statistical analysis*

The rate of UHR identification was calculated by the number of cases divided by the number of young people aged from 15 to 24 in the catchment area. Rates are presented

per 100,000 population and an average annual rate is presented (i.e. recruitment was over six years so the total rate was divided by six). Rate ratios were calculated using the 'iri' command with Stata version 10.0 and Poisson regression was performed to calculate rate ratios controlling for both neighbourhood factors.

### **3. Results**

#### *3.1 Participants*

219 UHR individuals participated in research studies at the PACE clinic during this study period. The place of residence was unknown for nineteen and a further thirty-four were not residing in the catchment area at the time of presentation. Therefore, 75.8% (N=166) of the total cohort were included in this study. 61.4% (N=102) were female and the mean age at the time of presentation was 18.5 years(S.D=2.8). The rate of UHR identification according to the neighbourhood factors are presented in Table 1.

#### *3.2. Social deprivation and rate of identification of UHR*

The average annual rate of UHR identification in the most affluent neighbourhoods was 19.65 cases per 100,000 population at risk and it was 18.67 in the most deprived neighbourhoods. There was a non-significant trend for a higher rate of UHR individuals in neighbourhoods with above average levels of deprivation (Rate ratio=1.51, 95% C.I. 0.93–2.53 p=0.08).

### *3.3. Proportion of migrants and rate of UHR presentation*

Information relating the country of birth of the participant and their parents was available for 66.3% (N=110). Ten individuals were first generation migrants and forty-nine were second generation migrants.

Within the catchment area, the median proportion of the first-generation migrant population was 30.6% (I.Q.R 22.0-39.2). The median proportion of the population who had at least one migrant parent was 61.0% (I.Q.R 47.5-69.5). There was no difference in the rate of UHR migrants according to the level of ethnic density of the neighbourhood of residence.

### *3.4. Relationships between social deprivation and proportion of migrants*

As a result of the potential association between the level of social deprivation and proportion of migrants residing in particular areas post-hoc analysis was performed, first to determine whether these two factors were correlated and second to calculate the rate of UHR identification controlling for these variables.

The proportions of first-generation migrants and total migrants were strongly correlated with the level of social deprivation ( $r=-0.72$ ,  $N=57$ ,  $p<0.001$ ,  $r=-0.72$ ,  $N=57$ ,  $p<0.001$  respectively). There remained no association between the rate of identification of UHR migrants according to ethnic density when controlled for the neighbourhood level of social deprivation. This analysis is presented in Supplementary Tables 1 and 2.

## **4.0 Discussion**

This study found no association between the ethnic density and the rate of identification of migrants who were at ultra-high risk for psychosis. There was a non-significant trend for a higher identification of UHR individuals from neighbourhoods of above average deprivation.

#### *Strengths and limitations*

A strength of the study includes the use of census data for comparison purposes and a diverse catchment area in regards to deprivation and ethnic density. A main limitation is that this is not an epidemiological cohort and it consists of individuals who were involved in research studies. It is possible that migrants were the most affected by this limitation, as an ability to read English was a requirement for study participation and migrants are less likely to participate in research (Patel et al., 2003). A further limitation is that there was missing data regarding migrant status for a small proportion of the cohort.

#### *Comparison with previous literature & Clinical implications*

A systematic review found a dose response relationship exists between neighbourhood ethnic density and the incidence of psychotic disorders (Bosqui et al., 2014). The finding that the rate of UHR migrants was not associated with the ethnic density could have a number of explanations. It could represent a 'true' finding and this would suggest that the influence of the ethnic density of the neighbourhood may not exert an influence until later in the development of a psychotic disorder, possibly near the time of transition.

Alternatively, these findings could be a result of a selection bias. It has been demonstrated that migrants who develop a psychotic disorder have a longer duration of untreated psychosis (Apeldoorn et al., 2014), possibly due to difficulties in navigating the



mental health services of the new countries. Therefore, it is possible that migrants are less likely to be identified as being UHR.

The moderate sample size involved in the study did not permit the migrant group to be separated further into groups according to their country of birth, as the ethnic density effect is related to the proportion of migrants from the particular individual's country of birth, as opposed to a collective migrant population. Additionally, the postcode area may have been too large to have been considered a neighbourhood level and this has particular relevance as a previous study in the UK found that the effect of ethnic density was only present at a small area level (Schofield et al., 2011). This lends support to the theory that the protective effect of higher ethnic density is from higher social capital and cohesion within the community.

The trend for a higher rate of UHR identification in more deprived areas is consistent with the psychosis literature and while only a trend association, it casts doubts on recent findings of a higher distribution of UHR cases in more affluent neighbourhoods (Kirkbride et al., 2014). However, it must be acknowledged that the most affluent neighbourhoods and the most deprived neighbourhoods in this study had similar rates of identification of UHR individuals. A number of studies have found that being born in a more deprived area is associated with an increased risk of developing a psychotic disorder (Sariaslan et al., 2015; Werner et al., 2007). This lends support to the theory that early exposure to a more deprived area could be involved in the aetiology of a psychotic disorder.

With the development of interventions to reduce or delay the onset of psychosis in the UHR group (van der Gaag et al., 2013), more specialized clinics for UHR individuals are emerging. This is only the second study to examine the neighbourhood factors associated with the incidence of UHR and further research could deliver insights into where these specialized clinics should be located.

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Table 1: Rates of UHR identification according to the level of social deprivation and ethnic density in the neighbourhood of residence

	<b>Number of cases</b>	<b>Population 15 - 24</b>	<b>Rate</b>	<b>Rate ratio</b>	<b>95% C.I.</b>	
<i>Social deprivation in area</i>						
					Lower	Upper
Least deprived	23	19506	19.65	ref	-	-
Below average (quartile 2)	28	33540	13.83	0.70	0.39	1.29
Above average (quartile 3)	72	40500	29.67	1.51	0.93	2.53
Most deprived	43	38244	18.67	0.95	0.56	1.66
<i>Proportion of total migrants in area</i>						
High ethnic density	16	40366	6.61	ref	-	-
Above average	20	33047	10.09	1.52	0.75	3.15
Below average	16	34387	7.75	1.17	0.55	2.51
Low ethnic density	7	23990	4.87	0.74	0.26	1.89
<i>Proportion of first generation migrants in area</i>						
High ethnic density	18	37118	8.08	ref		-
Above average	21	38570	9.08	1.12	0.57	2.24
Below average	13	34944	6.20	0.77	0.35	1.66
Low ethnic density	7	21158	5.51	0.68	0.24	1.71
*p<0.05, **p<0.001						