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Risk of psychotic disorders in migrants to Australia

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Abstract

Background. Certain migrant groups are at an increased risk of psychotic disorders compared to the native-born population; however, research to date has mainly been conducted in Europe. Less is known about whether migrants to other countries, with different histories and patterns of migration, such as Australia, are at an increased risk for developing a psychotic disorder. We tested this for first-generation migrants in Melbourne, Victoria.

Methods. This study included all young people aged 15–24 years, residing in a geographically-defined catchment area of north western Melbourne who presented with a first episode of psychosis (FEP) to the Early Psychosis Prevention and Intervention Centre (EPPIC) between 1 January 2011 and 31 December 2016. Data pertaining to the at-risk population were obtained from the Australian 2011 Census and incidence rate ratios were calculated and adjusted for age, sex and social deprivation.

Results. In total, 1220 young people presented with an FEP during the 6-year study period, of whom 24.5% were first-generation migrants. We found an increased risk for developing psychotic disorder in migrants from the following regions: Central and West Africa (adjusted incidence rate ratio [aIRR] = 3.53, 95% CI 1.58–7.92), Southern and Eastern Africa (aIRR = 3.06, 95% CI 1.99–4.70) and North Africa (aIRR = 5.03, 95% CI 3.26–7.76). Migrants from maritime South East Asia (aIRR = 0.39, 95% CI 0.23–0.65), China (aIRR = 0.25, 95% CI 0.13–0.48) and Southern Asia (aIRR = 0.44, 95% CI 0.26–0.76) had a decreased risk for developing a psychotic disorder.

Conclusion. This clear health inequality needs to be addressed by sufficient funding and accessible mental health services for more vulnerable groups. Further research is needed to determine why migrants have an increased risk for developing psychotic disorders.

Introduction

Background

Certain migrant groups are at an increased risk of psychotic disorders compared to the native-born population, with first-generation migrants at more than double the risk of native-born populations (Cantor-Graae & Selten, 2005; Selten, van der Ven, & Termorshuizen, 2019). This elevated risk has been replicated in a number of specific migrant and ethnic minority groups, including the African-Caribbean and black African populations in the UK (Fearon & Morgan, 2006; Fearon et al., 2006; Harrison et al., 1989, 1997). The reasons for increased risk in many migrant and ethnic minority populations are not yet known, but a number of potential explanations have been proposed from genetic, neurodevelopmental and psychosocial factors (Morgan, Charalambides, Hutchinson, & Murray, 2010), such as vitamin D deficiency in early life, exposure to childhood trauma, urban living and higher rates of social adversity and disadvantage in migrants (Veling, 2013).

However, the majority of research to date on this issue has tended to be conducted in Europe, with limited research in other settings, including Australia, where patterns of immigration may be very different. For example, first-generation migrants constitute 28% of Australia's population (Australian Bureau of Statistics, 2011) and nearly half of the population was either born overseas or has at least one foreign-born parent (Australian Bureau of Statistics, 2017a). Australia's immigration programme consists of two components, the Migration programme, for skilled workers and eligible family members, and the Humanitarian programme, for refugees and others in humanitarian need (Australian Bureau of Statistics, 2011). Under the Migration programme, individuals with specific qualifications can apply to enter Australia on a skilled workforce visa and it was estimated that approximately 65% of recent migrants held a qualification above school-level completion, and of these, 76% had a bachelor degree or higher (Australian Bureau of Statistics, 2016a).

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Australia's Humanitarian programme aims to provide options for refugees who have been forced to leave their homes by armed conflict, persecution and human rights abuses. In 2010, a total of 168 600 people came to Australia under the Migration programme, mainly from the UK, China and India, and 13 770 people under the Humanitarian programme (Australian Bureau of Statistics, 2012).

However, there is very limited evidence as to whether migrants to Australia are at an increased risk of psychotic disorders. McGrath et al. (2001) conducted a small case–control study in Queensland, based on prevalent cases, where results indicated that first-generation migrants had significantly decreased odds of having a psychotic disorder, while odds in second-generation immigrants were comparable to Australian-born individuals. However, reliance on prevalent (new and existing) rather than incident (new) cases could have introduced differential case ascertainment bias, for example, if migrants were more likely to return home after the onset of psychosis. In a separate study in New South Wales (Nielssen, Sara, Lim, & Large, 2013), first-generation migrants from Oceania had an increased risk of being admitted with a diagnosis of schizophrenia or mania; however, this study also did not include incidence cases.

Therefore, it remains unclear as to whether migrants to Australia have an increased risk of psychotic disorders. We aimed to determine: (i) the treated incidence of FEP among first-generation migrants; (ii) the risk of developing a psychotic disorder in first-generation migrants compared to native-born Australians; and (iii) the risk of developing a psychotic disorder in specific migrant groups within the cohort.

Methods

Study design

This study involved a cohort of young people with FEP who received treatment with the Early Psychosis Prevention and Intervention Centre (EPPIC) over the 6-year period between 1 January 2011 and 31 December 2016.

Setting

The study took place at Orygen Youth Health (OYH), the State Government funded youth mental health service for young people residing in north-western and western metropolitan Melbourne, Australia. Within OYH, EPPIC provides comprehensive care to all young people aged 15–24 who present with a first episode of psychosis (FEP) within the defined catchment area. The catchment area spans northwest Melbourne, including 59 postal codes, where more than one million people reside. EPPIC receives referrals for suspected FEP in young people within this catchment area; therefore, it is representative of an epidemiological cohort of treated incidence cases of psychotic disorders. Sources of referral include local mental health services, general practitioners, law enforcement agencies, community support services, family members and friends, and self-referral.

Participants

During the case ascertainment period, we included all people aged 15–24 years old who presented to EPPIC and were diagnosed with FEP, defined as full-threshold psychotic symptoms experienced for at least 1 week. Individuals with a concurrent personality disorder, substance use disorders, intellectual disability (IQ < 70) or low English proficiency were eligible for treatment with EPPIC and are therefore included in this study. At presentation, the general, non-specific term of 'First episode of psychosis' is used until after 3 months of care, when following the longitudinal assessment, clinical diagnoses were made by the treating consultant psychiatrist according to the Diagnostic and Statistical Manual for Psychiatric Disorders, Fourth edition (DSM-IV) (American Psychiatric Association, 1994). Some clients disengaged from the service before a longitudinal assessment and adequate diagnosis could be made and while they fulfilled the criteria for a FEP at presentation, the specific diagnosis according to DSM-IV could not be made. These individuals were therefore given a generic diagnosis of 'Unspecified FEP'. Diagnoses were then grouped as either affective or non-affective psychosis, except for those with the diagnosis of 'Unspecified FEP', as we could not determine if their diagnosis was non-affective or affective.

Data sources and measures

An instrument was developed to enable the extraction of relevant demographic and clinical information from client files and electronic medical records, which contained forms and notes compiled during the episode of care, completed by case managers, medical doctors, consultant psychiatrists and other allied health professionals. Sex, age at entry into service, postcode of residence, marital status, living arrangement, housing, employment status at entry into service and country of birth were obtained from a standard registration form. Diagnosis at 3 months of treatment, family history of psychosis in first- and/or second-degree relatives and co-morbid substance abuse were also recorded in the audit tool.

Population at risk

Data pertaining to those aged 15–24, stratified for age, sex and place of birth within each postcode of the defined catchment area were sourced from the 2011 Australian National Census through the Australian Bureau of Statistics. The study period corresponded with the census cycle in Australia which is completed every 5 years. The total population aged 15–24 years in the catchment area of OYH from the 2011 census was 166 760 (84 394 males and 82 366 females) and when multiplied by six represents the 'at-risk population' (Australian Bureau of Statistics, 2011). Postcode scores for social deprivation were obtained from the Australian Bureau of Statistics' (2011) Census as Socio-Economic Indexes for Areas (SEIFA) scores. The index used by this study was the Index of Relative Socio-Economic Disadvantage and this summarizes a range of information about the economic and social conditions of people and households in an area and considers the income levels and qualification levels of the people in the area.

For the 2011 Census, in Victoria, the response rate for dwellings was 96.8% and the person response rate was also 96.8% (Australian Bureau of Statistics, 2016b). The Australian Bureau of Statistics conducts a Post-Enumeration Survey (PES) shortly after the Census as a way of independently measuring the Census coverage. In 2011, the net undercount (representing the difference between the PES population estimate and the actual Census count) was 1.7%; however, it was large for people born

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overseas at 8.8%. The countries with the highest undercount were China (14.9%) and the Philippines (9.1%).

Country of birth coding

Participant country of birth was coded using the Standard Australian Classification of Countries (SACC) (Australian Bureau of Statistics, 2017b). There are three levels at which geographical areas are defined within this system. BPLP1 refers to the highest level and there are nine areas within this group, with some continents divided into two regions, for example, North-West Europe and Southern and Eastern Europe. BPLP2 refers to regions that consist of a number of neighbouring countries and have some similarities in terms of social, cultural, economic and political characteristics, for example, Southern Asia and Central Asia, or Northern America and Central America. Finally, BPLP3 refers to individual countries. In this study, we looked at the risk of psychotic disorders in migrants from the three different geographical levels.

Data analysis

The demographic and clinical characteristics of migrants with an FEP were compared to the Australian-born population with FEP using Pearson's χ^2 and *t* tests. In the χ^2 analysis, when there was a count of 5 or less, the *p* value for Fisher's exact test was provided. Negative binomial regression was used to estimate incidence rate ratios, controlling for age, sex and social deprivation at the neighbourhood level. The likelihood ratio test was used to assess whether the use of a negative binomial regression model was justified compared to a Poisson regression model, and in all cases, the additional parameter in the negative binomial regression model was necessary to account for over-dispersion in the data. A multi-level mixed-effects negative binomial regression was used for BPLP1 and it was controlled for age (by category 15–19 and 20–24) and sex at the individual level and social deprivation at the neighbourhood level. The socio-economic status was not available at the individual level from the census data and hence neighbourhood-level social deprivation was the closest factor that could be controlled for using census data. This analysis was performed using the menbreg command with Stata v. 14 (StataCorp, 2015). The analysis for BPLP2 and BPLP4 was only controlled for age and sex using the nbreg command with Stata v. 14. An analysis for BPLP1 controlled only for age and sex using the nbreg command is presented in online Supplementary Table S1.

Ethical approval

This study received ethical approval from the Royal Melbourne Human Research Ethic Committee.

Results

Description of participants

A total of 1220 young people presented with FEP during the 6-year study period. Of these, 27 (2.2%) were not residing in the catchment area or were of no-fixed abode, and there was also missing information on place or residence and country of birth for a further 39 (3.2%) and 24 (2.0%) young people, respectively. Therefore, the final cohort consisted of 1130 (92.6%) young people with an FEP. Within this cohort, 58.4% ($N = 660$) were male and 41.6% ($N = 470$) were female. The median age of the total cohort was 20.0 years (IQR = 17–22) and the median age for males was 20.0 years (IQR = 18–22) and females was 19 years (IQR = 16–22) (Table 1). The majority of young people were single (93.5%), living with parents, and either a student (37.7%) or unemployed (41.2%). A total of 75.5% were born in Australia. Excluding those with a diagnosis of unspecified psychotic disorder (6.4%), the majority of young people were diagnosed with a non-affective psychosis (71.6%). A comparison of the demographic and clinical characteristics of the total migrant group compared to the Australian-born group is provided in Table 1, and in summary, migrants were less likely to have a first- or second-degree relative with a psychotic disorder, there was a higher proportion of migrants who received a diagnosis of schizophrenia (32.1% *v.* 15.5%) and substance use, specifically cannabis abuse and methamphetamine abuse was lower.

Risk of psychotic disorders according to sub-continental region (BPLP1)

Compared to Australian-born young people, migrants from Sub-Saharan Africa ($N = 53$) had over a threefold greater risk of being diagnosed with FEP (adjusted incidence rate ratio [aIRR] = 3.47, 95% CI 2.23–5.38) when controlled for sex, age and neighbourhood-level social deprivation (Table 2). There was a trend-level association between an elevated risk for psychotic disorder in migrants from North Africa and the Middle East ($N = 70$) (aIRR = 1.51, 95% CI 0.98–2.34, $p = 0.06$). There was a reduced risk for developing a psychotic disorder in migrants from South-East Asia ($N = 45$) (aIRR = 0.63, 95% CI 0.40–0.99), North-East Asia ($N = 15$) (aIRR = 0.35, 95% CI 0.19–0.64) and Southern and Central Asia ($N = 30$) (aIRR = 0.51, 95% CI 0.30–0.87). These results were largely consistent in the sub-group of young people with a non-affective FEP (Table 2), except that the reduced risk observed in migrants from South-East Asia was reduced to trend-level significance ($p = 0.09$). In the sub-group with an affective FEP, migrants from Sub-Saharan Africa had an increased risk of an affective FEP (aIRR = 3.04, 95% CI 1.65–5.57) and migrants from South-East Asia had a reduced risk (aIRR = 0.49, 95% CI 0.24–0.97). Risks for developing a psychotic disorder were equivalent to the Australian-born population in migrants from Europe and the Americas.

Risk of psychotic disorders according to BPLP2

Examining region of origin in more detail (using the BPLP2 categorization; Table 3), we found that migrants from the two regions within Sub-Saharan Africa, namely Central and West Africa ($N = 7$) (aIRR = 3.53, 95% CI 1.58–7.92) and Southern and Eastern Africa ($N = 46$) (aIRR = 3.06, 95% CI 1.99–4.70), had an increased risk of FEP; however, the small number of migrants with FEP from Central and West Africa needs to be highlighted. These patterns remained in both the non-affective and affective sub-groups, although were not statistically significant in the Central and West Africa migrant group. Migrants from North Africa ($N = 44$) also had over a fivefold increased risk of FEP compared to the Australian-born population (aIRR = 5.03, 95% CI 3.26–7.76), which remained evident for non-affective and affective psychotic disorders separately. While acknowledging the small sample size, migrants from Central Asia ($N = 5$) also had an increased risk of psychotic disorder (aIRR = 2.84, 95% CI 1.11–7.29).

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Table 1. Demographic and clinical characteristics of the cohort

	Total cohort (*N* = 1130)		Migrants (*N* = 277)		Australian born (*N* = 853)		Statistics	
	N	%	*N*	%	*N*	%	χ^2, df	*p* value
Sex								
Male	660	58.4	180	65.0	480	56.3	6.53, 1	0.01
Female	470	41.6	97	35.0	373	43.7		
	Mean	S.D.	Mean	S.D.	Mean	S.D.	*t* test	*p*
Mean age, years ± S.D.	19.5	2.8	20.2	2.8	19.3	2.8	4.32	<0.001
	Median	IQR	Median	IQR	Median	IQR	*Z*	*P*
Median age, years (IQR)	20.0	17–22	20.0	18–23	19.0	17–22	−4.23	<0.001
Identifies as Aboriginal or Torres Strait Islander	33	2.9	–	–	33	3.8	–	–
Marital status	*N*	%	*N*	%	*N*	%	χ^2, df	*p* value
Never married	1056	93.5	248	89.5	808	94.7	10.9, 4	0.03
Married/*de-facto*	40	3.5	15	5.4	25	2.9		
Separated/divorced	11	1.0	5	1.8	6	0.8		
Not stated	23	2.0	9	3.2	14	1.6		
Housing								
Private house or flat	1087	96.2	262	94.6	825	96.7	11.4, 5	0.04
Residential care services	10	0.9	4	1.4	6	0.7		
Hostel	7	0.6	4	1.4	3	0.3		
Supported residential services	16	1.4	3	1.1	13	1.5		
Homeless persons shelter	4	0.4	3	1.1	4	0.1		
No usual accommodation	6	0.5	1	0.4	5	0.6		
Employment status at entry								
Home duties	10	0.9	4	1.5	6	0.7	7.16, 4	0.13
Unemployed	465	41.2	123	44.9	342	40.4		
Employed	186	16.5	35	12.8	151	17.8		
Student	426	37.7	107	39.1	319	37.7		
Student – not attending	33	2.9	5	1.8	28	3.3		
Family history of psychotic disorder								
Present in 1st degree relative	203	18.0	22	7.9	853	21.2	25.0, 1	<0.001
Present in 2nd degree relative	185	16.4	21	7.6	164	19.2	20.7, 1	<0.001
Diagnosis								
Affective/non-affective								
Non-affective psychosis	758	71.6	189	74.1	569	70.9	1.01, 1	0.32
Affective psychosis	300	28.4	66	25.9	234	29.1		
Specific diagnoses								
Schizophreniform disorder	214	18.9	53	19.1	161	18.9	25.8, 9	0.002
Schizophrenia	196	17.3	64	23.1	132	15.5		
Schizoaffective disorder	60	5.3	12	4.3	48	5.6		
Delusional disorder	15	1.3	4	1.4	11	1.3		
Substance-induced psychotic disorder	138	12.2	30	10.8	108	12.7		
Bipolar affective disorder	138	12.2	30	10.8	108	12.7		
Major depressive disorder	102	9.0	24	8.7	78	9.1		

(*Continued*)

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Table 1. (*Continued.*)

	Total cohort (*N* = 1130)		Migrants (*N* = 277)		Australian born (*N* = 853)		Statistics	
	N	%	*N*	%	*N*	%	χ^2, df	*p* value
Psychotic disorder NOS	167	14.8	25	9.0	142	16.6		
Brief psychotic disorder	28	2.5	13	4.7	15	1.8		
Unspecified (FEP)	72	6.4	22	7.9	50	5.9		
Concurrent substance abuse	662	58.6	137	50.0	525	63.1	14.7, 1	<0.001
Cannabis abuse	578	51.2	122	44.0	456	53.5	7.4, 1	0.006
Alcohol abuse	198	17.5	39	14.1	159	18.6	3.0, 1	0.08
Methamphetamine abuse	306	27.1	43	15.5	263	30.8	24.8, 1	<0.001

s.d., standard deviation; df, degrees of freedom, NOS, not otherwise specified; FEP, first-episode psychosis.

In contrast, migrants from the following regions had a decreased risk of psychotic disorder, which was also present in the non-affective and affective sub-groups: Maritime South East Asia (*N* = 20) (aIRR = 0.39, 95% CI 0.23–0.65), China and Mongolia (*N* = 12) (aIRR = 0.25, 95% CI 0.13–0.48) and Southern Asia (*N* = 25) (aIRR = 0.44, 95% CI 0.26–0.76). We found no evidence of differential risk of psychotic disorder in migrants from Middle East Africa (*N* = 26), Mainland South-East Asia (*N* = 20) or Japan and the Koreas (*N* = 3) compared with the Australian-born group.

Risk of FEP in specific migrant groups by country of origin

In our study, migrants from Kenya (*N* = 11) had the highest risk of psychotic disorder compared to the Australian-born population (Table 4), with over a 10-fold increase in risk (aIRR = 11.45, 95% CI 5.29–24.8), followed by migrants from Sudan (*N* = 40) (aIRR = 6.96, 95% CI 3.99–12.17), Ethiopia (*N* = 15) (aIRR = 5.56, 95% CI 2.79–11.06), Somalia (*N* = 11) (aIRR = 3.75, 95% CI 1.76–8.02) and Afghanistan (*N* = 11) (aIRR = 3.28, 95% CI 1.17–9.19). There was no increased risk of psychosis in migrants from New Zealand (*N* = 28) (aIRR = 1.12, 95% CI 0.62–2.02, *p* = 0.72). There was a decreased risk for developing a psychotic disorder in migrants from Indonesia (*N* = 5) (aIRR = 0.34, 95% CI 0.12–0.92), China (*N* = 11) (aIRR = 0.28, 95% CI 0.13–0.63) and India (*N* = 7) (aIRR = 0.17, 95% CI 0.07–0.44).

Discussion

Summary of findings

This is the first study to demonstrate that the treated incidence of FEP was at least three times higher in migrants from Sub-Saharan Africa and North Africa compared to the native-born Australian population, in a sample of young people living in a defined catchment area of Melbourne, Australia. Furthermore, we found that migrants from Maritime South-East Asia, China and Southern Asia had decreased rates of FEP compared with the Australian-born population. Migrants from Europe, New Zealand or the Americas appeared to have equivalent rates of treated psychotic disorder to the Australian-born population.

Possible explanation for findings

Despite differing migration histories between Australia and Europe, and potentially different confounding patterns, our results accord with findings from other settings which show that migrants from African countries face substantially elevated risks of being diagnosed with psychotic disorders in comparison with majority Caucasian populations (Kirkbride et al., 2012). Although data with respect to ethnicity were unavailable in this study, the majority of our Australian-born population would be descendants of European Caucasian ancestry, and as such our findings lend further support to differential rates of psychotic disorder by visible minority status. Our findings also replicate previous findings from Europe and Canada on the reduced risk for psychotic disorders in several migrant groups of Asian origin. In the UK, there has been no evidence of raised rates of psychotic disorders in migrants from India and in one study that examined the risk in a collective group of Asian migrants (Kirkbride et al., 2017; Kirkbride, Stubbins, & Jones, 2012). While in Ontario, Canada, it was found that migrants from East Asia had a reduced risk of psychotic disorders (IRR = 0.56, 95% CI 0.41–0.78) while migrants from South Asia had an increased risk (IRR = 1.51, 95% CI 1.08–2.12) (Anderson, Cheng, Susser, McKenzie, & Kurdyak, 2015).

Previous studies from the UK have found elevated rates of psychotic disorders in people of Pakistani and Bangladeshi heritage (Kirkbride et al., 2017), and although our study was small, we observed a trend-level association between Pakistani birthplace and increased risk of affective psychotic disorders in this sample (aIRR 2.58; 95% CI 0.96–6.97; *p* = 0.06; Table 4).

In trying to understand the reason for these differences in risk observed in our study, at least three models could be conceptualized, which are not mutually exclusive. First, it could be that certain migrant groups are more or less likely to be exposed to established risk factors for developing a psychotic disorder, such as a positive family history for a psychotic disorder (Mortensen, Pedersen, & Pedersen, 2010), obstetrical complications (Cannon, Jones, & Murray, 2002), trauma (Hollander et al., 2016; Popovic et al., 2019), social deprivation (O'Donoghue, Roche, & Lane, 2016) and drug use (Moore et al., 2007). Second, there may be a factor specific to migration that increases the risk, such as adapting to a new country, the experience of migration or seeking asylum and how the migrants are received in the new country

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Table 2. Participant birthplace by region (BPLP1)

	Total FEP cohort (*N* = 1130)					Non-affective FEP (*N* = 758)					Affective FEP (*N* = 300)				
Birthplace	*N*	%	aIRR	95% CI	*p*	*N*	%	aIRR	95% CI	*p*	*N*	%	aIRR	95% CI	*p*
Australia	853	75.5	ref			568	75.1	ref			234	78.0	Ref		
North-West Europe	13	1.2	0.78	0.41–1.50	0.46	9	1.2	0.82	0.39–1.72	0.60	3	1.0	0.73	0.23–2.26	0.58
Southern and Eastern Europe	10	0.9	0.74	0.36–1.51	0.41	5	0.7	0.56	0.22–1.43	0.24	4	1.3	1.16	0.43–3.12	0.77
North Africa and the Middle East	70	6.2	1.51	0.98–2.34	0.06	52	6.9	**1.76**	**1.13–2.75**	**0.01**	15	5.0	1.40	0.83–2.37	0.20
Sub-Saharan Africa	53	4.7	**3.47**	**2.23–5.38**	**<0.001**	39	5.1	**3.96**	**2.49–6.30**	**<0.001**	11	3.7	**3.04**	**1.65–5.57**	**<0.001**
South-East Asia	45	4.0	**0.63**	**0.40–0.99**	**0.04**	31	4.1	0.66	0.41–1.07	0.09	9	3.0	**0.49**	**0.24–0.97**	**0.041**
North-East Asia	15	1.3	**0.35**	**0.19–0.64**	**0.001**	6	0.8	**0.21**	**0.09–0.50**	**<0.001**	8	2.7	0.66	0.32–1.34	0.25
Southern and Central Asia	30	2.7	**0.51**	**0.30–0.87**	**0.01**	17	2.2	**0.44**	**0.24–0.81**	**0.008**	9	3.0	0.63	0.32–1.34	0.17
Americas	7	0.6	0.89	0.39–2.04	0.79	4	0.5	0.79	0.28–2.22	0.65	2	0.7	1.02	0.25–4.10	0.98

Controlled for sex, age and social deprivation in area of residence. Results in bold are statistically significant ($p < 0.05$).

Table 3. Participant birthplace by region (BPLP2)

		Total FEP cohort (*N* = 1130)					Non-affective FEP (*N* = 758)					Affective FEP (*N* = 300)				
	Birthplace	*N*	%	aIRR	95% CI	*p*	*N*	%	aIRR	95% CI	*p*	*N*	%	aIRR	95% CI	*p*
	Australia	853	75.5	ref			569	75.1	ref			300	78.0	ref		
North Africa and Middle East	North Africa	44	3.9	**5.03**	**3.26–7.76**	**<0.001**	32	4.2	**5.50**	**3.44–8.12**	**<0.001**	10	3.3	**4.23**	**2.25–7.98**	**<0.001**
	Middle East	26	2.3	0.87	0.52–1.43	0.57	20	2.6	0.99	0.57–1.71	0.98	5	1.7	0.63	0.26–1.52	0.30
Sub-Saharan Africa	Central and West Africa	7	0.6	**3.53**	**1.58–7.92**	**<0.001**	3	0.4	2.27	0.70–7.37	0.17	2	0.7	3.73	0.93–15.0	0.06
	Southern and East Africa	46	4.1	**3.06**	**4.70**	**0.001**	36	4.7	**3.56**	**2.25–5.65**	**<0.001**	9	3.0	**2.24**	**1.15–4.36**	**0.018**
South-East Asia	Mainland SE Asia	20	1.8	069	0.40–1.18	0.17	14	1.8	0.71	0.38–1.31	0.27	5	1.7	0.60	0.25–1.45	0.26
	Maritime SE Asia	25	2.2	**0.39**	**0.23–0.65**	**<0.001**	17	2.2	**0.40**	**0.23–0.71**	**0.002**	4	1.3	**0.06**	**0.01–0.40**	**0.004**
North-East Asia	China and Mongolia	12	11	**0.25**	**0.13–0.48**	**<0.001**	6	0.8	**0.18**	**0.08–0.44**	**<0.001**	5	1.7	**0.33**	**0.13–0.79**	**0.01**
	Japan and the Koreas	3	0.3	0.58	0.18–1.89	0.37	0	0	–	–	–	3	1.0	1.93	062–6.05	0.26
Southern and Central Asia	Southern Asia	25	2.2	**0.44**	**0.26–0.76**	**0.03**	15	2.0	**0.39**	**0.21–0.73**	**0.003**	8	2.7	**0.49**	**0.24–0.99**	**0.048**
	Central Asia	5	0.4	**2.84**	**1.11–7.29**	**0.002**	2	0.3	1.68	0.40–7.01	0.48	1	0.3	2.25	0.32–16.1	0.42

Controlled for sex and age. Results in bold are statistically significant ($p < 0.05$).

Table 4. Participant birthplace by region (BPLP4)

	Birthplace	Total FEP cohort					Non-affective FEP					Affective FEP				
		N	%	aIRR	95% CI	*p*	*N*	%	aIRR	95% CI	*p*	*N*	%	aIRR	95% CI	*p*
	Australia	853	75.5	ref			569	75.1	ref			234	78.0			
	New Zealand	28	2.5	1.12	0.62–2.02	0.72	20	2.6	1.23	0.71–2.13	0.45	5	1.7	0.75	0.31–1.82	0.52
North Africa	Sudan	40	3.5	**6.96**	**3.99–12.17**	**<0.001**	30	4.0	**8.02**	**4.94–13.02**	**<0.001**	8	2.7	**5.35**	**2.65–10.83**	**<0.001**
Maritime South-East Asia	Indonesia	5	0.4	**0.34**	**0.12–0.92**	**0.04**	4	0.5	0.44	0.15–1.23	0.12	1	0.3	0.27	0.04–1.92	0.19
	Philippines	12	1.1	0.75	0.36–1.57	0.45	9	1.2	0.86	0.42–1.79	0.70	0	–	–	–	–
China and Mongolia	China	11	1.0	**0.28**	**0.13–0.63**	**0.002**	5	0.7	**0.18**	**0.07–0.47**	**<0.001**	5	1.7	**0.39**	**0.16–0.95**	**0.04**
Southern Asia	India	7	0.6	**0.17**	**0.07–0.44**	**<0.001**	4	0.5	**0.15**	**0.05–0.44**	**<0.001**	2	0.7	**0.18**	**0.05–0.74**	**0.02**
	Pakistan	7	0.6	1.08	0.42–2.76	0.88	3	0.4	0.75	0.22–2.50	0.64	4	1.3	2.58	0.96–6.97	0.06
	Sri Lanka	6	0.5	0.92	0.35–2.36	0.86	5	0.7	1.21	0.47–3.13	0.69	1	0.3	0.58	0.08–4.17	0.59
Central Asia	Afghanistan	5	0.4	**3.28**	**1.17–9.19**	**0.02**	2	0.3	2.12	0.50–8.93	0.31	1	0.3	2.96	0.42–21.14	0.28
Southern and East Africa	Ethiopia	15	1.3	**5.56**	**2.79–11.06**	**<0.001**	13	1.7	**7.57**	**4.01–14.29**	**<0.001**	2	0.7	2.82	0.70–11.36	0.14
	Kenya	11	1.0	**11.45**	**5.29–24.78**	**<0.001**	7	0.9	**10.55**	**4.64–24.00**	**<0.001**	3	1.0	**11.68**	**3.73–36.53**	**<0.001**
	Somalia	11	1.0	**3.75**	**1.76–8.02**	**0.001**	9	1.2	**4.86**	**2.33–10.14**	**<0.001**	2	0.7	2.68	0.67–10.77	0.17

Results in bold are statistically significant ($p < 0.05$).

(Dykxhoorn, Hollander, Lewis, Dalman, & Kirkbride, 2019). Third, it is possible that migrants from different regions of origin are more or less likely to be referred to treatment programmes such as EPPIC.

The design of this present study does not allow inference as to why certain migrant groups are at a higher risk for developing a psychotic disorder; however, certain hypotheses could be made, which could direct future work. It has been established that there is an increased risk of psychotic disorders in individuals who are refugees or seeking asylum (Brandt et al., 2019) and refugees to Australia were most commonly from Afghanistan, Somalia and Ethiopia (Parliament-of-Australia, 2017), thereby suggesting that the experience of forced migration may have a causal role in the risk for a psychotic disorder (Morgan, Knowles, & Hutchinson, 2019).

Clinical implications

We have previously argued that mental health services and early intervention for psychosis services should be funded according to the predicted incidence rates of first-episode psychosis, as opposed to per-capita funding (Eaton et al., 2019). The findings from this study also support such a model, as communities in which higher proportions of migrants from the aforementioned African countries or Afghanistan would manifest higher treated incidence rates of psychotic disorder, and should therefore receive the appropriate funding based on local population need to reduce public mental health inequalities. Similar models of evidence-based service early intervention already exist elsewhere, such as in England through the development of models such as PsyMaptic (Kirkbride, 2015). Such models should also consider the possibility of 'ethnic density' effects on psychosis risk, where evidence suggests the risk may be lower when people from similar ethnic backgrounds live in closer proximity (Schofield et al., 2017). Future research should establish whether the ethnic density effect has a similarly protective effect in Australia.

Strengths and limitations

This cohort represented an epidemiological cohort of treated cases of FEP, yet it is possible that not all cases of psychosis were detected for reasons highlighted above. This study was unable to differentiate second-generation migrants from the Australian-born population. If second-generation migrants have an increased risk of psychotic disorders, then this would have inflated the risk in the Australian-born group and therefore reduced the IRRs in first-generation migrants. Additionally, the Australian-born group also included those individuals who identify as Aboriginal or Torres Strait Islander and a higher prevalence of psychotic disorders has been identified in this group (Black et al., 2015), although <4% of the Australian-born individuals in this study identified as Aboriginal or Torres Strait Islander. Furthermore, cases were ascertained on the basis of a clinical diagnosis, as opposed to using a structured diagnostic instrument. The likely impact of using a clinical diagnosis is that there may have been a variation in the specific diagnosis as opposed to misdiagnosis (either over- or under-diagnosis in certain groups), as the criteria for what constitutes a first episode of a psychotic disorder was clearly operationalized. Finally, there is always the risk that the 'at-risk population' (i.e. the denominator) is under-estimated, which would result in the risk ratios being inflated. This is particularly relevant if migrants enter countries by unofficial methods and are therefore reluctant

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to enter information for the Census. However, as previously stated, the estimated undercount of migrants was 8.8% and the country with the highest undercount was China. Migrants from China demonstrated a decreased risk for first contact with a psychotic disorder and hence if the undercount was corrected for, their risk would be further reduced.

Conclusion

This is the first study in Australia that has investigated the incidence and risk of FEP in first-generation migrants and it has identified specific migrant groups who have a dramatically elevated risk. Mental health services need to ensure that they are accessible to migrants and they are adequately resourced to address this increased need.

Supplementary material. The supplementary material for this article can be found at https://doi.org/10.1017/S0033291719004100.

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