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Social disadvantage in early psychosis and its effect on clinical presentation and service access, engagement and use

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ABSTRACT

Incidence of psychosis varies geographically due to factors such as social disadvantage. Whether this influences the clinical presentation and/or engagement of those experiencing psychosis remains relatively understudied. This study analysed data from young people across Australia accessing ultra-high risk (UHR) or first episode psychosis (FEP) services delivered through the *headspace* Early Psychosis (hEP) program between June 2017 and March 2021. The cohort was categorised into low, middle, and high tertiles of social disadvantage using the Index of Relative Socioeconomic Disadvantage (IRSD). Data from 3089 participants aged 15–25 were included (1515 UHR, 1574 FEP). The low and middle tertiles for both cohorts had greater percentages of those not in education or employment (NEET), with First Nations or culturally and linguistically diverse backgrounds. Clinical presentations to services were similar across all tertiles in both cohorts, however, functioning at presentation varied significantly within the FEP cohort. Significantly lower numbers of direct services were provided in the low tertile of both cohorts, with significantly poorer engagement in the initial three-months also occurring for these young people. This variation in early psychosis service patterns associated with geographical variation in social deprivation demonstrates the need for further research and fine tuning of national early psychosis services.

1. Introduction

Schizophrenia and psychoses can be lifelong disorders with one of the largest burdens of disease (Vos et al., 2020). Prompt treatment within the disease progression is now recognised as the gold standard of care (Early Psychosis Guidelines Writing Group, 2016). This model of service provision has become known as Early Intervention in Psychosis (EIP). Various EIP studies have demonstrated a reduction in the frequency and duration of hospital admissions, increased involvement in employment or education, and reduced symptom severity (Posselt et al., 2021; Correll et al., 2018; Cotton et al., 2016). These outcomes are achieved through the combination of guiding EIP principles including pharmacological and psychological support, and family and psychosocial interventions, delivered through a multi-disciplinary team (Cotton et al., 2016).

In Australia, 2014 saw the development of the *headspace* Early Psychosis (hEP) program, where EIP services are delivered through the *headspace* National Youth Mental Health Foundation. *headspace* is a primary healthcare provider that now delivers youth mental health services across over 150 sites in Australia (Rickwood et al., 2019). The

Abbreviations: ANOVA, Analysis of variance; APS, Attenuated psychotic symptoms; BLIPS, Brief limited intermittent psychotic symptoms; BPRS, Brief Psychiatric Rating Scale; CAARMS, Comprehensive Assessment of At Risk Mental States; DUP, Duration of untreated psychosis; EIP, Early intervention in psychosis services; FEP, First episode psychosis; hEP, *headspace* Early Psychosis; IRSD, Index of Relative Socio-economic Disadvantage; K10, Kessler psychological distress scale; MDS, Minimum data set; NEET, Not in Education, Employment, or Training; SD, Standard Deviation; SEIFA, Socio-Economic Indexes for Areas; SOFAS, Social and Occupational Functioning Assessment Scale; UHR, Ultra high risk of psychosis.

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hEP program is administered through 14 centres within six service clusters across most Australian states and territories (Brown et al., 2021), providing a novel and accessible pathway to deliver EIP services.

Despite this innovation in care delivery and availability across most states in Australia, there are still substantial socioeconomic-related inequalities. The influence of social determinants on the risk and presentation of psychosis has been recognised and studied for decades (Faris and Dunham, 1939). Cohort and cross-sectional studies have demonstrated an association between psychosis incidence and environmental factors, including social fragmentation (Ku et al., 2021; Pedersen et al., 2021), income inequality (Kirkbride et al., 2014), unemployment (Eaton et al., 2019) and social deprivation (Lee et al., 2020; O'Donoghue et al., 2016). Eaton et al. (2019) reported in their study, undertaken in the north-western suburbs of Melbourne, Australia that young people from the most socially deprived areas experienced a two-fold increase in incidence of non-affective psychotic disorders compared to those from the least socially deprived suburbs (Eaton et al., 2019). This association was also observed in individuals in the putative prodrome of psychosis, termed being at Ultra High Risk of psychosis (UHR), with more socially deprived regions found to have significantly higher rates of individuals at UHR status in the community (Moore et al., 2022).

There was limited evidence regarding the potential association between social disadvantage and access to care. A recent study suggested that those experiencing greater social deprivation have an increased likelihood of disengaging from EIP care (Reynolds et al., 2019). However, little is known about whether social disadvantage is associated with the clinical and functional status of young people upon presentation. One of the primary scientific arguments for EIP service provision stems from research into treatment outcomes relating to the duration of untreated psychosis (DUP), the time from first frank psychosis to commencement of neuroleptic treatment (McGorry et al., 2007). Identifying and supporting those experiencing psychosis at the earliest point in the trajectory of illness produces the best chance to improve short- and medium-term outcomes, whilst avoiding the social consequences associated with active psychosis (Marshall et al., 2014). Enhanced outcomes consist of reduced psychotic symptoms, lower depression rates, higher functioning, and improved quality of life (Perkins et al., 2005; Marshall et al., 2005; Penttilä et al., 2014; Sullivan et al., 2019). Thus, the putative prodromal period for those at ultra-high risk of psychosis (UHR) through to the first episode of psychosis (FEP) represents a critical stage for intervention and treatment through the EIP model. It is, therefore, critical to understand whether there was socioeconomic-related inequality in accessing timely care during this critical stage.

In addition, work to date has focused on specific areas of Australia, with a lack of national-level data hampering efforts to determine patterns across the country. Given the well-established geographical variation in incidences of psychosis (March et al., 2008), a better understanding of the impact of sociodemographic characteristics on a national level is required.

Using data from a large cohort of young people receiving treatment for FEP and UHR in sites across Australia, we aim to (1) explore differences in socioeconomic status distribution differences between hEP clients, young people living in hEP service catchment areas and all young people in Australia; (2) investigate the association of sociodemographic factors with initial clinical and functional presentation (psychiatric symptomatology, psychiatric distress, and social engagement) for young people within levels of social deprivation; and (3) explore potential variation in service engagement by levels of social deprivation.

2. Methods

2.1. Setting

Participant data were obtained from the current EIP services provided through the hEP program. Services were based in 14 centres within the six clusters throughout Australia, comprising Darwin, Southeast Queensland, Adelaide, North Perth, Western Sydney, and South-East Melbourne. These site locations are predominately based in metropolitan areas of Australia and service the geographically local area that surrounds them and tend not to be catchment-based. Services were provided to young people within two cohorts; those experiencing FEP for 2 to 5 years (dependant on age and date of entry to the program), and those deemed at UHR status, able to access the program for 6 to 12 months (dependant on date of entry to the program).

2.2. Participants

Participants in this study consisted of young people (aged 12 to 25 years upon intake) who were enroled in EIP services between June 2017 and March 2021. FEP was assessed by clinicians as those experiencing daily full-threshold psychotic symptoms for at least one week (Breitborde et al., 2009). UHR status was assessed using the CAARMS criteria whereby at least one of three categories was met: attenuated psychotic symptoms (APS), brief limited intermittent psychotic symptoms (BLIPS), and trait vulnerability factors such as a family history of psychotic disorder or schizotypal personality disorder (Yung et al., 2005).

2.3. Study design and sources of information

At service entry, the clinical team assessed all participants using standardised tools and collected standard demographical characteristics, risk factors and clinical and functional status data as a part of the hEP minimum dataset (MDS). Demographic data included age, gender, sexuality, postcode, identifying as First Nations, language, country of birth, and identification as Not in Education, Employment or Training (NEET).

Socio-economic data were compiled based on a young person's residential postcode on entry to the service. Relative Socio-economic Disadvantage (IRSD) scores, as a part of the Socio-Economic Indexes for Areas (SEIFA) (derived from the 2016 Australian National Census (ABS, 2016a), were used as the socio-economic marker. The IRSD uses a weighted combination of socio-economic conditions including income, education level, employment, occupation, and housing within postcode boundaries to determine the relative disadvantage of areas. Postcodes were ranked into percentiles from 1 to 100, with 1 representing the greatest disadvantage, and 100 the least disadvantaged. We divided postcodes into IRSD tertiles (using percentile cut-offs 33.33 and 66.67) to represent the low, medium, and high IRSD categories. The Estimated Residential Population (ERP) by postal area for the 12-to-25-year age group was estimated using the available age group population data in the 2016 ABS census pack (ABS, 2021) as follows: $ERP_{age\ 12-25} = 0.3ERP_{age\ 5-14} + ERP_{age\ 15-19} + ERP_{age\ 20-24} + ERP_{age\ 12-15} + 0.1ERP_{age\ 25-34}$

The MDS also consists of several measures of functional and clinical status. The Kessler Psychological Distress Scale (K10), a self-report tool, was employed to assess psychological distress (Kessler et al., 2003). K10 scores range from 10 to 50, with any score greater than 30 demonstrating very high levels of distress. Psychopathology was assessed using the Brief Psychiatric Rating Scale (BPRS) conducted by clinicians. The BPRS is a 24-item tool measuring psychiatric symptoms including depression, anxiety, hallucinations, and unusual behaviour. The BPRS total score ranges between 24 and 168 with higher scores indicating more significant psychopathology (Overall and Gorham, 1962). Within this, we utilised two subscales, BPRS-Psychosis (4-item) and BPRS-Negative (3-item), which focused on the positive and negative symptomatology, respectively (Lachar et al., 2001).

The Social and Occupational Functioning Assessment Scale (SOFAS), an indicator of functional status, was also assessed by clinicians. The SOFAS measures social and occupational functioning on a scale of 1 to

100. Scores of 50 or below demonstrate 'serious impairment in social, occupational, or school functioning', whilst a score of 80 represents 'no more than a slight impairment in social, occupational, or school functioning' (American Psychiatric Association). Finally, the transition from UHR status to FEP during the episode of care was recorded within the MDS.

Treatment engagement data was also captured through the MDS, including days in service (calculated from commencement date to the last date of any direct or indirect service), number of direct services (number of times an individual was seen), and retention rates in the service at the three-month time point.

2.4. Statistical analysis

The distribution of IRSD was first compared between residential population aged 12–25 years in Australia, residential population aged 12–25 years in hEP service catchment areas (postal areas where clients attend services), and the hEP participants. This provides us with a broader understanding of socioeconomic-related inequity in hEP service availability and access. Rates of service attendance within catchment areas were also compared between IRSD groups using Chi-square tests.

Descriptive statistics and simple statistical tests including ANOVA, Kruskal Wallis and Chi-square tests were utilised to compare participant demographic, clinical and functional characteristics, as well as treatment engagement, between clients of low, middle, and high IRSD tertiles in both UHR and FEP cohorts. Only crude differences were evaluated as we were interested in exploring the baseline differences of a range of factors between participants from areas with different socioeconomic statuses. Clinical and functional characteristic distributions at baseline were visualised using violin plots combined with boxplots. The horizontal line of the boxplot indicates the median, while the sides of the box indicate the 25th and 75th percentiles. The whiskers indicate lowest and highest values, excluding outliers, with the dots indicating outliers. The violin shapes surrounding the boxplots are rotated kernel density estimations (mirrored on either side), showing the distribution of the outcomes. The thicker sections of the violin shape represent higher frequencies of the outcome.

2.5. Ethics

Ethics approval was granted by the University of Melbourne Human Research Ethics Committee (2021-20371-13617-3). Data used in this study came from participants who had provided consent for their de-identified data to be collected and used, with consent from a guardian also being provided for those under 18 at time of service entry.

3. Results

3.1. Cohort in catchment areas

A total of 3089 young people were included in this study ($n = 1515$ UHR, $n = 1574$ FEP) with Table 1 showing the percentage of young people in low, middle, and high IRSD for the Australian youth population, by hEP catchment area . Catchment areas of hEP services had higher IRSD status compared with general Australia. A higher proportion of young people aged 12–25 were living in the most disadvantaged areas in Australia (27% in first IRSD tertile) compared to those in catchment areas of hEP services (21.4%).

Within the catchment areas, the distribution of IRSD tertiles for clients accessing hEP services varied by cohort group ($p = 0.002$, Table 1). The tertile distribution in the FEP group matched percentages in the catchment area, however, in the UHR cohort, there was a greater rate of clients from middle IRSD and a lower proportion from high IRSD areas.

Despite a higher percentage of hEP clients residing in high IRSD areas (42.0%), the rate of the general population attending the service by catchment area was lowest in high IRSD group (1.9 per 1000). Within the UHR cohort, hEP attendance varied significantly across catchment area tertiles ($p < 0.001$), with the lowest rate of the general population attending within the high IRSD tertile (0.9 per 1000). There were no significant differences by tertile for the FEP cohort (Table 1).

Table 1
Percentage distribution for population groups by IRSD tertile.

Population	IRSD tertile Low (Most disadvantaged)	Mid	High (Least disadvantaged)	*p*-value
IRSD distribution within each population (%)				
Australia ($N = 4175,360$)	27.0%	33.1%	39.9%	
Catchment area ($N = 1499,143$)	21.4%	33.7%	44.9%	
Total participation in hEP ($N = 3089$)	21.0%	37.0%	42.0%	
UHR cohort ($N = 1515$)	20.4%	40.0%	39.6%	0.002[b]
FEP cohort ($N = 1574$)	21.7%	34.1%	44.3%	
hEP attendance rates (per 1000 population) within catchment area tertiles[a]				
Total participants in hEP	2.0	2.3	1.9	<0.001
UHR cohort	1.0	1.2	0.9	<0.001
FEP cohort	1.1	1.1	1.0	0.879

[a] Chi-square tests used to compare attendance between IRSD groups within catchment areas for each hEP cohort.
[b] Chi-square test used to compare IRSD distribution between the hEP cohorts.

3.2. Cohort demographics

A total of 1515 adolescents in the UHR cohort received hEP services during the study period. Within the UHR cohort, First Nations status differed across tertiles, with a lower percentage residing in high tertile locations ($p<0.001$, Table 2). Another demographic presentation that differed across tertiles was NEET status, with significantly higher rates in the low tertile (34.7%) than the middle (27.7%) and high (25.3%), $p = 0.013$. The total mean age was 17.7 years (SD $\pm$ 3.1), which was slightly lower in the middle tertile (17.4 $\pm$ 3.1, $p = 0.004$). As shown in Table 2, cohort characteristics including gender, country of birth, language spoken at home, and sexuality did not vary significantly across IRSD tertiles. The overall rate of transition to psychosis within six months was 7.9%, which was comparable across all tertiles.

A total of 1574 adolescents in the FEP cohort received hEP services during the study period. Like the UHR cohort, the percent of young persons identifying as First Nations differed significantly; 9.7%, 9.0%, and 4.7% in the low, middle, and high tertiles respectively ($p = 0.005$, Table 2). Country of birth varied with higher rates of individuals born in Australia or New Zealand in the high tertile (83.6%) compared to the low tertile (75.5%), an opposing trend to that observed in the UHR cohort. Corresponding trends were evident for English spoken at home ($p<0.001$). NEET status, which differed across tertiles ($p = 0.039$), was highest in the low tertile (54.4%) and decreased to 50.5% in the middle tertile and 46.2% in the high tertile. Additionally, the average duration of untreated psychosis (DUP) varied between tertile groups ($p = 0.042$). Participants in the low tertile had longer DUP compared with other groups (71.7% less than 30 days compared with 77.1% and 74.8% in the middle and high IRSD tertiles). Characteristics including gender, and sexuality, were comparable across tertiles of social disadvantage.

3.3. Clinical presentations

Baseline measures of clinical status for the UHR cohort are summarised across IRSD tertiles in Table 3, with the distributions shown in Fig. 1. There was no evidence of significant variation across tertiles for the BPRS, K10, or SOFAS scores, Baseline measures of clinical status in

Table 2
Demographic characteristics for UHR and FEP participants by IRSD tertile.

Characteristic	Low	Tertile Mid	High	Total	*p*-value
UHR	$n = 309$	$n = 606$	$n = 600$	$N = 1515$	
Age at intake	17.9 (3.2)	17.4 (3.1)	17.9 (3.0)	17.7 (3.1)	0.004
Gender					0.322
Female	157 (55.3%)	307 (54.8%)	275 (49.3%)	739 (52.7%)	
Male	119 (41.9%)	235 (42.0%)	261 (46.8%)	615 (43.9%)	
Non-binary	8 (2.8%)	18 (3.2%)	22 (3.9%)	48 (3.4%)	
Heterosexual	153 (81.4%)	288 (76.8%)	258 (74.8%)	699 (77.0%)	0.223
First Nations	28 (10.9%)	62 (12.6%)	26 (5.1%)	116 (9.3%)	<0.001
Country of birth (Aus/NZ)	240 (93.8%)	446 (92.7%)	447 (89.4%)	1133 (91.6%)	0.065
English as home language	229 (91.2%)	438 (93.6%)	448 (91.8%)	1115 (92.4%)	0.434
NEET	105 (34.7%)	164 (27.7%)	148 (25.3%)	417 (28.2%)	0.013
Transitioned to FEP	25 (8.1%)	46 (7.6%)	48 (8.0%)	119 (7.9%)	0.951
FEP	$n = 341$	$n = 536$	$n = 697$	$N = 1574$	
Age at intake	19.9 (2.9)	19.6 (2.9)	19.9 (2.8)	19.8 (2.8)	0.112
Gender					0.893
Female	96 (30.2%)	167 (32.8%)	216 (33.4%)	479 (32.5%	
Male	219 (68.9%)	338 (66.4%)	425 (65.8%)	982 (66.7%)	
Non-binary	3 (0.9%)	4 (0.8%)	5 (0.8%)	12 (0.8%)	
Heterosexual	172 (89.6%)	266 (87.8%)	323 (89.2%)	761 (88.8%)	0.780
First Nations	28 (9.7%)	41 (9.0%)	27 (4.7%)	96 (7.3%)	0.005
Country of birth (Aus/NZ)	213 (75.5%)	368 (81.6%)	486 (83.6%)	1067 (81.2%)	0.016
English as home language	187 (69.5%)	356 (83.6%)	487 (88.9%)	1030 (82.9%)	< 0.001
NEET	184 (54.4%)	265 (50.5%)	314 (46.2%)	763 (49.4%)	0.039
DUP					0.042
30 days or less	165 (71.7%)	249 (77.1%)	285 (74.8%)	699 (74.8%)	
31–90 days	40 (17.4%)	27 (8.4%)	40 (10.5%)	107 (11.5%)	
91 days-1 year	16 (7.0%)	34 (10.5%)	37 (9.7%)	87 (9.3%)	
Over 1 year	9 (3.9%)	13 (4.0%)	19 (5.0%)	41 (4.4%)	

UHR: ultra-high risk of psychosis; FEP: First episode of psychosis; NEET: Not in education, employment, or training; DUP: duration of untreated psychosis. Statistics are: mean (SD) for age (with ANOVA) or frequency (%)(with Chi-square test). Missing data for UHR: gender $n = 113$; sexual orientation $n = 607$; First Nations $n = 262$; country of birth (COB) $n = 299$; English at home $n = 344$; NEET $n = 37$. Missing data for FEP: gender $n = 101$; sexual orientation $n = 717$; First Nations $n = 250$; COB $n = 320$; English at home $n = 411$; NEET $n = 31$; DUP $n = 640$.

the FEP cohort are also summarised in Table 3, with the distributions by tertiles shown in Fig. 2. Again, there was no evidence of differences in any of the baseline clinical presentation scores (BPRS or K10) by tertile groups. In contrast to the findings for the UHR cohort however, the median SOFAS score on entry to service within the FEP cohort was higher in the high tertile group (mean: 55) compared with low (mean: 55) and mid (mean: 55) tertile group, see violin box plot in Fig. 2.

3.4. Engagement in services

Table 4 shows the significant variation in treatment engagement

Table 3
Median clinical and functional characteristics scores at baseline for UHR and FEP participants by IRSD tertile.

Characteristic	Low	Tertile Mid	High	Total	*p*-value
UHR	$n = 309$	$n = 606$	$n = 600$	$N = 1514$	
BPRS	44 (37, 53)	46 (39, 54)	46 (38, 54)	45 (38, 54)	0.433
BPRS-Psychosis	8 (6, 10)	8 (6, 11)	8 (6, 11)	8 (6, 11)	0.264
BPRS-Negative	5 (3, 6)	5 (3, 7)	4 (3, 6)	5 (3, 7)	0.181
K10	32 (27, 38)	33 (27, 38)	31 (26, 37)	32 (26, 38)	0.114
SOFAS	55 (50, 65)	60 (50, 65)	60 (50, 65)	60 (50, 65)	0.419
FEP	$\boldsymbol{n = 341}$	$\boldsymbol{n = 536}$	$\boldsymbol{n = 697}$	$\boldsymbol{N = 1574}$	
BPRS	45 (37, 59.5)	46 (38, 58)	45 (38, 57)	46 (38, 58)	0.848
BPRS-Psychosis	9 (6.5, 13)	9 (6, 13)	9 (6, 13)	9 (6, 13)	0.495
BPRS-Negative	5 (3, 8)	5 (3, 8)	5 (3, 7)	5 (3, 8)	0.834
K10	24 (17, 30.8)	25 (18, 31)	25 (18, 31)	25 (18, 31)	0.660
SOFAS	55 (50, 61)	55 (50, 65)	60 (50, 65)	55 (50, 65)	0.006

UHR: ultra-high risk of psychosis; FEP: First episode of psychosis. Statistics are: median (Interquartile range - Q1, Q3) (with Kruskal Wallis test). Missing data for UHR: All BPRS scores $n = 484$; K10 $n = 389$; SOFAS $n = 94$. Missing data for FEP: All BPRS scores $n = 604$; K10 $n = 559$; SOFAS $n = 165$.

profiles across tertiles. Within the UHR cohort, low tertile individuals received fewer direct services (median = 34), than the middle tertile (median = 39) and high tertile (median = 41). The number of days in service also varied ($p = 0.042$), with the median number of days in the low tertile being 187 days, compared to 196 days in the middle tertile and 212 in the high tertile. In addition, those within the low tertile were less likely to remain in the hEP service after 3 months, with 69.6% in the low tertile compared to 78% in the high tertile ($p = 0.013$).

Similar trends were observed in the FEP cohort, with variation in the number of direct services received across tertiles ($p < 0.001$). The median number of direct services in the low tertile was 58, compared to 61 and 75.5 in the middle and high tertiles respectively. Though a greater proportion of those within the high tertile remained within the service at 3 months, 79.9%, compared to those from within the low tertile, 76.0%, there is only weak evidence supporting this variation ($p = 0.073$).

4. Discussion

4.1. Summary of findings

This study aimed to explore the association of social-economic status with clinical and functional presentation to services, and service access, use and engagement for young people experiencing FEP or UHR in Australia. The use of intake data from 3089 participants, allowed for a unique analysis of demographic factors, and clinical and functional status, in relation to socio-economic status.

Considering demographic data, there were some differences observed (NEET status, and identification as a First Nations young person) between participants from low, middle, and high areas of social disadvantage across Australia (ABS, 2016b). Whilst within the FEP cohort, rates of country of birth, excluding Australia and New Zealand, and non-English speaking home language, were significantly higher in the low IRSD tertile. Additionally, young people from the low IRSD tertiles experienced reduced engagement as evidenced by fewer direct services. Despite these variations, clinical status on presentation did not vary significantly across tertiles in either cohort, whilst it was only within the FEP cohort that functional status varied.

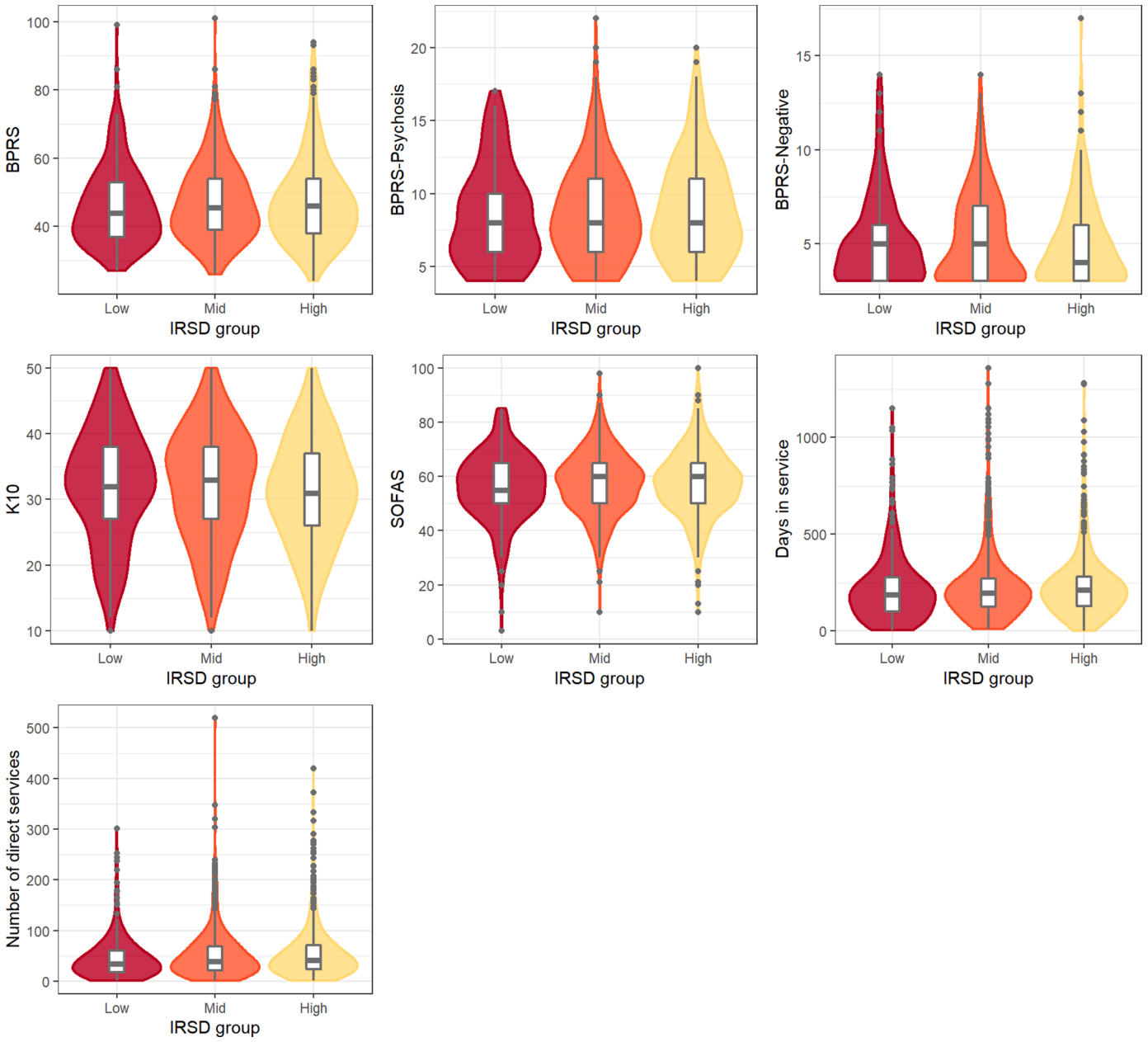

Fig. 1. Violin box plot of UHR clinical characteristics at baseline by IRSD group. *Note:* The violin shapes surrounding the box plots show the shape of the outcome distribution, mirrored on either side of the box plot. The thicker sections represent higher frequencies of the outcome.

4.2. Comparison to previous literature

Given the well-established influence of social disadvantage on incidence of UHR and FEP within Australia (Eaton et al., 2019; Moore et al., 2022; O'Donoghue et al., 2016), and internationally (Kirkbride et al., 2017; Lasalvia et al., 2014; O'Donoghue et al., 2016), the current study sought to explore in more detail the influence of social disadvantage on clinical presentations and service use for young people engaged with early psychosis services.

Previous studies have investigated elements of our findings, including the relationship between social disadvantage and engagement with early intervention services (Reynolds et al., 2019; Seidler et al., 2020). Our findings demonstrated those of low IRSD received fewer direct services in both cohorts and were less likely to remain engaged in the services after three months, in the UHR group. This same lower tertile demonstrated higher rates of certain demographic factors, including NEET and identifying as of Indigenous status in both cohorts, whilst the low tertile in the FEP cohort also comprised increased rates of language and country of birth elements associated with recent immigration. These demographic variations are to be expected, as the construct of the IRSD index is based upon elements including rates of employment, language, and immigration status.

4.3. Clinical implications

Of note was the considerably low representation of socially disadvantaged communities within the hEP catchment areas, despite the established association of greater social deprivation with increased incidence of psychosis (Eaton et al., 2019; O'Donoghue et al., 2016). This is potentially due to the large number of low IRSD communities located in regional and rural areas (Vinson et al., 2007), thereby reducing their likelihood to fall under catchment areas for hEP services located in state and territory capitals. These findings act as a reminder that the location of services should be tailored to the needs of the

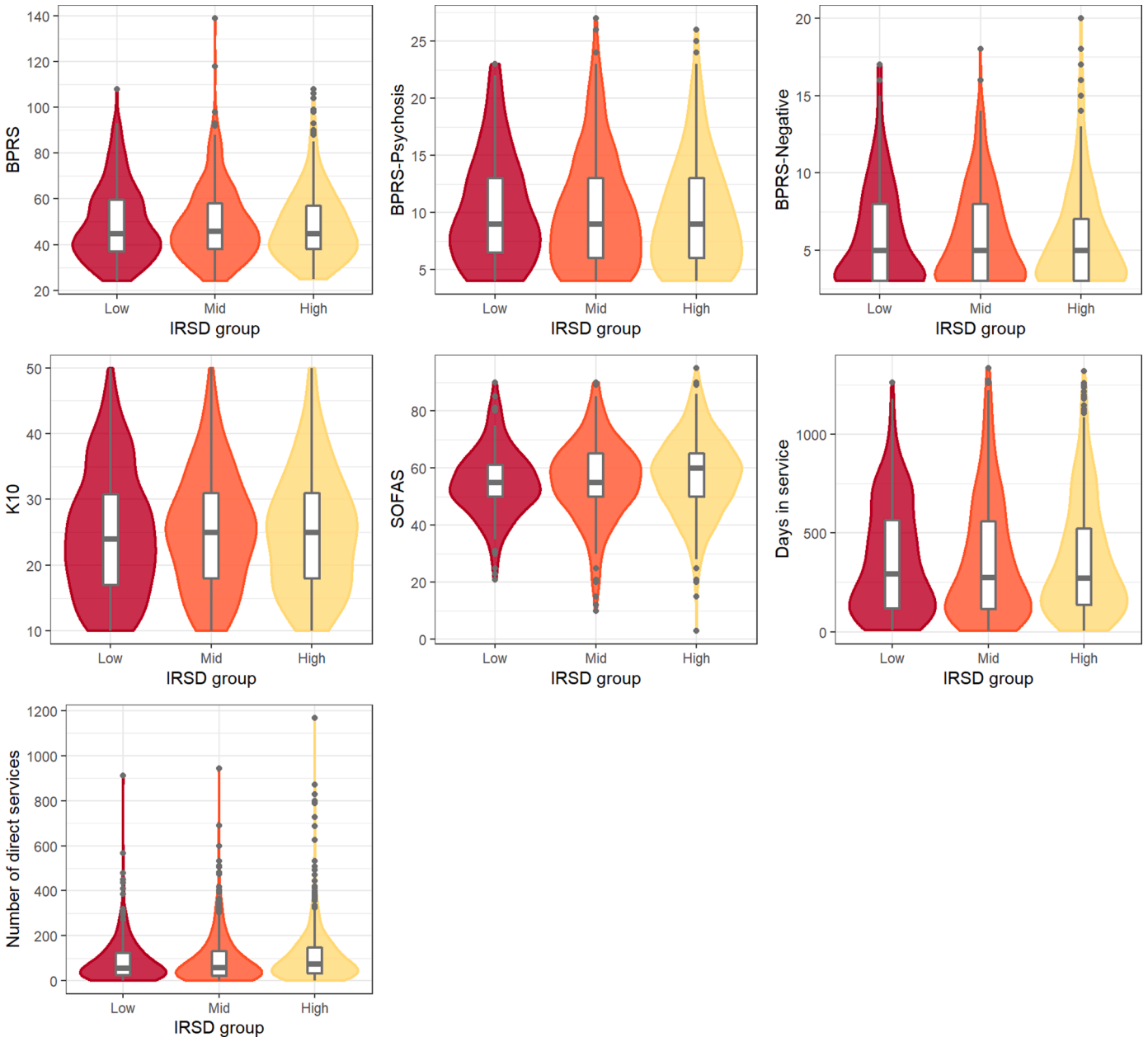

Fig. 2. Violin box plot of FEP clinical characteristics at baseline by IRSD group. *Note:* The violin shapes surrounding the box plots show the shape of the outcome distribution, mirrored on either side of the box plot. The thicker sections represent higher frequencies of the outcome.

population. A similar scenario was observed in EIP services in England and Wales, in which the incidence and presentation of psychosis was incorrectly assumed to be geographically consistent. This resulted in some services experiencing low caseloads (Tiffin and Glover, 2007), whilst others bore the brunt of unsustainably high demand (Cheng et al., 2011; Kirkbride et al., 2012). However, as demonstrated by (Croudace et al., 2000), it is also not a linear relationship between social disadvantage, psychosis, and the severity of symptoms. Thus, there is no simple solution, however, given the unique barriers within Australia, including workforce shortfalls and low population densities in regional parts of the country, more research is needed to determine the best location and distribution of services, whilst optimising participant engagement, to ensure young people at greatest risk of psychosis can initiate support and remain engaged over time.

When considering geographical positioning of EIP services, it is equally vital to recognise and support the demographic factors of the population being served. As demonstrated in both the FEP and UHR cohorts, individual factors such as Indigenous status, NEET, language, and country of birth vary significantly across levels of social disadvantage. Further research into this relationship is therefore imperative to explore the optimum structuring of service mechanisms to support aspects including employment, education, and cultural connection. Following this, community educational strategies should be encouraged to aid potential demographic barriers to presentation, particularly in areas of greater social deprivation.

A final clinical implication relates to the significantly lower levels of engagement in services in young people from low tertile locations. Clinicians should be aware of this potential pattern and may need to utilise novel strategies to minimise disengagement with services (Reynolds et al., 2019; Seidler et al., 2020). Utilisation of the MDS to monitor the number of service engagements in young people should be considered to ensure that possible points of continued engagement, as opposed to withdrawal, are not missed. Additionally, the development of a national level registry would allow us to further explore the variation in hEP

Table 4
hEP service engagement for UHR and FEP cohorts by IRSD tertile.

Measure	Low	Tertile Mid	High	Total	*p*-value
UHR	$n = 309$	$n = 606$	$n = 600$	$N = 1515$	
Days in service	187 (101, 277)	196 (126, 271)	212 (129, 282)	199 (122, 276)	0.042
Number of direct services	34 (18, 60)	39 (21, 69)	41 (23, 71)	39 (21, 68)	0.014
In program at 3 months					0.013
Yes	215 (69.6%)	467 (77.1%)	468 (78.0%)	1150 (75.9%)	
No	94 (30.4%)	139 (22.9%)	132 (22.0%)	365 (24.1%)	
FEP	$n = 341$	$n = 536$	$n = 697$	$N = 1574$	
Days in service	293 (117, 566)	275 (113, 558)	273.0 (136, 523)	280 (126, 544)	0.631
Number of direct services	58 (24, 124)	61 (23, 131)	75.5 (32, 148)	66 (27, 135)	< 0.001
In program at 3 months					0.073
Yes	259 (76.0%)	400 (74.6%)	557 (79.9%)	1216 (77.3%)	
No	82 (24.0%)	136 (25.4%)	140 (20.1%)	358 (22.7%)	

UHR: ultra-high risk of psychosis; FEP: First episode of psychosis. Statistics are: median (Q1, Q3) (with Kruskal Wallis test) for days and number of services, and frequency (%) (with Chi-square test) for program at 3 months. Missing data for UHR: Days in service $n = 28$; Number of direct services $n = 1$. Missing data for FEP: Days in service $n = 26$; Number of direct services $n = 6$.

service access, provision of care and engagement, thereby facilitating the creation of more advanced solutions.

4.4. Limitations

Alongside these results, several limitations must be considered. Digital Healthcare data tools used by clinicians to collect routine data creates the potential for data-entry errors (Dinov, 2016) and missing data due to staffing shortages may impact on the reliability of the dataset. As with any index calculated from population characteristics, the IRSD may fail to appreciate some aspects of social deprivation, yet the use of large input data and variable weighting reduces these errors (ABS, 2016b). The IRSD is also one of the many indices used to inform appropriate government policy and it is thus important for us to utilise this same measure to maximise the clinical relevancy of our findings. A further limitation of the current study is that while the services exist nationally across Australia, they are still limited in their geographical locations to specific areas of the country. As discussed within Clinical Implications, we suggest developing novel models of care to accommodate for these geographical discrepancies. Additionally, some of these sites are located proximal to other state FEP services, thus these concurrent programs could influence the number and nature of presentations to hEP services at these sites.

5. Conclusion

This large naturalistic cohort study is one of the first of its kind to explore the intricate relationship between socio-economic status, sociodemographic characteristics and engagement for young people experiencing FEP or considered to be UHR. Despite the discrepancies in participant engagement and service provision, similar clinical status was noted for all tertiles within both cohorts. This occurred on a complex backdrop, in which analysis of catchment area and hEP cohort populations demonstrated relative underrepresentation of those from more socially disadvantaged areas across the nation. Thus, further enquiry is needed to investigate the current distribution of hEP services to ensure adequate access, education, and support for young people most in need.

Author statement

This statement is to certify that all authors have seen and approved the final version of the manuscript being submitted. This warrants that the article is the authors' original work, hasn't received prior publication and isn't under consideration for publication elsewhere.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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References

ABS. (2016a). Census of Population and Housing: Socio-Economic Indexes For Areas (SEIFA), Australia, 2016. Retrieved from ht tps://www.abs.gov.au/ausstats/abs@.nsf/mf/2033.0.55.001. from ABS https://www.abs.gov.au/ausstats/abs@.nsf/mf/2033.0.55.001.

ABS, 2016b. Technical Paper Socio-Economic Indexes for Areas (SEIFA). Retrieved from. https://www.ausstats.abs.gov.au/ausstats/subscriber.nsf/0/756EE3DBEFA869EFCA258259000BA746/$File/SEIFA%202016%20Technical%20Paper.pdf.

ABS, 2021. Census. Retrieved from. https://www.abs.gov.au/census.

American Psychiatric Association, 2023. Diagnostic and Statistical Manual of Mental Disorders.

Breitborde, N.J.K., Srihari, V.H., Woods, S.W., 2009. Review of the operational definition for first-episode psychosis. Early Interv. Psychiatry 3 (4), 259–265. https://doi.org/10.1111/j.1751-7893.2009.00148.x.

Brown, E., Gao, C.X., Staveley, H., Williams, G., Farrelly, S., Rickwood, D., Thompson, A., 2021. The clinical and functional outcomes of a large naturalistic cohort of young people accessing national early psychosis services. Aust. N. Z. J. Psychiatry, 48674211061285. https://doi.org/10.1177/00048674211061285.

Cheng, F., Kirkbride, J.B., Lennox, B.R., Perez, J., Masson, K., Lawrence, K., Jones, P.B., 2011. Administrative incidence of psychosis assessed in an early intervention service in England: first epidemiological evidence from a diverse, rural and urban setting. Psychol. Med. 41 (5), 949–958. https://doi.org/10.1017/s0033291710002461.

Posselt, C.M., Albert, N., Nordentoft, M., Hjorthøj, C., 2021. The Danish OPUS early intervention services for first-episode psychosis: a phase 4 prospective cohort study with comparison of randomized trial and real-world data. Am. J. Psychiatry 178 (10), 941–951. https://doi.org/10.1176/appi.ajp.2021.20111596.

Correll, C.U., Galling, B., Pawar, A., Krivko, A., Bonetto, C., Ruggeri, M., Kane, J.M., 2018. Comparison of early intervention services vs treatment as usual for early-phase psychosis: a systematic review, meta-analysis, and meta-regression. JAMA Psychiatry 75 (6), 555–565. https://doi.org/10.1001/jamapsychiatry.2018.0623.

Cotton, S.M., Filia, K.M., Ratheesh, A., Pennell, K., Goldstone, S., McGorry, P.D., 2016. Early psychosis research at Orygen, The National Centre of Excellence in Youth Mental Health. Soc. Psychiatry Psychiatr. Epidemiol. 51 (1), 1–13. https://doi.org/10.1007/s00127-015-1140-0.

Croudace, T.J., Kayne, R., Jones, P.B., Harrison, G.L., 2000. Non-linear relationship between an index of social deprivation, psychiatric admission prevalence and the incidence of psychosis. Psychol. Med. 30 (1), 177–185. https://doi.org/10.1017/s0033291799001464.

Perkins, D.O., Gu, H., Boteva, K., Lieberman, J.A., 2005. Relationship between duration of untreated psychosis and outcome in first-episode schizophrenia: a critical review and meta-analysis. Am. J. Psychiatry 162 (10), 1785–1804. https://doi.org/10.1176/appi.ajp.162.10.1785.

Dinov, I.D., 2016. Methodological challenges and analytic opportunities for modeling and interpreting Big Healthcare Data. Gigascience 5, 12. https://doi.org/10.1186/s13742-016-0117-6.

Early Psychosis Guidelines Writing Group, E. N. S. P., 2016. Australian Clinical Guidelines for Early Psychosis. Retrieved from. https://www.orygen.org.au/Campus/Expert-Network/Resources/Free/Clinical-Practice/Australian-Clinical-Guidelines-for-Early-Psychosis/Australian-Clinical-Guidelines-for-Early-Psychosis.aspx?ext.

Eaton, S., Harrap, B., Downey, L., Thien, K., Bowtell, M., Bardell-Williams, M., O'Donoghue, B., 2019. Incidence of treated first episode psychosis from an Australian early intervention service and its association with neighbourhood

characteristics. Schizophr. Res. 209, 206–211. https://doi.org/10.1016/j.schres.2019.04.017.
Faris, R.E.L., Dunham, H.W., 1939. Mental Disorders in Urban Areas: An Ecological Study of Schizophrenia and Other Psychoses. Univ. Chicago Press, Oxford, England.
Kessler, R.C., Barker, P.R., Colpe, L.J., Epstein, J.F., Gfroerer, J.C., Hiripi, E., Zaslavsky, A.M., 2003. Screening for serious mental illness in the general population. Arch. Gen. Psychiatry 60 (2), 184–189. https://doi.org/10.1001/archpsyc.60.2.184.
Kirkbride, J.B., Hameed, Y., Ankireddypalli, G., Ioannidis, K., Crane, C.M., Nasir, M., Jones, P.B., 2017. The epidemiology of first-episode psychosis in early intervention in psychosis services: findings from the social epidemiology of psychoses in East Anglia [SEPEA] Study. Am. J. Psychiatry 174 (2), 143–153. https://doi.org/10.1176/appi.ajp.2016.16010103.
Kirkbride, J.B., Jones, P.B., Ullrich, S., Coid, J.W., 2014. Social deprivation, inequality, and the neighborhood-level incidence of psychotic syndromes in East London. Schizophr. Bull. 40 (1), 169–180. https://doi.org/10.1093/schbul/sbs151.
Kirkbride, J.B., Stubbins, C., Jones, P.B., 2012. Psychosis incidence through the prism of early intervention services. Br. J. Psychiatry 200 (2), 156–157. https://doi.org/10.1192/bjp.bp.111.094896.
Ku, B.S., Compton, M.T., Walker, E.F., Druss, B.G., 2021. Social fragmentation and schizophrenia: a systematic review. J. Clin. Psychiatry 83 (1). https://doi.org/10.4088/JCP.21r13941.
Lachar, D., Bailley, S.E., Rhoades, H.M., Espadas, A., Aponte, M., Cowan, K.A., Wassef, A., 2001. New subscales for an anchored version of the Brief Psychiatric Rating Scale: construction, reliability, and validity in acute psychiatric admissions. Psychol. Assess. 13 (3), 384–395. https://doi.org/10.1037//1040-3590.13.3.384.
Lasalvia, A., Bonetto, C., Tosato, S., Zanatta, G., Cristofalo, D., Salazzari, D., Ruggeri, M., 2014. First-contact incidence of psychosis in north-eastern Italy: influence of age, gender, immigration and socioeconomic deprivation. Br. J. Psychiatry 205 (2), 127–134. https://doi.org/10.1192/bjp.bp.113.134445.
Lee, S.C., DelPozo-Banos, M., Lloyd, K., Jones, I., Walters, J.T.R., Owen, M.J., John, A., 2020. Area deprivation, urbanicity, severe mental illness and social drift - A population-based linkage study using routinely collected primary and secondary care data. Schizophr. Res. 220, 130–140. https://doi.org/10.1016/j.schres.2020.03.044.
March, D., Hatch, S.L., Morgan, C., Kirkbride, J.B., Bresnahan, M., Fearon, P., Susser, E., 2008. Psychosis and place. Epidemiol. Rev. 30 (1), 84–100. https://doi.org/10.1093/epirev/mxn006.
Marshall, M., Husain, N., Bork, N., Chaudhry, I.B., Lester, H., Everard, L., Birchwood, M., 2014. Impact of early intervention services on duration of untreated psychosis: data from the National EDEN prospective cohort study. Schizophr. Res. 159 (1), 1–6. https://doi.org/10.1016/j.schres.2014.07.005.
Marshall, M., Lewis, S., Lockwood, A., Drake, R., Jones, P., Croudace, T., 2005. Association between duration of untreated psychosis and outcome in cohorts of first-episode patients: a systematic review. Arch. Gen. Psychiatry 62 (9), 975–983. https://doi.org/10.1001/archpsyc.62.9.975.
McGorry, P.D., Killackey, E., Yung, A.R., 2007. Early intervention in psychotic disorders: detection and treatment of the first episode and the critical early stages. Med. J. Aust. 187 (S7), S8–10. https://doi.org/10.5694/j.1326-5377.2007.tb01327.x.
Moore, D., Eaton, S., Polari, A., McGorry, P., Nelson, B., O'Donoghue, B, 2022. The association between social deprivation and the rate of identification of individuals at Ultra-High Risk for psychosis and transition to psychosis. Int. J. Soc. Psychiatry, 207640221087608. https://doi.org/10.1177/00207640221087608.
O'Donoghue, B., Lyne, J.P., Renwick, L., Lane, A., Madigan, K., Staines, A., Clarke, M., 2016a. Neighbourhood characteristics and the incidence of first-episode psychosis and duration of untreated psychosis. Psychol. Med. 46 (7), 1367–1378. https://doi.org/10.1017/s003329171500286x.
O'Donoghue, B., Roche, E., Lane, A., 2016b. Neighbourhood level social deprivation and the risk of psychotic disorders: a systematic review. Soc. Psychiatry Psychiatr. Epidemiol. 51 (7), 941–950. https://doi.org/10.1007/s00127-016-1233-4.
Overall, J.E., Gorham, D.R., 1962. The brief psychiatric rating scale. Psychol. Rep. 10 (3), 799–812. https://doi.org/10.2466/pr0.1962.10.3.799.
Pedersen, C.B., Antonsen, S., Timmermann, A., Pedersen, M.G., Ejlskov, L., Horsdal, H.T., Thompson, W.K., 2021. Urban-rural differences in schizophrenia risk: multilevel survival analyses of individual- and neighborhood-level indicators, urbanicity and population density in a Danish National Cohort Study. Schizophr. Bull. Open 3 (1). https://doi.org/10.1093/schizbullopen/sgab056.
Penttilä, M., Jääskeläinen, E., Hirvonen, N., Isohanni, M., Miettunen, J., 2014. Duration of untreated psychosis as predictor of long-term outcome in schizophrenia: systematic review and meta-analysis. Br. J. Psychiatry 205 (2), 88–94. https://doi.org/10.1192/bjp.bp.113.127753.
Reynolds, S., Brown, E., Kim, D.J., Geros, H., Sizer, H., Eaton, S., O'Donoghue, B., 2019. The association between community and service level factors and rates of disengagement in individuals with first episode psychosis. Schizophr. Res. 210, 122–127. https://doi.org/10.1016/j.schres.2019.05.037.
Rickwood, D., Paraskakis, M., Quin, D., Hobbs, N., Ryall, V., Trethowan, J., McGorry, P., 2019. Australia's innovation in youth mental health care: the headspace centre model. Early Interv. Psychiatry 13 (1), 159–166.
Seidler, Z., Rice, S., Dhillon, Haryana M., Cotton, Sue M., Telford, Nic R., McEachran, Juliet, Rickwood, Debra J., 2020. Patterns of youth mental health service use and discontinuation: population data from australia's headspace model of care. Psychiatr. Serv. 71 (11), 1104–1113. https://doi.org/10.1176/appi.ps.201900491.
Sullivan, S.A., Carroll, R., Peters, T.J., Amos, T., Jones, P.B., Marshall, M., Tilling, K., 2019. Duration of untreated psychosis and clinical outcomes of first episode psychosis: an observational and an instrumental variables analysis. Early Interv. Psychiatry 13 (4), 841–847. https://doi.org/10.1111/eip.12676.
Tiffin, P.A., Glover, G., 2007. From commitment to reality: early intervention in psychosis services in England. Early Interv. Psychiatry 1 (1), 104–107. https://doi.org/10.1111/j.1751-7893.2007.00004.x.
Vinson, T., Services, J.S., Australia, C.S.S., Rawsthorne, M., Cooper, B., 2007. *Dropping Off the Edge: The Distribution of Disadvantage in Australia* (0957780354). Retrieved from Richmond: https://www.dote.org.au/home.
Vos, T., Lim, S.S., Abbafati, C., Abbas, K.M., Abbasi, M., Abbasifard, M., Murray, C.J.L., 2020. Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. Lancet North Am. Ed. 396 (10258), 1204–1222. https://doi.org/10.1016/S0140-6736(20)30925-9.
Yung, A.R., Yuen, H.P., McGorry, P.D., Phillips, L.J., Kelly, D., Dell'Olio, M., Buckby, J., 2005. Mapping the onset of psychosis: the comprehensive assessment of at-risk mental states. Aust. N. Z. J. Psychiatry 39 (11–12), 964–971. https://doi.org/10.1080/j.1440-1614.2005.01714.x.