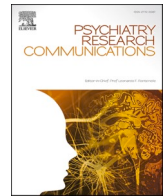




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Duration of untreated psychosis and functional trajectories: A 36-month analysis from EPIC-NOLA clinic, a community early intervention clinic

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ABSTRACT

Psychosis can be the first indication of serious mental illness such as schizophrenia or bipolar disorder. Some literature suggests that the longer the duration of untreated psychosis (DUP), the worse the prognostic outcomes of psychosis are. At this point, there is no evidence-based intervention to reduce the DUP and therefore, DUP remains a major barrier in attempts to reduce duration of untreated serious mental illnesses. This study provides a more granular look at DUP by examining the socio-demographic and clinical characteristics of 489 patients enrolled at an early psychosis intervention clinic and their association with short vs. long DUP. We also examined the association of DUP with trajectories of functioning over 36 months derived by group trajectory modeling. Findings demonstrate that DUP was significantly associated with referral source, and that longer DUP was associated with poorer functioning during treatment at the clinic. This study also presents an innovative strategy to reduce DUP through a psychosis early detection campaign in the home community of the early psychosis intervention clinic. This illustration of an early psychosis intervention clinic working in concert with a community-based psychosis early detection campaign highlights the need for a collaborative approach to streamline pathways to specialized care for young people to reduce DUP and improve functioning of these patients.

1. Introduction

In the United State, about 100,000 adolescents and young adults experience first episode psychosis (FEP), with peak onset between 15- 25 (McGrath et al., 2008). Psychosis can be the first indication of serious mental illness, such as schizophrenia or bipolar disorder. Approximately 5.5 % of US adults, approximately 14.1 million people, live with serious mental illness with prevalence peaking at 11.4 % for ages 18–35. 35 % of these patients go untreated (National Alliance on Mental Illness Boulder County, n.d.).

The last 3 decades have seen an increase in early psychosis intervention programs providing multidisciplinary and specialized care for youth and young adults following their FEP. There is growing evidence that early intervention, effective monitoring, psychosocial assessment, and sustained treatment can dramatically improve patient outcomes and

reduce costs (National Institute of Mental Health, 2019). Clinical and functional outcomes of patients receiving such care are significantly improved compared to treatment as usual, which speaks to the possibility of changing the treatment trajectory for those with serious mental illness. (Salazar de Pablo et al., 2024).

Despite these benefits, major barriers exist both in accessing services and in providing continuity of care. Barriers in accessing services can lead to prolonged periods during which individuals experiencing a first episode of psychosis do not receive the necessary care. A growing body of research has identified the negative effect of a long duration of untreated psychosis (DUP) on the course and outcome of FEP (Howes et al., 2021). Various systemic and individual level factors influence help-seeking behavior and DUP, which in turn impacts the outcomes of FEP (Whitley et al., 2021). Among these factors, stigma, misunderstanding of psychiatric illness, and fear of marginalization have received

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more attention. In a meta-analysis of randomized controlled studies of early intervention in psychosis, the average time to diagnosis of psychosis was 72 weeks with a median ranging from 8 to 74 weeks (Correll, 2018). This meta-analysis also found early intervention had positive impact on all outcomes, including reduced severity of symptoms, lower rates of treatment discontinuation and psychiatric hospitalizations, and increased involvement in school or work-up for up to 24 months of treatment. However, questions remain regarding the most appropriate disposition of patients following the initial treatment.

While most past clinical and epidemiological research on early psychosis define DUP as the time from symptom onset to the first anti-psychotic use—what Srihari et al. (2022) describe as DUP-Demand—a new framework in the context of Coordinated Specialty Care (CSC) defines DUP as the time from onset of psychosis to admission to such clinics (termed DUP-Total by Srihari et al., 2022). This new framework recognizes the centrality of CSC in providing effective care for patients experiencing early psychosis and takes into account systemic issues such as diagnostic uncertainty, fragmented services, and poor referral pathways. In this report, we use DUP-Total which is the time from symptom onset to the initiation of appropriate first episode care, i.e., entry into FEP care with the Early Psychosis Intervention Clinic New Orleans.

Upon admission to a specialty care clinic, treatment can vary in length and depth. The Majority of FEP programs in the United States last 2–3 years. Findings from the OPUS study (Secher et al., 2015) suggest that discharging patients to usual care following the 2–3 years of early intervention may undermine previous gains, with patients experiencing clinical decline within 5 years of discharge. In our early intervention program in New Orleans, we have embarked on a new model of care in which patients continue to receive care beyond the customary 2–3 years. As such, the program not only addresses the access barriers to care but also provides a sustainable framework for longitudinal care for enrolled patients with serious mental illness.

This study describes the socio-demographic and clinical characteristics of patients recruited to the program to date overall and according to DUP. We also examine the association of DUP with trajectories of social functioning over the course of 36 months. We further discuss innovative strategies aimed at not only shortening DUP in this setting, but reducing stigma, and reducing barriers in one's help seeking pathway for appropriate care. The article concludes with highlighting the need for flexible systems of care to more effectively address and influence DUP particularly in underserved areas.

2. Methods

2.1. Sample

The study sample was comprised of 489 patients seen at the Early Psychosis Intervention Clinic New Orleans, Louisiana (EPIC-NOLA) with information sufficient to estimate the DUP. Informed consent to participate in research was obtained from all participants, and from parents or guardians in the case of minors. Assessments were conducted every 6 months by members of the research team.

2.2. Measures

The clinical team estimated the DUP total based on all available information in the patient's record on month/year of onset of frank psychosis. Data from SIPS and POPS were used when available. DUP Total was rated in months based on all available information at the time of admission and covered time from onset of psychosis to uptake at EPIC-NOLA.

Functioning was assessed every 6 months based on the patient's involvement in school and paid work during the majority of the past 6-month period. For this analysis, we dichotomized this rating into any school and/or work involvement vs. none.

Socio-demographic and clinical information included age at

admission, self-reported gender (male, female, other), race/ethnicity (categorized into non-Hispanic black, non-Hispanic white, Hispanic, other). Referral source (inpatient mental health, outpatient mental health, emergency department, primary care, self/family/friends, school, justice system, other), diagnosis at intake (schizophrenia spectrum, bipolar disorder, major depressive disorder, other), prior hospitalization, and medical insurance (Medicaid, commercial, non/OBH) were also recorded.

2.3. Analyses

Analyses were conducted in 3 stages. First, associations of socio-demographic and clinical characteristics with DUP were assessed. Because the distribution of DUP seriously deviated from normal distribution (see Fig. 1 and Appendix A), it was split based on the median value (10 months). Characteristics of patients with long (>median) DUP vs. short (≤median) DUP were compared. Next, associations of long vs. short DUP with trajectories of functioning over the first 36 months of the patients' involvement with EPIC-NOLA were examined. For these analyses, group-based trajectory modeling was used (see Table 2) (Nagin, 2005).

Group-based trajectory modeling involved several steps. First, the number of trajectory groups was identified based on fit indices, indicators of classification adequacy as well as “parsimony and comprehensibility” of the model (Nagin, 2005). Fit indices included the Bayesian Information Criterion (BIC) and Akaike Information Criterion (AIC). The Guidelines for Reporting on Latent Trajectory Studies recommend using BIC for selecting the number of groups (Van De Schoot et al., 2017). Larger (less negative) BIC and AIC values in group-based trajectory modeling indicate better fit of the data to the model. Two BIC estimates were computed, one for the individual participants (person-level BIC) and another for the assessment points (assessment-level BIC, see Table 2). (Nagin, 2005).

Additionally, to assess the adequacy of classification of individuals into trajectory groups, we computed the following indices: (1) average posterior probability (AvePP) of assignment to each group, (2) odds of correct classification (OCC) based on AvePP, and, (3) relative entropy which is a measure of the degree of classification accuracy of placing participants into a trajectory based on their posterior probability. An AvePP closer to 1, an OCC >5.0 for all groups, and relative entropy >0.80 are indicative of high assignment accuracy. These measures are described in more detail elsewhere (Nagin, 2005; Mesidor et al., 2022).

After identifying the optimal number of trajectories, DUP was entered into the final model to examine its association with trajectories. Group-based trajectory analyses were conducted using the *traj* plug-in of Stata 19 software (StataCorp LLC, College Station, TX) (Jones and Nagin, 2013). Statistical significance was determined based on $p < 0.05$.

3. Results

3.1. Correlates of DUP

The socio-demographic and clinical characteristics of patients are described in Table 1. A majority (66.7 %) were male, non-Hispanic black (57.2 %), with an average age of 21.0 years (standard deviation = 5.1). Also, most (55.7 %) of the patients were referred to the program from inpatient settings, had a history of prior hospitalizations (86.7 %), and were on Medicaid (65.2 %). More than a third (38.0 %) had a diagnosis of schizophrenia spectrum disorders on admission.

Patients with long vs. short DUP did not differ with regard to gender, race/ethnicity, age, history of prior hospitalization or health insurance (Table 1). However, there were fewer patients with “other” diagnoses (which included brief psychotic disorder and schizophreniform disorder) among the long DUP group than the short DUP group (37.9 % vs. 47.9 %, OR = 0.62, 95 % CI = 0.42–0.93). There were also significant differences between the long vs. short DUP with regard to the source of

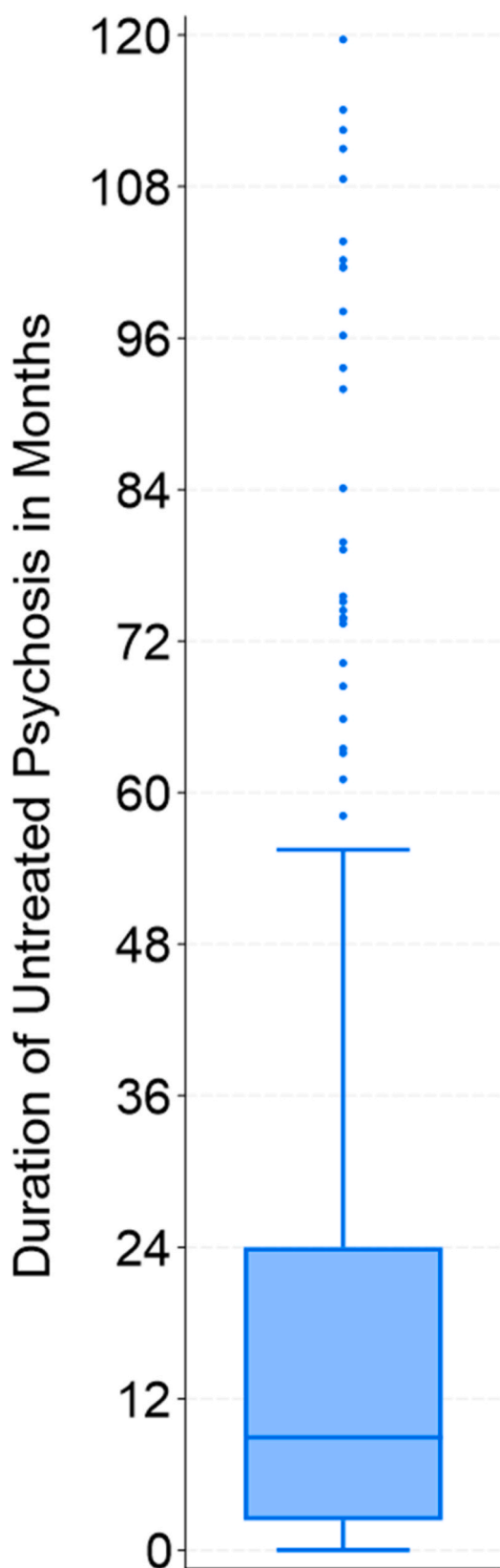


Fig. 1. Distribution of Duration of Untreated Psychosis in months among patients at EPIC-NOLA. The horizontal line inside the box shows the median DUP ~10 months. Individual points beyond the whiskers represent outliers with extended DUP durations.

referral. Compared to patients with short DUP, those with long DUP were more likely to be referred from outpatient settings (22.2 % vs. 13.9 %, OR = 2.36, 95 % CI = 1.44–3.86), from primary care settings (4.1 % vs. 1.2 %, OR = 4.95, 95 % CI = 1.33–18.41), self-referred or referred by family/friends (20.6 % vs. 12.7 %, OR = 2.40, 95 % CI = 1.44–3.99), and from Justice system (3.7 % vs. 1.6 %, OR = 3.34, 95 % CI = 1.00–11.13).

In trajectory modeling, a 2-group model was associated with the best fit indices and satisfactory AvePP and OCC values, although low entropy. The model produced 2 clearly demarcated trajectories (Fig. 2). In comparison, the model with 3 groups had worse fit indices and the model with 4 groups did not converge. Therefore, we opted for the 2-group model which included a group comprised of 54 % with consistently high level of functioning (80 % of times or more employed or in school) and a second group comprised of 45.3 % of patients who had poor functioning throughout the 36 months (Fig. 1).

The DUP variable was significantly associated with groups (regression coefficient = -0.478 , standard error = 0.219 , $p = 0.030$) — 54.9 % of patients categorized in the poor functioning group vs. 46.7 % of those categorized in the high functioning group had long DUP.

4. Discussion

This study highlights three key findings from a relatively large sample of patients recruited from an early psychosis clinic. First, this patient sample had a median DUP of approximately 10 months (~40 weeks). While this number falls within the range of median DUP values from 5 studies in the United States (8–74 weeks) (Correll et al., 2018), it is generally longer than the 14 weeks (Interquartile range = 8.8–28.0) pooled median DUP from 206 international studies (Salazar de Pablo et al., 2024). However, the DUP measure in this study incorporated time from onset of psychosis to enrollment in the early psychosis clinic and may not be comparable to DUP estimates in the aforementioned studies. By focusing on time to entry into effective care, our measure of DUP (DUP-Total) presents a different aspect of delay in care than most past research (Howes et al., 2021).

Patients who have a DUP of 10 months or longer have worse functional outcomes, consistent with findings from other early psychosis studies. (Yu et al., 2023, Hadi et al., 2021). These findings highlight the urgent need for earlier identification and intervention as well as a better understanding of factors that contribute to the DUP of 10 months and longer.

Second, DUP was significantly associated with referral source. Importantly, patients who were self-referred or referred by family and friends tended to have longer DUPs. This is consistent with existing literature that stigma, lack of awareness and knowledge about psychosis and available services may delay help seeking. Additionally, family members may hesitate to initiate psychiatric care due to cultural stigma or fear of labeling their loved ones with a mental illness while patients themselves may lack insight or fear marginalization.

A systematic review of 39 studies published between 2010 and 2024 exploring the impact of stigma on psychiatric illness outcomes (Chukwuma et al., 2024) found that stigma is significantly associated with delayed treatment initiation and poor adherence to treatment, both of which are known contributors to longer DUP. Stigma was also correlated with longer illness duration (mean effect size = 0.42 , $p < 0.05$), a reduction in clinic visit frequency (mean decrease = 2.3 visits per year), and increased likelihood of having a psychotic disorder diagnosis (OR = 1.78, 95 % CI: 1.20–2.65) (Chukwuma et al., 2024).

In a multisite U.S. study of 399 participants with FEP, perceived stigma was found to be significantly associated with DUP (Mueser et al., 2020). Higher levels of perceived stigma were also linked to severe depression, lower well-being, and reduced subjective recovery. These negative results were more pronounced among participants with longer DUP. The authors conclude that stigma not only contributes to treatment delay in FEP but also deteriorates psychosocial functioning during the

Table 1

Socio-demographic and clinical characteristics of 489 patients admitted to the New Orleans early psychosis clinic with information on duration of untreated psychosis (DUP). Long vs. short DUP was defined by median (10 months) split.

Characteristics	Total		Long DUP		Short DUP		Comparison of Long vs. Short DUP groups		
	N	%	N	%	N	%	OR	95 % CI	p
Gender									
Male	326	66.7	160	65.3	166	68.0	1.00	Ref.	–
Female	148	30.3	75	30.6	73	29.9	1.07	0.72–1.57	0.747
Other	15	3.1	10	4.1	5	2.1	2.07	0.69–6.20	0.191
Race/ethnicity									
Non-Hispanic black	271	57.2	137	57.3	134	57.0	1.00	Ref.	–
Non-Hispanic white	149	31.4	74	31.0	75	31.9	0.97	0.65–1.44	0.862
Hispanic	26	5.5	15	6.3	11	4.7	1.33	0.59–3.01	0.488
Other	28	5.9	13	5.4	15	6.4	0.85	0.39–1.85	0.678
Referral source									
Inpatient mental health	271	55.7	109	44.9	162	66.4	1.00	Ref.	–
Outpatient mental health	88	18.1	54	22.2	34	13.9	2.36	1.44–3.86	0.001
Emergency department	2	0.41	1	0.4	1	0.4	1.49	0.09–24.01	0.780
Primary care	13	2.7	10	4.1	3	1.2	4.95	1.33–18.41	0.017
Self/Family/friends	81	16.6	50	20.6	31	12.7	2.40	1.44–3.99	0.001
School	13	2.7	7	2.9	6	2.5	1.73	0.57–5.30	0.334
Justice system	13	2.7	9	3.7	4	1.6	3.34	1.00–11.13	0.049
Other	6	1.2	3	1.2	3	1.2	1.49	0.29–7.50	0.631
Diagnosis at intake									
Schizophrenia spectrum ^a	183	38.0	102	42.5	81	33.5	1.00	Ref.	–
Bipolar disorder	70	14.5	36	15.0	34	14.1	0.84	0.48–1.46	0.538
Major depressive disorder	22	4.6	11	4.6	11	4.6	0.79	0.33–1.92	0.610
Other ^b	207	43.0	91	37.9	116	47.9	0.62	0.42–0.93	0.021
Prior hospitalization									
Any	410	86.7	197	85.3	213	88.0	1.00	Ref.	–
None	63	13.3	34	14.7	29	12.0	1.27	0.74–2.16	0.382
Health insurance									
Medicaid	316	65.2	163	76.4	153	63.0	1.00	Ref.	–
Commercial	129	26.6	64	26.5	65	26.8	0.92	0.61–1.39	0.706
None/OBH	40	8.3	15	6.2	25	10.3	0.56	0.29–1.11	0.097
	Mean	SD	Mean	SD	Mean	SD	B	SE	p
Age, years	21.0	5.1	21.4	5.6	20.7	4.7	0.67	0.47	0.151

Abbreviations: OR stands for odds ratio, CI for confidence interval, SD for standard deviation, B for linear regression coefficient and SE for standard error.

Note: information was missing for 15 (3.1 %) on race/ethnicity, 16 (3.3 %) on prior hospitalization, 7 (1.4 %) on diagnosis, 4 (0.8 %) on health insurance, 2 (0.4 %) on referral source, and 1 (0.2 %) on age.

^a Includes schizophrenia, schizoaffective disorder and schizophreniform disorder.

^b Includes brief psychotic disorder, other psychotic disorder, unspecified psychotic disorder, substance-induced psychotic disorder, clinical high risk for psychosis, and other conditions.

Table 2

Fit indices and measures of adequacy of classification of patients into trajectory groups in group-based trajectory analysis for models with 1–3 groups.

Number of groups	Group sizes	BIC ^a (N = 479)	BIC (N = 1647)	AIC	Entropy	AvePP	OCC
1	G: 100.0 %	–1077.59	–1079.44	–1071.33	–	–	–
2	G1: 45.3 % G2: 54.7 %	–892.38	–896.70	–877.78	0.627	G1: 0.911 G2: 0.874	G1: 12.3 G2: 5.8
3	G1: 36.7 % G2: 44.0 % G3: 19.3 %	–901.81	–908.61	–878.87	0.544	G1: 0.755 G2: 0.807 G3: 0.726	G1: 5.3 G2: 5.3 G3: 11.0

a. Person-level BIC.

a. Assessment-level BIC.

untreated period (Mueser et al., 2020).

Effective interventions that aim to reduce stigma through correcting misinformation, normalizing help-seeking behaviors and improving psychiatric care outcomes are important elements of care in treatment of early psychosis (Chukwuma et al., 2024). Efforts to reduce DUP should go beyond addressing individual level stigma and also address system-level detection. School counselors and primary care providers (PCPs) can play a key role in early detection. Raising awareness and providing training for school-based counselors and PCPs in recognizing signs of psychosis may help reduce DUP. A 2017 Korean study that surveyed 132 school counselors using a vignette of a student at ultra-high risk (UHR) for psychosis found that only 12.4 % of the counselors identified the risk state while most misdiagnosed it as full

psychosis or other conditions (Lee et al., 2017).

Third, longer DUP was associated with poorer functioning during treatment at EPIC-NOLA. This finding is consistent with prior research suggesting a link between prolonged DUP and outcomes of psychotic disorders (Howes et al., 2021) and extends these findings to DUP-Total. Recent research indicates that shorter DUP is linked to more rapid functional recovery within the first year after admission to a specialized program (Hazan et al., 2025). Although, we were not able to identify a trajectory group with significant change in functioning in this sample.

Observed associations between DUP and functional outcomes support the idea that early intervention is critical in improving long-term outcomes for those experiencing psychosis. Additionally, O’Keefe et al., 2022 study demonstrates that the beneficial effects of shorter DUP

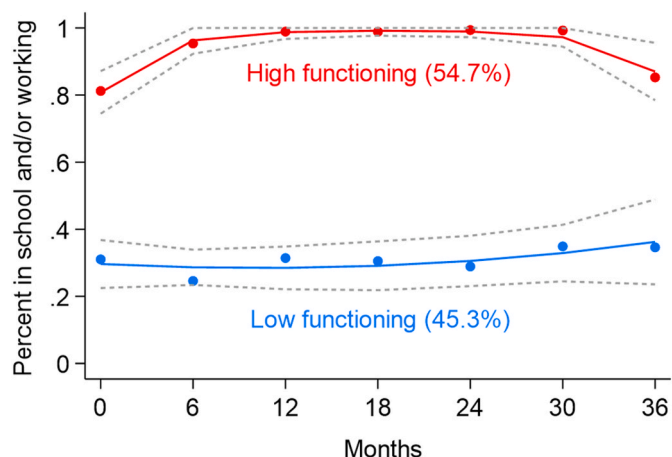


Fig. 2. Trajectories of functioning across 36 months among patients in the New Orleans early psychosis clinic. Categorization of functioning was dependent on enrollment in school or employment.

may endure up to 20 years after the initial psychotic episode, implying that efforts to reduce DUP may have clinical benefits that could last into mid-life.

Functional trajectories in this study showed a nearly-even split between high and poor functioning groups. High Functioning Group, comprised of 54 % of the participants, was defined as being employed/in school ≥ 80 % of the time over 36 months. In contrast, 45.3 % of participants fell into a persistently poor functioning group over time.

While DUP was significantly associated with the functioning trajectories, the effect size for this association was modest. Many patients with shorter DUP functioned poorly over time, whereas others with longer DUP were able to attend school and work. This finding carries two key implications. First, DUP alone does not fully account for long-term functioning. Other factors such as ongoing services and social support systems may be essential factors in determining the functional outcomes of these patients. This highlights the importance of delivering holistic and individualized care to each patient.

The second implication is that continuity of care beyond the typical first 2-year framework of early psychosis programs is likely needed for both groups of patients with high and low functioning, although the focus of services may be different. The disruption in services after discharge from CSC to usual care may explain the loss of early gains that patients experience in FEP programs (Secher et al., 2015). Services that bolster independent functioning may be more beneficial for patients who are able to maintain a high level of functioning. In contrast, more supportive services that improve resilience, prevent hospitalization and ensure housing stability may be more appropriate for the lower functioning patients. In both cases, extending services beyond the standard 2–3 years could offer substantial clinical and societal benefits.

The EPIC-NOLA clinic has demonstrated promising outcomes in engaging poor functioning patients beyond 2–3 years, with persistent engagement in medication management and various modalities of therapy, adapted to individual needs during their course of illness. These results demonstrate the potential of continuity of care to keep patients stable at a low level of functioning and potentially protecting them from further decline and preventing acute states where emergent care is needed.

The association of long DUP with poor long-term functioning highlights the need for not only early intervention but earlier detection for psychosis. We have recently embarked on such a campaign: the Clear Answers to Louisiana Mental Health (CALM), which is focused on early detection of psychosis and runs in parallel to the EPIC-NOLA. CALM's mission is to address the systemic and individual barriers that prohibit individuals from seeking help when psychosis symptoms begin and to establish a clear pathway to care. CALM approaches this mission

through community education on psychosis and risk factors for psychosis, addressing stigma and the misrepresentation of individuals with serious mental illness, and targeted engagement of key stakeholders that can be a part of clearing the way for youth and young adults to seek and receive care for FEP. As reported elsewhere (Weiss et al., 2025), CALM produced promising results for reducing DUP in a cohort of patient referrals to EPIC during the CALM campaign.

5. Conclusion

Psychosis early detection campaigns such as CALM, TIPS, and MindMap demonstrate the importance of addressing barriers to help-seeking for psychosis to ultimately reduce the DUP (Srihari et al., 2022; Hegelstad et al., 2012). These efforts are crucial to improve short- and long-term outcomes for those with serious mental illness. In addition to clinical benefits, these programs also offer economic benefits by decreasing the need for emergency visits and hospitalizations, thereby effectively reducing healthcare costs and indirect costs to communities. However, expanding these efforts beyond controlled settings and into the larger diverse communities is challenging (Sanders and Hirschtritt, 2025). These challenges could be mitigated by inclusion of community-centered early detection strategies in the implementation of first episode psychosis clinics. Efforts through future research and action must address both population-level barriers to care as well as the unique community-specific needs of patients that affect help-seeking behavior. Importantly, stakeholders must recognize that the early detection efforts are critical to reducing DUP, to ultimately improve clinical and functional outcomes of patients.

In summary, our findings support a growing consensus that while early intervention is critical, early detection of psychosis and continuity of care beyond the initial 2–3 years are equally important in shaping long-term outcomes for individuals with psychosis. While we await administrative comprehensive data integration, the immediate question remains, what should we do now? We need programs that integrate early detection, intervention, and continued support to improve recovery, reduce societal burden, and create a more equitable system of mental healthcare.

CRedit authorship contribution statement

Serena Chaudhry: Writing – review & editing, Writing – original draft, Supervision, Project administration, Methodology, Investigation, Funding acquisition, Conceptualization. **Ashley Weiss:** Writing – review & editing, Writing – original draft, Supervision, Project administration, Methodology, Investigation, Funding acquisition, Data curation, Conceptualization. **Ramin Mojtabei:** Writing – review & editing, Writing – original draft, Supervision, Project administration, Methodology, Investigation, Formal analysis, Data curation. **Ian Farrow:** Writing – review & editing, Writing – original draft, Data curation. **Reeya Shrestha:** Writing – review & editing, Writing – original draft, Data curation. **Sydney Long:** Writing – review & editing, Writing – original draft, Conceptualization.

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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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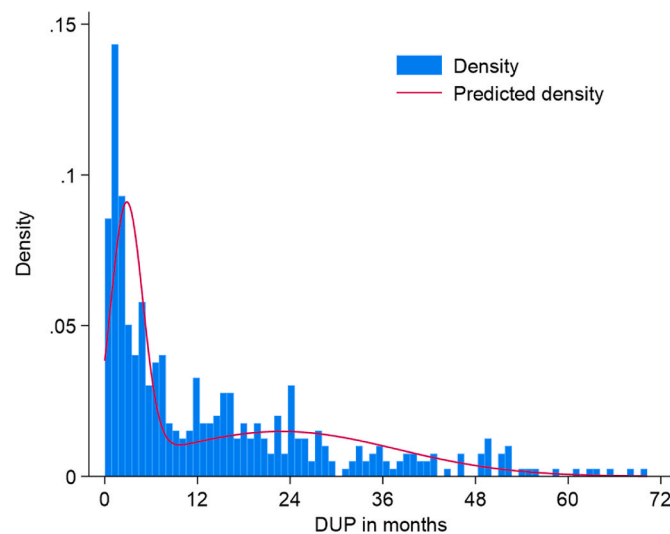
EPIC-NOLA and the learners in the EPIC-LAB. Collectively we are working to better understand and reduce DUP.

Glossary

Please provide definitions of field-specific terms used in your article, in a separate list.

- Duration of Untreated Psychosis (DUP): The time interval between the onset of psychotic symptoms and the initiation of treatment, typically with a first episode psychosis (FEP) program.
- DUP Demand: Time from the onset of psychotic symptoms to first clinical contact.
- DUP-Supply: Time from first clinical contact to enrollment in Coordinated Specialty Care (CSC).
- DUP Total: Time from symptom onset to the initiation of appropriate first episode care.
- First Episode Psychosis (FEP): Initial occurrence of psychotic symptoms in an individual, typically during adolescence or early adulthood.
- Group-Based Trajectory Modeling: A statistical method used to identify subgroups of individuals who follow similar trajectories in an outcome over time.

Appendix A. Distribution of DUP (truncated at 72 months) among patients in the New Orleans early psychosis clinic



Data availability

Due to the sensitive nature of severe mental illness, we assure patients that raw data for research remains confidential and will not be shared.

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