First Episode Psychosis

Predicting the Risks of Psychosis Using Administrative Data

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Report to the Health Care Authority, Division of Behavioral Health and Recovery

THE SUBSTANCE ABUSE AND MENTAL HEALTH SERVICES ADMINISTRATION of the U.S. Department of Health and Human Services requires states receiving the Mental Health Block Grant funds to set aside 10 percent to implement programs that show evidence of effectiveness for persons who have experienced a first episode of psychosis (FEP). In previous analyses, we examined the characteristics of a cohort of Medicaid-eligible individuals who were diagnosed with psychotic disorders for the first time in State Fiscal Year (SFY) 2015. In this report, we describe key risk indicators associated with FEP among youth and young adults between the ages of 12 and 25. We also present a model to identify individuals with the highest risk for experiencing FEP using administrative data.

Key Findings

1. **Prior mental health diagnoses are highly predictive of a subsequent first episode of psychosis.** Specifically, youth and young adults with histories of depression, mania, anxiety, and ADHD had heightened risks for FEP.

2. **Receiving services for acute behavioral conditions and adverse experiences are the most important risk indicators predicting FEP.** Those who received crisis mental health services in the most recent six months had odds of FEP three times more than those who did not. Those who had substance use disorder treatment needs or criminal justice involvement, received child welfare services, or visited hospital emergency departments were also at increased risk for FEP.

3. **Individuals at the highest risk for experiencing FEP often had recent health, child welfare and criminal justice system involvement.** More than half of the high-risk individuals received crisis mental health and child welfare services in the six months prior to baseline. Nine in ten visited hospital emergency departments.

SERVICE-RELATED RISK INDICATORS

AXIS = 1
Equal Odds

INCREASED RISK

Indicator	Odds Ratio
Mental Health Crisis Service — Past Six Months	3.75
Substance Use Disorder Treatment Need	1.89
Emergency Department Visit	1.87
Mental Health Outpatient Services	1.61
Child Welfare Services	1.60
Criminal Justice Involvement	1.50

ODDS RATIO

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Study Methods

Study Population

In our baseline report, we reviewed the lifetime mental health histories of a cohort of Medicaid enrollees and identified individuals who received psychotic disorder diagnoses for the first time in SFY 2015 (Hong et. al., 2017). This report focuses on a subgroup of youth and young adults between the ages of 12 and 25 with FEP in the same year. In total, we identified 899 youth and young adults who experienced their first episode of psychosis in SFY 2015. Using the same Medicaid eligibility criteria, we also identified 273,512 youth and young adults with no documented history of psychosis. The incidence rate of 0.33% found in our study population is consistent with the range of estimates reported in the literature (Simon, et.al, 2017; Goldner et. al, 2002; McGrath et.al, 2004). We developed a predictive model on the risks for FEP using data from this sample of 274,411 individuals. Demographic characteristics of the study population can be found in the Appendix.

First Episode Psychosis Defined

We define individuals with first episode psychosis as individuals who:

- Received a psychotic disorder diagnosis for the first time in SFY 2015 (July 2014 – June 2015) in the following categories:
  - Schizophrenic Disorders
  - Delusional Disorders
  - Other Nonorganic Psychoses
  - Mood Disorders with Psychotic Behavior
  - Transient Psychotic Disorder
- Did not use anti-psychotic medications between SFY 2012 and SFY 2014.

To ensure sufficient health history for analyses, we only included individuals who were:

- Enrolled in Medicaid in at least one month in 2 of the 3 years between SFY 2012 and SFY 2014; and
- Not dually enrolled in Medicare.

Data and Measures

This analysis leveraged longitudinal data from linked administrative data in the Integrated Client Data Base (Mancuso 2014). We reviewed the individuals' mental health history prior to their first episodes of psychosis, their utilization of publicly funded behavioral health and physical health services, involvement with the child welfare and criminal justice systems, housing status, and poverty indicators. Risk factors included short-term, mid-term, and long-term indicators. We reviewed most indicators within six-month and three-year windows. Where possible, we also examined lifetime histories of the study population. The technical notes of this report include a detailed discussion of candidate predictors and model specification.

Risk Factors Timeline

Lifetime
- Out-of-home placement before age 18
- Any documented history of abuse and neglect

36 months
- Medicaid eligibility categories
- Mental illness diagnoses
- Mental health service use
- Substance use disorder treatment needs
- Marijuana use disorder
- Emergency department use
- Hospitalization
- Child welfare services
- Criminal history
- Developmental disability services
- Basic Food and TANF benefits
- Homelessness and housing instability

6 months — **INDEX**
- Mental health service utilization
- Substance use disorder treatment needs
- Emergency department use
- Hospitalization
- Child welfare services
- Criminal history

# Youth and Young Adults Who Experienced First Episode Psychosis

Transitional age youth and young adults have the highest risk of developing psychosis (Brucato et al., 2017; Piccinellie & Homen, 1997). Therefore, the focus of this report was on 899 youth and young adults between the ages of 12 and 25 who received their first documented diagnosis of psychotic disorder in SFY 2015.

Among these individuals, 586, or 65 percent, were between the ages of 14 and 19.

- Slightly more than half of the group was female, and about half were non-Hispanic white. Individuals with Hispanic origin accounted for about one fourth of the group.

- About 14 percent were Black, 14 percent were American Indian or Native American, and 8 percent were Asian or Pacific Islanders.

FIGURE 1.

Demographics TOTAL = 899

GENDER — Male 47%, Female 53%

AGE DISTRIBUTION — 5%, 10%, 14%, 9%, 3%, 5% | YEARS OF AGE: 12 13 14 15 16 17 18 19 20 21 22 23 24 25

RACE ETHNICITY — White Only 48%, Any Minority 52%, Hispanic 26%, Black 14%, American Indian/Alaska Native 14%, Asian/Pacific Islander 8%

MINORITY DETAIL
Persons may be in more than one group.
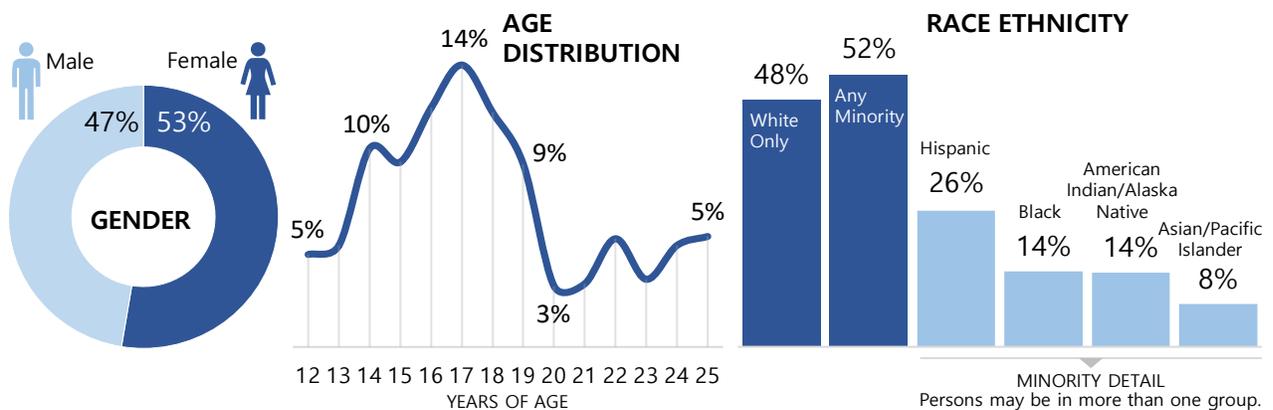
The most common first diagnoses of psychotic disorders among youth and young adults was "other nonorganic psychosis."[1] Over half of the individuals received this type of diagnosis in their first documented psychosis episode. About 31 percent of the individuals were diagnosed with mood disorders with psychotic behavior. Only one in ten individuals received diagnoses of schizophrenia as their first psychotic disorder diagnoses.

FIGURE 2.

Psychotic Disorders Diagnosed for Individuals with First Episode Psychosis
SFY 2015, Ages 12 to 25

Other Nonorganic Psychosis, n = 489	54%
Mood Disorder with Psychotic Behavior, n = 280	31%
Schizophrenia, n = 94	10%
Delusional Disorder, n = 66	7%

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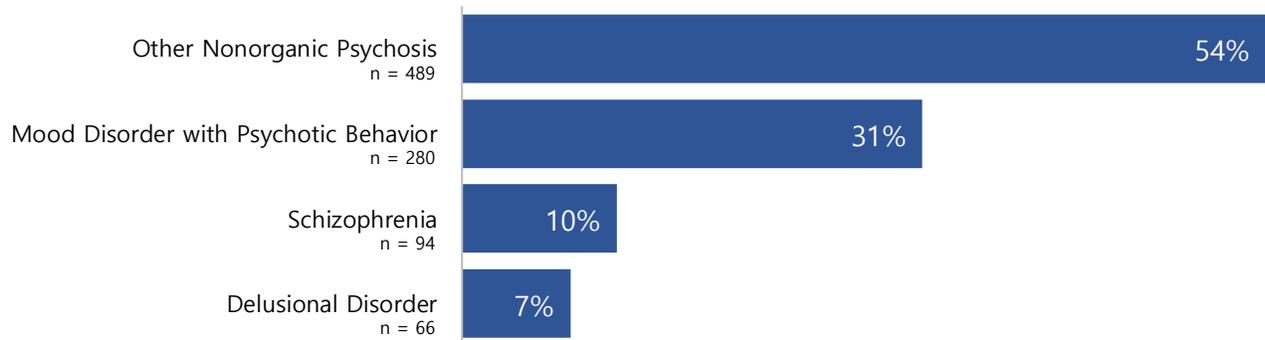
[1] ICD-9 diagnosis codes for "other nonorganic psychosis" include psychotic conditions due to or provided by emotional stress or environmental factors as major part of etiology. This category includes unspecified psychosis.

Risk Indicators of First Episode Psychosis among Youth and Young Adults

We developed a logistic regression model to identify the most important factors in predicting the receipt of psychotic disorder diagnoses by members of the study population. A set of approximately 50 indicators were included in the initial model, and measures that were statistically significant and most predictive of FEP were retained. The final model produced robust predictions with a c-statistic of 0.82. In the highest predicted risk percentile, the actual rate of FEP was 5.0 percent, compared with 0.33 percent among all in the study population, and 0.04 percent in the lowest predicted risk percentile.

Figure 3 presents the most predictive indicators for first episode psychosis (see Appendix for the complete list of risk factors). We found behavioral health factors to be strong predictors for FEP. Youth and young adults with histories of depression, anxiety, mania/bipolar disorder, or ADHD in the past three years were more likely to be diagnosed with psychotic disorders. Utilization of outpatient mental health services, especially crisis mental health services in the most recent six months was associated with substantially increased risks for FEP. Compared with other youth and young adults, those who had substance use disorder treatment needs in the most recent six months were also more likely to experience psychosis.

Even after taking into account of behavioral health history, we found that recent use of services indicating acute behavioral symptoms and adverse experiences to be predictive of FEP. Individuals who visited hospital emergency departments, received child welfare services, and those who were arrested, charged, or convicted in the most recent six months were significantly more likely to experience FEP than those who did not.

FIGURE 3.
Odds Ratios of Key Risk Indicators for First Episode Psychosis
TOTAL = 274,411

MENTAL HEALTH DIAGNOSES

AXIS = 1 Equal Odds | INCREASED RISK

Indicator		Odds Ratio
*Depression	Past Three Years	2.31
*Bipolar/Mania		1.56
Anxiety		1.52
ADHD		1.52

ODDS RATIO

RISK INDICATORS

Indicator		Odds Ratio
Mental Health Crisis Service	Past Six Months	3.75
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Child Welfare Services		1.60
Criminal Justice Involvement		1.50

ODDS RATIO

*Excludes mood disorders with psychotic behavior.

Youth and Young Adults at High Risks of Experiencing FEP

As discussed in the previous section, we examined the risk indicators leading up to the first diagnosis of psychotic disorder among youth and young adults, and estimated a logistic regression model assessing the likelihood of the presence of FEP for individuals in the span of a year. Using this model, we identified 382 youth and young adults who had a 10 percent or greater predicted chance of receiving a psychotic disorder diagnosis during the year. We describe the characteristics of these high-risk youth and young adults below in order to identify points of intervention and targeted services.

Mental Health and Substance Use Problems

We can identify high-risk youth and young adults from those who recently utilized behavioral health services. Almost all individuals with elevated risk for FEP had mental health and substance use problems in the past.

- Most high-risk individuals were diagnosed with depression (97%) or anxiety (87%) in the past three years.
- About three in four high-risk individuals received crisis outpatient mental health services in the past six months.
- Almost nine in ten received other mental health outpatient services.
- More than 70 percent of the group had substance use treatment needs in the past six months.

FIGURE 4.

High Risk Youth and Young Adults: Behavioral Health History and Service Utilization
TOTAL = 382, SFY 2015

MENTAL HEALTH DIAGNOSIS

*Depression
n = 369 — Past Three Years — 97%

Anxiety
n = 332 — 87%

*Mania and Bipolar
n = 206 — 54%

ADHD
n = 173 — 45%
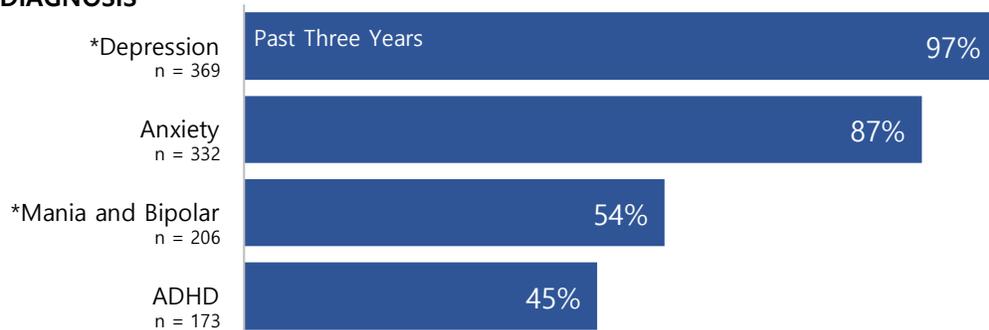
MENTAL HEALTH SERVICE HISTORY AND SUBSTANCE USE DISORDER TREATMENT NEED

Mental Health OP Crisis Service
n = 310 — Past Three Years — 81%
n = 284 — Past Six Months — 74%

Other Mental Health Outpatient Service
n = 363 — 93%
n = 330 — 86%

Substance Use Disorder Treatment Need
n = 306 — 80%
n = 274 — 72%
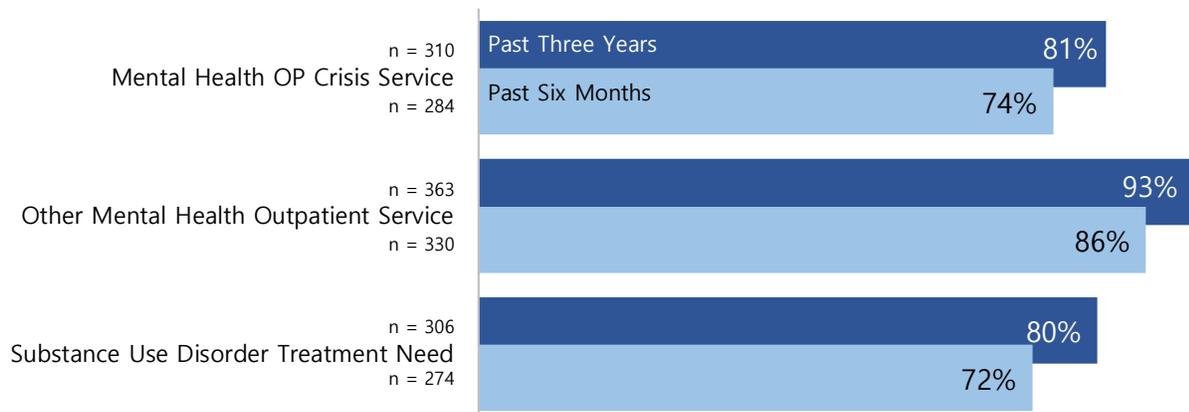
*Excludes mood disorders with psychotic behavior.

Child Welfare Involvement

Many individuals with high risk of FEP had encounters with the child welfare system.

- More than half of the group received child welfare services in the past six months.
- More than one-third had out-of-home placements before the age of 18.
- History of reported neglect and abuse was prevalent among the members of this group.

FIGURE 5.

High Risk Youth and Young Adults: Child Welfare Involvement

CHILD WELFARE INVOLVEMENT

Out-of-Home Placement Prior to Age 18
n = 137

Lifetime 36%

Any Lifetime Reported Neglect
n = 296

78%

Any Lifetime Reported Physical Abuse
n = 211

55%

Any Lifetime Reported Sexual Abuse
n = 119

31%

RECENT CHILD WELFARE INVOLVEMENT

n = 261
Any Child Welfare Service Receipt
n = 210

Past Three Years 68%
Past Six Months 55%
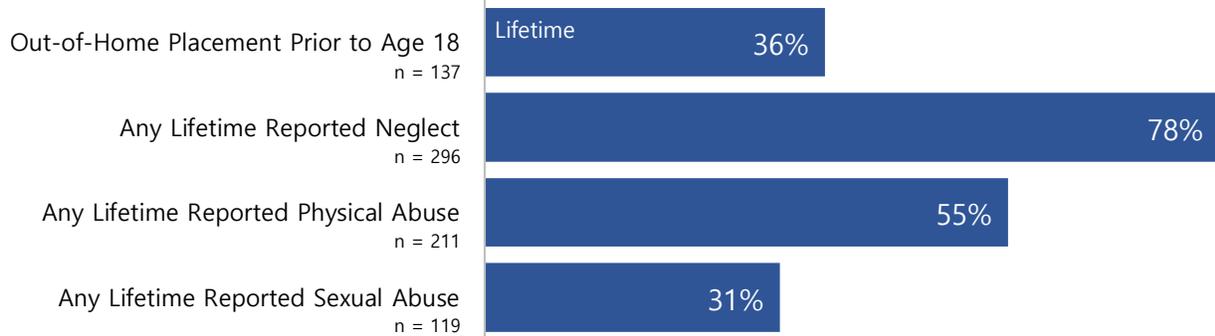
Hospital Emergency Department Visits

Utilization of hospital emergency departments is a strong predictor of FEP.

- Almost 90 percent of the individuals identified with high risk for FEP visited hospital emergency departments at least once during the last six months.
- Over half of them visited ER and received psychiatric diagnoses within the past six months.

FIGURE 6.

High Risk Youth and Young Adults: Emergency Department Visits

EMERGENCY DEPARTMENT VISITS

n = 365
Any Outpatient ED Visit
n = 340

Past Three Years 96%
Past Six Months 89%

n = 286
Psychiatric ED Visit
n = 218

75%
57%

First Episode Psychosis
Predicting the Risks of Psychosis Using Administrative Data

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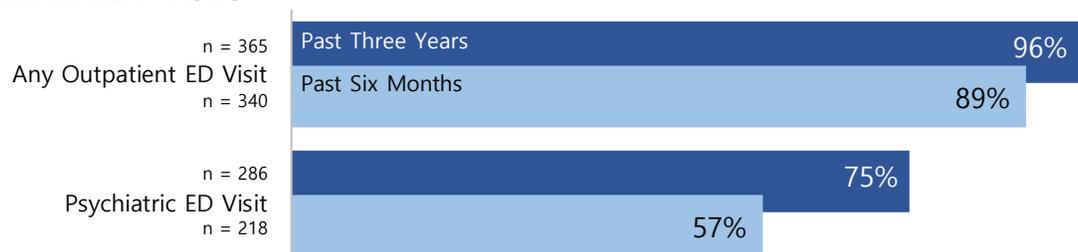
Other Indicators of Need in Poverty and Health, Including Criminal Justice Involvement

A substantial number of the high-risk youth and young adults received other state services. Eight out of ten high-risk individuals received Basic Food assistance in the past three years. Four out of ten were enrolled in disability-related Medicaid coverage. Three out of ten reported being homeless or unstably housed. Half of the individuals were involved with the criminal justice system.

FIGURE 7.

High Risk Youth and Young Adults: Other State Services and Experiences

OTHER RISK INDICATORS

Indicator	Past Three Years
Basic Food Receipt n = 326	85%
Criminal Justice Involvement n = 194	51%
Disabled Medicaid Coverage n = 167	44%
Homeless or Unstably Housed n = 106	28%
TANF Participation n = 93	24%
Developmental Disability Service Use n = 17	4%
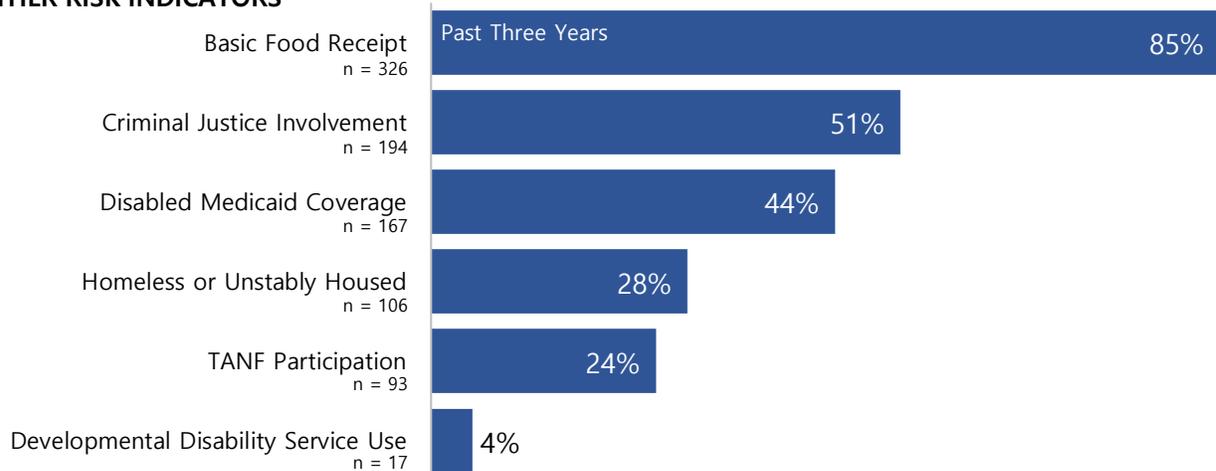
Discussion

Schizophrenia and other psychotic disorders have been categorized as some of the most devastating diseases experienced by individuals (Tandon and Keshavan, 2008). Schizophrenia is among the leading causes of disability worldwide (World Health Organization, 2018). In developed countries, the life expectancy of individuals with schizophrenia is estimated to be 20 to 25 years shorter than the general population (Wildgust et al., 2010). Longer untreated psychosis may be the trigger of lifelong disabilities and premature deaths seen in many patients (Melle et al., 2008). However, connecting individuals in need with early intervention services presents specific challenges.

While individuals experiencing early psychosis often do not know where to seek help, timely clinical information to identify high-risk individuals is usually lacking for service providers and program administrators (National Alliance of Mental Illness, 2001). Results from our analyses demonstrated that it is possible to assess the risks of FEP and identify high-risk individuals using administrative data from linked, longitudinal, cross-system databases.

In the study sample of Medicaid enrollees between the age of 12 and 25 who had no prior record of psychotic disorder, we found that 0.33 percent of individuals received a psychotic disorder diagnosis for the first time in SFY 2015. We found that mental health history and mental health service utilization are the strongest predictors of FEP. For example, individuals who received crisis mental health services had odds of FEP three times more than those who did not. Being treated in a hospital emergency department almost doubled the odds of FEP. Other significant predictors included substance use disorder treatment needs, receipt of child welfare services, and involvement with the criminal justice system.

Using our predictive model, we estimate that we would be able to identify about 350 to 400 youth and young adults per year with a 10 percent or greater chance of receiving psychosis diagnosis sometime during the year. At this risk level, based on the performance of the validation sample,

between 42 and 48 (12 percent) high-risk youth and young adults would later be diagnosed with psychotic disorders. The high-risk individuals would often have encounters with mental health and substance use disorder treatment facilities, child welfare agencies, and hospital emergency rooms within a six-month window before being first diagnosed with psychotic disorders. They are also likely to be receiving other social services such as Basic Food, and to be involved with the criminal justice system.

Program services for youth and young adults experiencing their first episode of psychosis should work across systems serving high-risk individuals. The Division of Behavioral Health and Recovery of the Health Care Authority is currently piloting the New Journeys early intervention program, which includes components of evidence-based practices such as Oregon's Early Assessment & Support Alliance and NAVIGATE. Involving child welfare, criminal justice, and other social services agencies, as well as behavioral treatment facilities and hospital emergency departments in outreach and screening may help the New Journeys program reach more potential clients.

This analysis has notable limitations. First, using predictive models to identify potential cases of psychosis is challenging because psychosis is a relatively uncommon illness. Schizophrenia, specifically, is a multidimensional disorder with massive heterogeneity in disease etiology, measures, and symptomatology (Keshavan et al., 2011). The high-risk population we describe in this report only represents a small percentage of actual FEP cases. Whether to set a different threshold to define the "high-risk population" more inclusively or selectively would be a policy decision.

Second, first episode psychosis in this study is defined as receiving a psychotic disorder diagnosis for the first time. The rate of FEP may be underestimated among groups of individuals who have limited access to mental health services and those who feel more perceived stigma of mental illnesses. For example, certain populations face cultural pressures; specifically, Asian populations and men are more likely to delay in initiating treatment and only seek help after disease progression is considerably advanced (Rotenberg et al., 2017; Coid et al., 2008). Many immigrant and minority communities may be hesitant to engage in the mental health system due to cultural beliefs, fear of bias, or anxiety over cultural insensitivity in formal services (Snowden and Yamada, 2005; Cauce et al., 2002; Ferrari et al., 2016). Individuals with psychosis who were incarcerated tend to have experienced much longer periods of undocumented and untreated psychosis than others (Wan et al., 2014). The predictive model developed in this analysis may underestimate the risks of first episode psychosis for these populations.

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APPENDIX | Supporting Tables

Sample Demographic Characteristics

	Individuals with FEP TOTAL = 899		Individuals with no FEP TOTAL = 273,512	
	NUMBER	PERCENT	NUMBER	PERCENT
Gender				
Male	426	47.4	126,098	46.1
Female	473	52.6	147,414	53.9
Age				
12-14	174	19.4	103,549	37.9
15-17	313	34.8	94,916	34.7
18-20	212	23.6	41,576	15.2
21-23	106	11.8	18,928	6.9
24-25	94	10.5	14,543	5.3
Race and ethnicity (not mutually exclusive)				
White only	428	47.6	115,606	42.2
Hispanic	235	26.1	89,814	33.3
Asian/Pacific Islander	74	8.2	26,248	9.6
Black	130	14.5	29,658	10.8
Native American/Alaskan Native	128	14.2	19,810	7.2
County of residence				
Urban, high density	591	65.7	167,079	61.1
Other	308	34.3	106,427	38.9

Odds Ratios from Stepwise Logistic Regression of First Episode Psychosis

	Odds Ratio	95% Confidence Interval	
Age (in years)	1.09*	1.05	1.13
Race and ethnicity†			
Hispanic	1.09	0.85	1.39
Asian/Pacific Islander, non-Hispanic	0.69	0.36	1.31
Black, non-Hispanic	1.00	0.64	1.58
American Indian/Alaskan Native, non-Hispanic	1.04	0.45	2.37
Other race, non-Hispanic	0.38	0.05	2.75
Two or more races, non-Hispanic	1.46*	1.13	1.88
County of residence			
Urban, high density	1.47*	1.18	1.82
Medicaid eligibility categories in the past 3 years			
Disabled children or adults	1.79*	1.34	2.38
Non-disabled adults	0.54*	0.37	0.80
Mental illness diagnoses in the past 3 years			
ADHD	1.52*	1.19	1.95
Anxiety disorders	1.52*	1.21	1.92
Depression, without psychotic behavior	2.31*	1.82	2.93
Mania/bipolar disorder, without psychotic behavior	1.56*	1.16	2.10
Services and other experiences in the past 6 months			
Mental health crisis services	3.75*	2.59	5.43
Other mental health outpatient services	1.61*	1.23	2.09
Substance use disorder treatment needs	1.89*	1.41	2.53
Hospital emergency department visit	1.87*	1.50	2.33
Child welfare services	1.61*	1.26	2.06
Involvement with criminal justice system	1.50*	1.12	2.02

† Mutually exclusive. Non-Hispanic white is the reference group.

* Statistically significant with p<0.01. Other predictors in the table are not statistically significant.

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DEFINITION OF PSYCHOTIC DISORDER

Psychotic disorders were defined in this study using ICD-9 diagnosis codes.

Type of Psychotic Disorder	ICD-9 Code
Schizophrenic Disorders	295 – 295.99
Delusional Disorders	297 – 297.99
Other Nonorganic Psychoses	298 – 298.99
Transient Psychotic Disorder with Delusions or Hallucinations in Conditions Classified Elsewhere	293.81, 293.82
Mood Disorder with Psychotic Behavior	296.04, 296.14, 296.24, 296.34, 296.44, 296.54, 296.64

CANDIDATE PREDICTORS AND MODEL SPECIFICATION

To build a predictive model of first episode psychosis, we conducted a thorough literature review of risk factors, and identified a set of more than 700 candidate predictors. Bi-variate analyses were conducted to assess the strength of correlations between the candidate predictors and the outcome. We selected predictors with statistically significant correlations with FEP, combined variables with low frequencies, and addressed potential multicolinearity among predictors by recoding and deleting some predictors. The final set of candidate predictors included approximately 50 indicators in the following categories:

- **Demographic characteristics:** Age, race, ethnicity, and urbanicity of residence county.
- **Mental health history and service utilization:** Mental health diagnoses received by the individual other than psychotic disorders or mood disorders with psychotic behavior; receipt of mental health inpatient and outpatient services, including outpatient mental health crisis services.
- **Substance use disorder and treatment needs:** Substance use treatment needs, marijuana use disorder, and tobacco use disorder.
- **Utilization of medical services:** Emergency department visits, without or without psychiatric diagnoses, any hospitalization during the baseline period.
- **Child welfare indicators:** Receipt of any child welfare services, out of home placements before 18, and any lifetime history of abuse and neglect.
- **Criminal justice involvement:** Having any charges, arrests, convictions, or receiving any services from Juvenile Rehabilitation.
- **Public assistance:** Receiving Basic Food or Temporary Assistance for Needy Families (TANF) benefits.

We estimated a logistic regression model using stepwise forward selection methods. The final model included 15 predictors with a C-statistic of 0.82. The final list of predictors is shown in the Appendix table "Odds Ratios from Stepwise Logistic Regression of First Episode Psychosis". Half of 274,411 individuals in our study sample were randomly selected to form the analysis sample. Their data were used in model estimation. Data for the remaining half of the study sample were used for model validation. The validation results demonstrated that the model was able to predict risks for FEP with comparable accuracy (C-statistic=0.80).