MARYLAND MODEL ANALYTICS

Task 7

Outcomes and Costs Associated with Evidence-based Treatment of First Episode Psychosis

Final Report

September 26, 2022

EXECUTIVE SUMMARY

Research shows that expeditious and comprehensive treatment of first episode psychosis (FEP) positively impacts a range of clinical and social outcomes including reducing psychotic symptoms, improving functioning and quality of life, increasing medication adherence, and reducing hospitalizations. This descriptive study estimated the prevalence of psychosis among Maryland commercial insurance enrollees ages 15 to 30, examined patterns of behavioral health treatment following a diagnosis of FEP, and explored how demographic characteristics and treatment patterns following an FEP diagnosis related to clinical outcomes in the year following diagnosis (excluding the initial 30-days following the diagnosis).

The prevalence of psychosis was 0.34 percent in this population. Enrollees with psychosis had high rates of comorbid mental health disorders and substance use disorder (SUD) relative to the general age cohort targeted in the study. They also were more likely to be male and reside in the more urban regions of the state. A very high percentage of enrollees with FEP received some type of treatment in the year following their diagnosis. The most common types of treatment were pharmacotherapy, office-based visits, and psychotherapy. More intensive treatments, e.g., intensive outpatient treatment and residential treatment were less common, particularly in the rural regions of the state. Despite the high rate of SUD comorbidity, specific SUD treatment was rare, although substance use issues might have been addressed in the context of the other services provided.

The patterns of care by age group appeared inconsistent with the evidence that early, aggressive treatment of a first psychotic episode may mitigate the progression to more severe psychosis and functional impairment. Younger enrollees were treated more often with psychotherapy and less often with antipsychotic medication. This might reflect a hesitancy on the part of patients and families to initiate pharmacotherapy with anti-psychotic medications at a young age, however, it is inconsistent with current clinical recommendations.

Approximately 34 percent of enrollees had an ED visit in the follow-up period. ED use was more common among the youngest age group (ages 15 to 18) and among enrollees with comorbid mental health disorder and SUD. No specific treatment type was significantly associated with ED use. However, enrollees with SUD and those with intensive outpatient treatment in the month following the FEP diagnosis were significantly more likely to have a behavioral health related hospital admission. This suggests that more complex and higher need beneficiaries drive hospital admissions and that these individuals may be prioritized for hospitalization given the limited availability of inpatient psychiatric services in Maryland, particularly for adolescents.

These findings provide an initial investigation of behavioral health service use and outcomes for Maryland commercial enrollees with FEP. Further studies might investigate the impact of more granular patterns of treatment, for example, pharmacological treatment continued over a specified length of time. It also would be informative to investigate racial and ethnic differences in care should race and ethnicity data be made available. Finally, conducting a similar study for the Maryland Medicaid population would provide an opportunity to compare the treatment patterns and outcomes for the Medicaid population to commercial enrollees.

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1. INTRODUCTION

This project investigated patterns of healthcare use and outcomes for individuals with first episode psychosis (FEP). Research shows that expeditious and comprehensive treatment of FEP significantly improves patient outcomes.[1,2] Evidence from U.S.-based trials demonstrates that multi-component treatment programs, referred to as coordinated specialty care (CSC), positively impact a range of clinical and social outcomes including reducing symptoms, improving functioning and quality of life, increasing medication adherence, and reducing hospitalizations.[3] Specific CSC components vary across programs, but typically include pharmacotherapy, care management, medication management, individual and family psychoeducation and therapy, and supported employment and education.[4,5] Maryland currently provides CSC programs in four treatment centers located in Baltimore City, Baltimore County, and Montgomery County.[6]

This project was designed to examine use of CSC for FEP in Maryland based on service utilization captured in administrative claims data. The aims were to (1) estimate the proportion of individuals with FEP who received services defined as CSC, (2) examine variation in use of CSC across geographic locations and population sub-groups, and (3) examine associations between CSC and clinical outcomes. The study addressed the following specific research questions:

1. What is the prevalence of psychosis and FEP among the study population based on administrative claims data?
2. What are the characteristics of enrollees with FEP?
3. What percentage of individuals with FEP received various types of behavioral healthcare ranging from less to more intensive services?
4. How did behavioral health service use for FEP vary by age, sex, and geographic region of the state?
5. What enrollee characteristics and patterns of behavioral health service use were associated with ED use and hospitalizations in the year following an FEP diagnosis?

2. DATA SOURCES

Acumen initially planned to analyze Medicaid, Medicare, and private insurance claims data from Maryland. However, the Medicaid data were not available for the project. Further, preliminary analysis of the Medicare data, accessed through the CMS Virtual Research Data Center, yielded a sample of individuals with FEP that was determined to be too small for meaningful analyses of service use and outcomes. Therefore, the primary focus of this report is private insurance enrollment, claims, and pharmacy data from 2016 through 2019 provided by CRISP from Maryland's all payer claims database. Appendix A summarizes the Medicare analysis showing the number and percentage of Medicare enrollees with FEP, overall and by age group, sex, and race/ethnicity. The remainder of this report summarizes the methodology and results of the private insurance data analysis.

3. METHODOLOGY

As described in the introduction, this analysis examined patterns of behavioral health service use by individuals with FEP and variation in service use and outcomes by enrollee characteristics. This section describes the key variable definitions and analytic steps conducted by the Acumen team.

Acumen first identified the eligible sample which included enrollees ages 15 to 30 on January 1, 2017 plus anyone who turned 15 in 2017 or 2018, and then identified those with a psychosis diagnosis. Consistent with the Chronic Conditions Data Warehouse (CCW) definition,[7] a psychosis diagnosis required one inpatient stay or two outpatient visits on separate days associated with a primary psychosis diagnosis code. We identified enrollees with psychosis using claims from January 1, 2017 through December 31, 2018 using the date of the first encounter to establish the beginning of an episode (the incident visit). To establish a *first episode*, i.e., FEP, we subset the sample to enrollees who did not have a claim with a primary psychosis diagnosis code in the one-year period prior to the incident visit using 2016 data. Because of the loss of sample associated the enrollment restrictions required to establish a first episode, we conducted analyses for both enrollees with FEP and those with psychosis without restricting to enrollees with claims in the prior year. Because of the age restriction (ages 15 to 30), the psychosis sample includes enrollees in the early stages of the disorder, who also may benefit from CSC. This report focuses on the sample with FEP; the accompanying workbook (Acumen_MD_Model_Analytics_T7_FEP.xlsx) includes results for both samples—those with psychosis and with FEP.

Acumen constructed additional analysis variables from the claims and enrollment data to define enrollee demographic characteristics (age category, sex, race, and ethnicity), behavioral health comorbidities, and region of the state based on enrollee's address. Appendix B lists the International Classification of Diseases (ICD-10)[8] codes used to establish a psychosis diagnosis. The accompanying workbook contains the codes used for the other behavioral health comorbidity diagnoses. Appendix C includes a crosswalk of Maryland counties by region.

Next, Acumen examined the claims data to determine how to define CSC. Acumen produced claim line counts of all procedures associated with a primary behavioral health diagnosis among enrollees with psychosis using claims from 2017 and 2018 to understand the types of treatments provided to individuals with psychosis. Acumen's clinical team reviewed the resulting procedure codes and classified them into three major categories: outpatient treatment, ED use, and hospitalization. The outpatient treatment category was further broken down into sub-categories including: office visits (OFF), psychotherapy (PSY), care coordination (CC), intensive outpatient treatment (IOP), SUD treatment (SUD), alternative treatments (ALT), medication management (MED), and residential treatment (RES). The pharmacy claims were used to identify enrollees with prescription fills for antipsychotic, antidepressant, and anxiolytic (anti-anxiety agents) medications.

As described in the introduction, CSC typically incudes pharmacotherapy, medication management, psychotherapy, and additional services such as supportive employment. Based on our review of the procedure codes reflected in the claims, Acumen was unable to explicitly code CSC. Supported employment was not coded and other key CSC components, i.e., care coordination and

medication management, were coded too infrequently in the claims to justify a specific CSC category. These services may be provided in the context of office visits or other services, but they were not represented at a sufficient level in the claims to validly classify care as CSC. As an alternative, our team created categories of outpatient service use that reflect typical patterns of care ranging in intensity. These included:

- Office-based care—office-based services in conjunction with pharmacotherapy
- Office-based care plus psychotherapy—office-based services in conjunction with pharmacotherapy and psychotherapy
- High intensity care—more intensive treatment, including care coordination, residential treatment, or intensive outpatient treatment

Appendix D lists the procedure codes used to define each treatment category and sub-category and provides the claim line counts for each procedure. The accompanying workbook provides further detail regarding the treatment categories and sub-categories.

Acumen then used the constructed variables to conduct descriptive analyses to describe patterns of service use by enrollees with FEP, and to describe clinical outcomes (ED use and inpatient hospitalization) in relation to the above-defined patterns of service use. Specifically, Acumen conducted descriptive analyses to:

1. Characterize the total eligible sample, the sample with psychosis, and the sample with FEP by demographic characteristics, behavioral health comorbidities, and Maryland region
2. Produce frequencies reporting the number and percentage of enrollees with psychosis and with FEP who received each treatment category, overall and by age group, sex, and region
3. Estimate the odds of ED use and hospitalization in the year following diagnosis by demographic characteristics, region, and behavioral health service type in unadjusted and multivariable logistic regression models.

4. ANALYTIC FINDINGS

This section summarizes the analytic findings on patterns of behavioral healthcare by commercial enrollees in Maryland ages 15 to 30 with a diagnosis of psychosis. Section 4.1 summarizes the characteristics of the eligible cohort and enrollees with psychosis. Section 4.2 describes the patterns of behavioral health service use in the year following a first episode of psychosis. Section 4.3 reports the results of an analysis of ED use and inpatient hospitalization following treatment for FEP.

4.1 Characteristics of Eligible Enrollees and Those with Psychosis

Table 1 presents a comparison of enrollees with psychosis to the total eligible population of enrollees ages 15 to 30. A total of 931,617 enrollees met the eligibility criteria for the study. Of these, 3,209 (0.34 percent) qualified for a psychosis diagnosis during the timeframe of interest. Approximately half (48.9 percent) of the eligible sample were male, however, males were over-represented among enrollees with psychosis (54.9 percent). Data on race and ethnicity was largely missing, prohibiting further analyses of race/ethnicity differences. Behavioral health comorbidities were common among

enrollees with psychosis, with 81.8 percent having a comorbid mental health disorder and 34.2 percent having a SUD, compared to 9.6 percent and 1.4 percent, respectively, in the total eligible sample. The more populated regions of the state (Capital and Central) had slightly higher representation of enrollees with psychosis compared to the more rural regions (Eastern, Southern, and Western).

Table 1. Characteristics of the Total Eligible Sample and Enrollees with a Psychosis Diagnosis

Characteristic	Total Eligible Sample*		Enrollees with Psychosis**	
	n	%	n	%
Total	931,617	100.0	3,209	100.0
Age Category				
15 to 18	171,485	18.4	524	16.3
19 to 25	419,557	45.0	1,769	55.1
26 to 30	340,575	36.6	916	28.5
Sex				
Male	455,676	48.9	1,763	54.9
Female	475,912	51.1	1,446	45.1
Ethnicity				
Hispanic	22,034	2.4	53	1.7
Non-Hispanic	88,235	9.5	423	13.2
Missing or Unknown	821,348	88.2	2,733	85.2
Race				
Asian	16,595	1.8	46	1.4
Black	66,968	7.2	357	11.1
Hawaiian	194	0.0	-	0.0
Indian	518	0.1	-	0.0
White	96,771	10.4	404	12.6
Declined	111,598	12.0	458	14.3
Other/Unknown	190,568	20.5	402	12.5
Missing	449,693	48.3	1,545	48.1
Behavioral Health Comorbidities				
Other Mental Health Disorder	89,842	9.6	2,626	81.8
Substance Use Disorder	13,406	1.4	1,099	34.2
MD Region				
Capital	404,287	43.4	1,501	46.8
Central	393,515	42.2	1,353	42.2
Eastern	47,797	5.1	104	3.2
Southern	59,949	6.4	180	5.6
Western	26,069	2.8	71	2.2

*Enrollees ages 15 to 30 on 1/1/2017 plus anyone who turned 15 in 2017 or 2018, no enrollment criteria applied.

**One inpatient or two outpatient visits with a primary psychosis diagnosis code (Appendix B) between 1/1/2017 and 12/31/2018, no enrollment criteria applied.

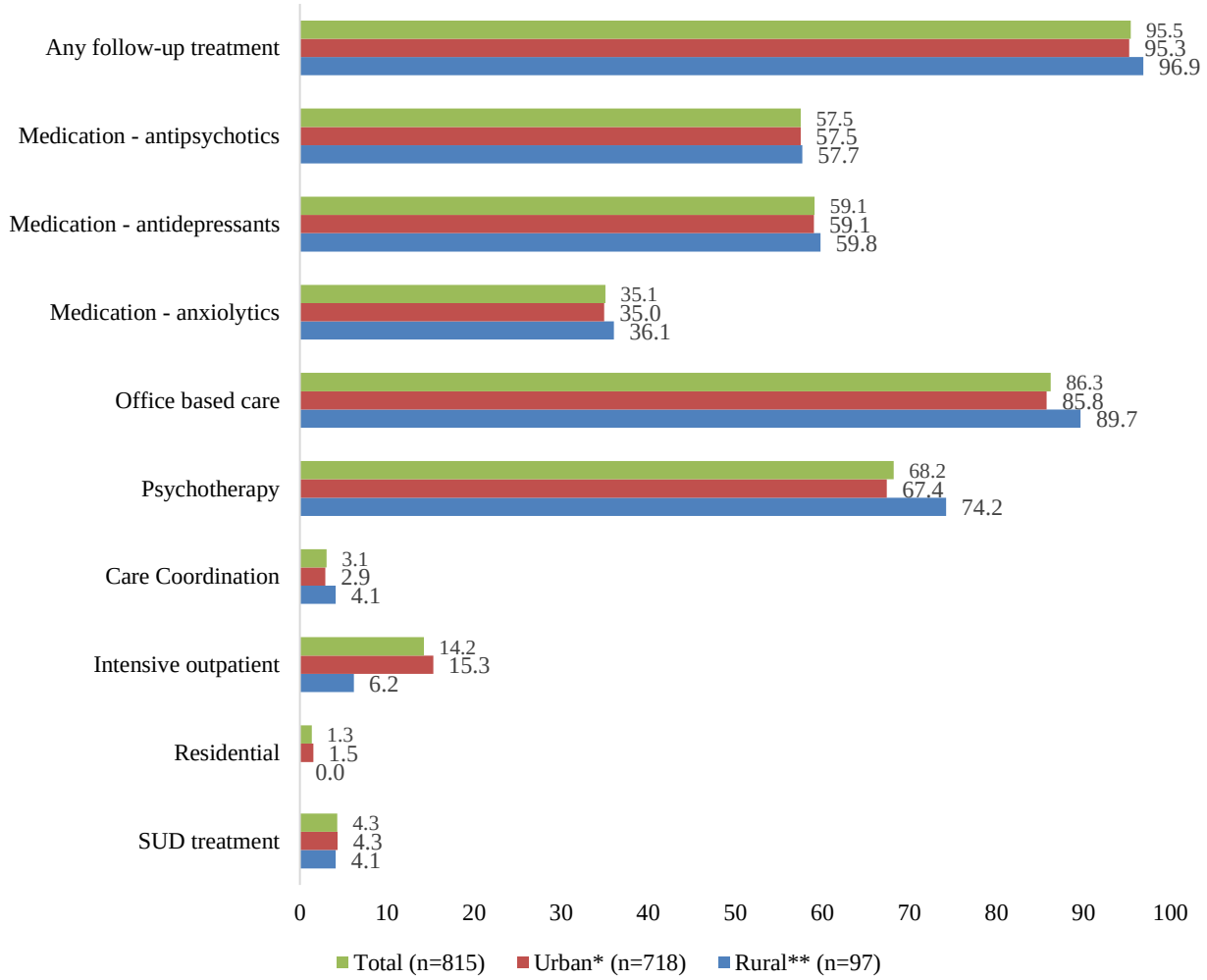
To identify enrollees with FEP, the sample was restricted to those who were continuously enrolled in the year prior to the incident encounter in order to establish a first episode. A total of 1,941 enrollees met this criterion. Of the 1,941 meeting the enrollment criterion, 1,352 (69.7 percent) had no claims with a psychosis diagnosis in the prior year, thereby establishing a first episode diagnosis. To analyze service use in the year following the FEP diagnosis, the sample was further restricted to enrollees with complete enrollment in the year following the FEP diagnosis. Restricting to enrollees with complete data and sub-setting to first episode psychosis events yielded an analysis sample of 815 enrollees. The following sections present the treatment patterns of these enrollees in the year following their FEP diagnosis and explores the associations between treatment immediately following the diagnosis and ED visits and hospitalizations thereafter.

4.2 Patterns of Behavioral Health Service Use by Enrollees with FEP

Figure 1 presents the number and percentage of enrollees with FEP who received different types of treatments in the year following their diagnosis in the overall sample with FEP and by region of the state. Because of the small number of cases, the regions were combined into rural (Eastern, Southern, and Western regions) and urban (Capital and Central). The Capital and Central regions represent areas where CSC was available during the time period of the study, whereas enrollees in the rural regions were less likely to have access to CSC, which might have impacted the types of services available.

Nearly all enrollees (greater than 95 percent) received some type of follow-up treatment across all regions. Fewer than five percent of enrollees received medication only (not shown in graph), i.e., had prescription fills without receipt of any other type of service. Psychotherapy use was considerable across the state (68.2 percent), and highest in more rural areas (74.2 percent). However, intensive outpatient treatment was less common (6.2 percent) in the rural regions compared to the Capital (13.9 percent) and Central (16.4 percent) regions. As mentioned, medication management and care coordination, two key components of CSC, were coded infrequently in the claims. Despite the high level of SUD among enrollees with psychosis (Table 1), specific SUD treatment was uncommon across the state (around 4 percent). Substance use issues might have been addressed in the course of overall mental health treatment, however, specific claims for SUD treatment were rare.

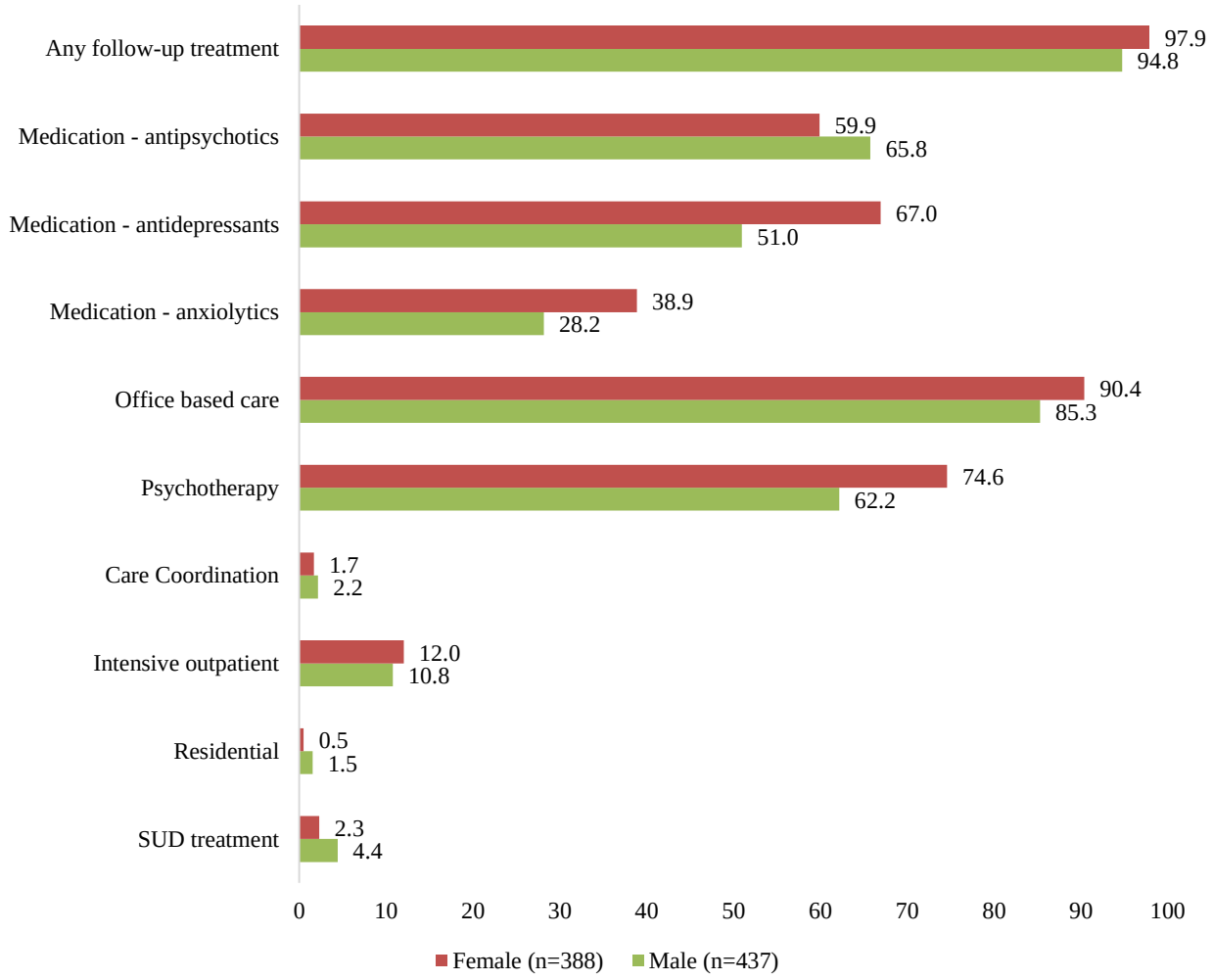
Figure 1. The Percentage of Enrollees with FEP Receiving Different Types of Services in the Year Following Their Diagnosis, Overall and by Region of the State



*Capital and Central regions – CSC was available in these regions during the timeframe of the study.
**Eastern, Southern, and Western regions – CSC was not available in these regions during the timeframe of the study.

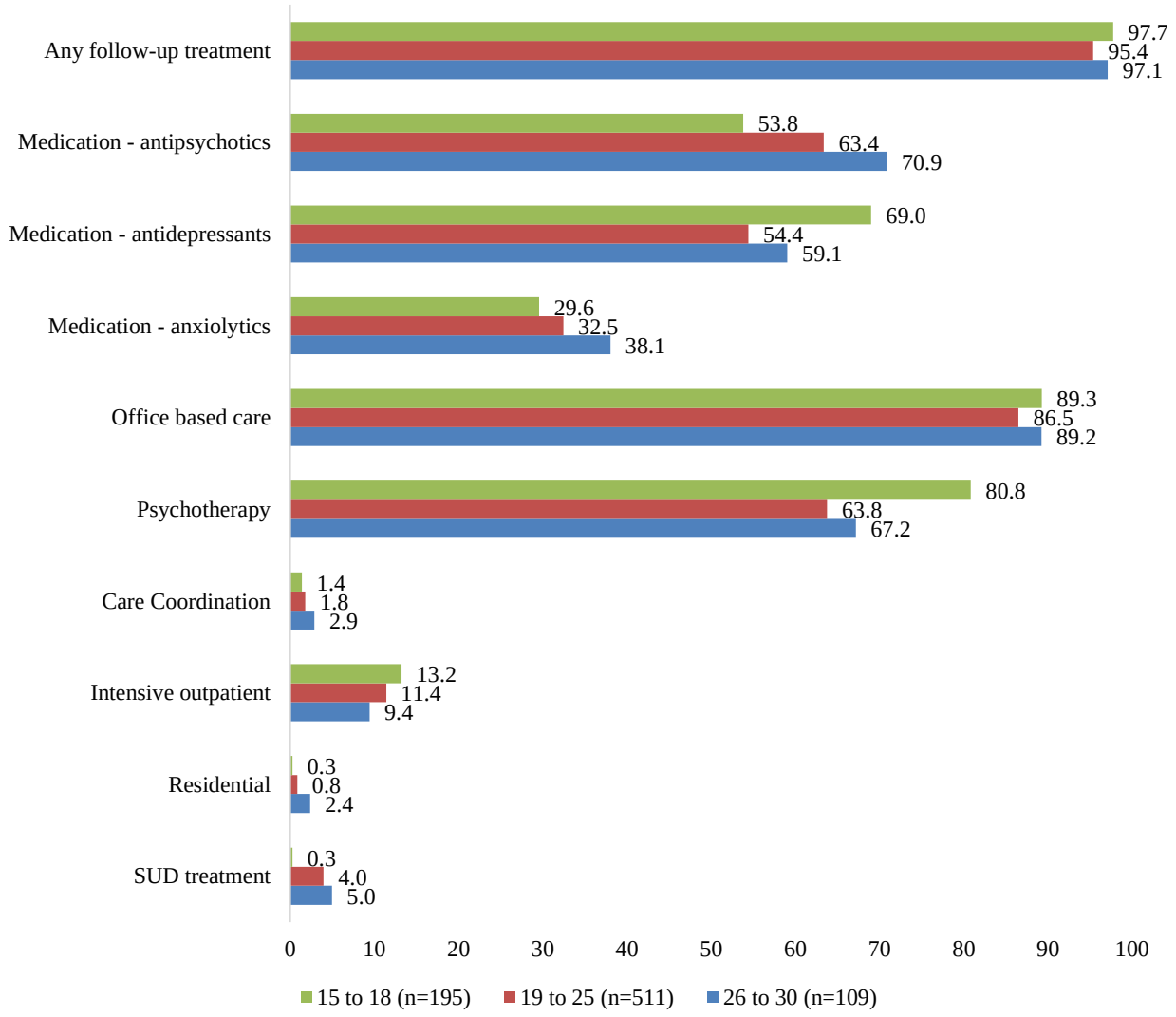
Next, we examined sex and age differences in treatment. There were sex differences in the frequency of some types of treatments (Figure 2). Females were more likely to receive most treatment types compared to males. In particular, 74.5 percent of females received psychotherapy compared to just 62.2 percent of males. As stated above, SUD treatment was uncommon, however, males were more likely to receive SUD treatment compared to females (4.4 versus 2.3 percent). The patterns of medication use also differed by sex, with females more likely to receive antidepressant (67.0 versus 51.0 percent) and anxiolytic medications (38.9 versus 28.2 percent), but less likely to receive anti-psychotic medications (59.9 percent versus 65.8 percent).

Figure 2. The Percentage of Enrollees with FEP Receiving Different Types of Treatments by Sex



Similarly, treatment types differed by age category (Figure 3). Enrollees in the lowest age group—ages 15 to 18—were least likely to receive antipsychotic medication and most likely to receive psychotherapy. Intensive outpatient treatment was more common among enrollees ages 15 to 18 (13.2 percent). Whereas, residential treatment and SUD treatment were more common for the older age groups.

Figure 3. The Percentage of Enrollees with FEP Receiving Different Types of Treatment by Age Category



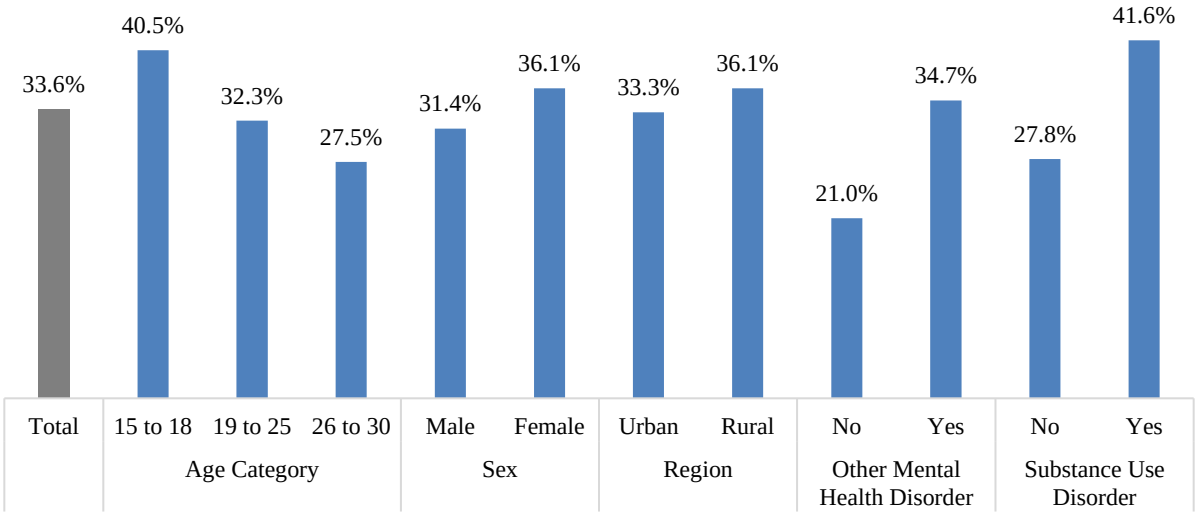
4.3 ED Use and Inpatient Hospitalization Following Treatment for FEP

The final analyses examined ED use and inpatient hospitalization for a behavioral health condition in the year following an FEP diagnosis and explored whether enrollee characteristics or treatment types in the 30-day period following the diagnosis were associated with these outcomes. The goal was to determine if particular enrollee characteristics or treatment immediately following an FEP diagnosis were associated with ED use or hospitalization in the following year. ED visits and hospitalizations in the 30-day period following the diagnosis were excluded from the analyses to capture these outcomes after the initial treatment for FEP.

Overall, 33.6 percent of enrollees with FEP had an ED visit in the follow-up period (Figure 4). ED visits were most common among enrollees ages 15 to 18 (40.5 percent) compared to enrollees ages 19 to 25 (32.3 percent) and 26 to 30 (27.5 percent). Having a comorbid mental health disorder and SUD

were strongly associated with ED visits; 34.7 percent of enrollees with other MH disorder and 41.6 percent of those with SUD had and ED visit in the follow-up period.

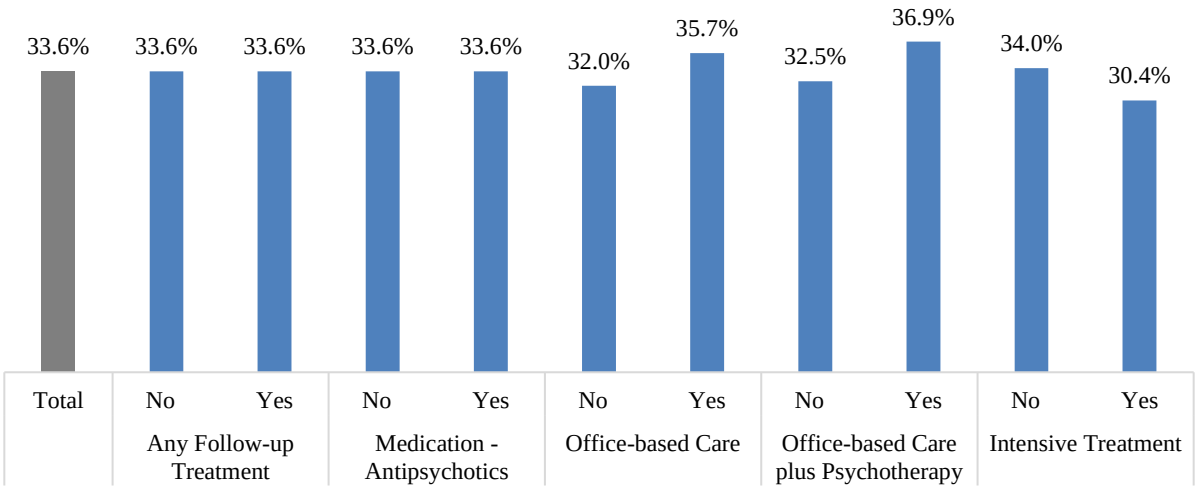
Figure 4. The Percentage of Enrollees with FEP Who Had an ED Visit in the Year* Following Their Diagnosis, Overall and by Enrollee Characteristics



*Excludes ED visits in the 30-day period following the FEP diagnosis.

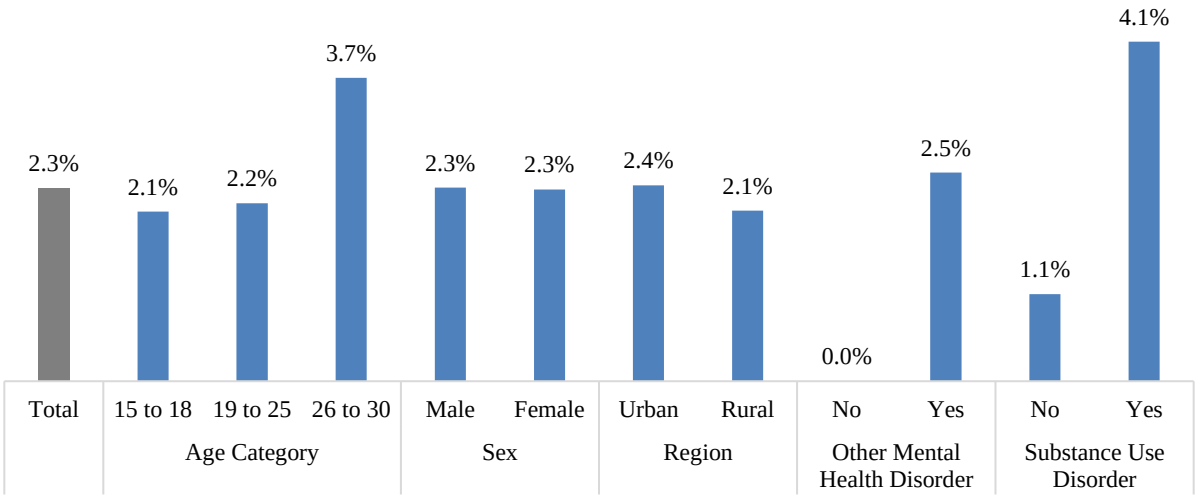
There were no differences in ED visits for enrollees with any type of follow-up treatment or antipsychotic medication fills in the 30-day period following FEP diagnosis (Figure 5). However, enrollees with office-based treatment in conjunction with psychotherapy were more likely to have an ED visit (36.9 versus 32.5 percent), whereas enrollees with intensive treatment post-diagnosis were less likely to have an ED visit (30.4 versus 34.0 percent) in the year following their diagnosis.

Figure 5. The Percentage of Enrollees with FEP Who Had an ED Visit in the Year* Following Their Diagnosis, Overall and by Type of Treatment Received in the 30-days Following Diagnosis



Just 2.3 percent of enrollees had an inpatient hospital admission (Figure 6) in the year following diagnosis. Admissions were highest among enrollees ages 26 to 30 (3.7 percent) and were slightly higher in the urban regions (2.4 percent) compared to the more rural regions of the state (2.1 percent). Notably, all of the inpatient admissions were among enrollees with comorbid MH disorder, i.e., no enrollees with only an FEP diagnosis had an admission. Like ED visits, enrollees with SUD had higher rates of inpatient admission (4.1 percent) compared to those with no SUD (1.1 percent).

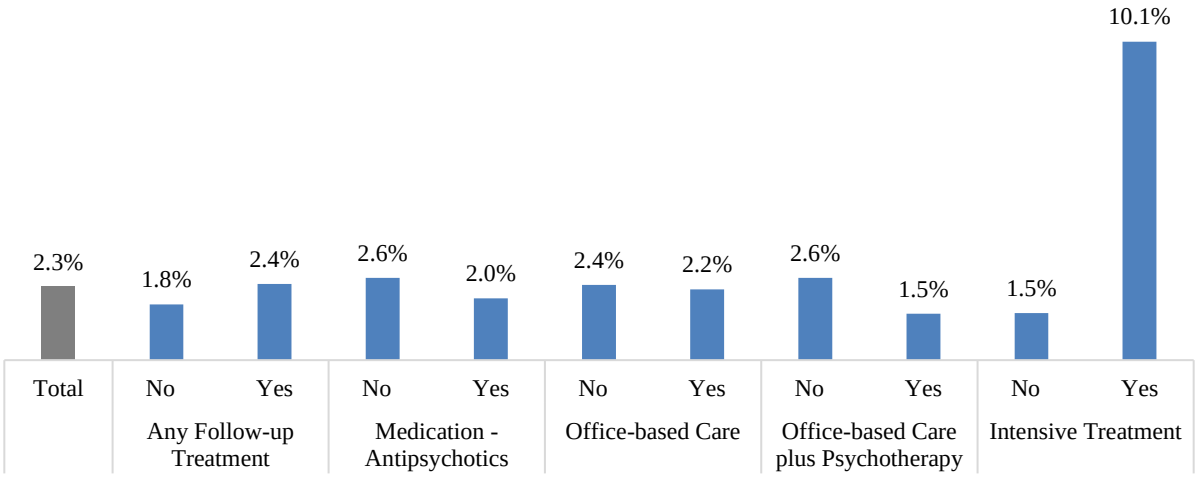
Figure 6. The Percentage of Enrollees with FEP Who Had an Inpatient Hospital Admission in the Year* Following Their Diagnosis, Overall and by Enrollee Characteristics



*Excludes hospital admissions in the 30-day period following the FEP diagnosis.

Enrollees who received antipsychotic medication in the 30-day period following diagnosis were less likely to have an inpatient hospitalization in the following year (2.0 versus 2.6 percent) (Figure 7). A similar pattern was seen for enrollees receiving office-based care (2.2 versus 2.4 percent) and office-based care plus psychotherapy (1.5 versus 2.6 percent). There was a very large difference in the percentage of enrollees with intensive treatment with 10.1 percent of enrollees receiving intensive treatment having an inpatient hospitalization in the follow-up period compared to just 1.5 percent of enrollees who did not receive intensive treatment.

Figure 7. The Percentage of Enrollees with FEP Who Had an Inpatient Hospital Admission in the Year* Following Their Diagnosis, Overall and by Type of Treatment Received in the 30 days Following Diagnosis



*Excludes hospital admissions in the 30-day period following the FEP diagnosis.

Finally, Acumen conducted multivariable logistic regression analyses estimating the odds of each clinical outcome —ED use and hospitalization—given enrollee characteristics and types of treatment following FEP diagnosis (Table 2). These analyses estimated the statistical significance of the observed associations while holding constant the other variables in the regression models. Because of the considerable overlap in treatment modalities, we defined treatment patterns ranging in service intensity as described in the methods section.

None of the defined treatment types were significantly associated with ED visits in the follow-up period, however, several enrollee characteristics were. Enrollees in the older age categories were significantly less likely to have an ED visit compared to the youngest age group—ages 15 to 18 ($p=0.01$). Enrollees with SUD were 2.21 times more likely ($p<0.001$) to have an ED visit. Enrollees with other mental health disorder had an increased, but non-significant, odds of ED visit (OR=1.83, $p=0.07$).

As described, inpatient hospitalization was infrequent; just 19 of the 815 (2.3 percent) enrollees with FEP had a behavioral health inpatient admission during the follow-up period. All 19 of these enrollees had a comorbid mental health disorder and 14 of them had SUD. Because there were no enrollees with other MH disorders who had an inpatient admission, the model was unable to produce a valid odds ratio for this characteristic. Enrollees with SUD were 3.63 times more likely to have an inpatient admission ($p=0.02$). Enrollees who were treated with antipsychotic medications and those who received psychotherapy in conjunction with office-based care had lower, but non-significant odds of inpatient admission. However, enrollees in more intensive treatment were 6.88 times more likely to have an inpatient admission compared to those not receiving intensive treatment ($p<0.001$).

Table 2. Multivariable Logistic Regression Analyses of ED Visits and Inpatient Admissions in the Year following an FEP Diagnosis

	ED Visit*			Inpatient Admission*		
	Odds Ratio	95% CI	p value	Odds Ratio	95% CI	p value
Age category (reference: 15 to 18)						
19 to 25	0.64	(0.44 - 0.91)	0.01	0.82	(0.24 - 2.78)	0.75
26 to 30	0.49	(0.29 - 0.83)	0.01	1.56	(0.36 - 6.78)	0.55
Female sex	1.30	(0.95 - 1.77)	0.10	1.11	(0.42 - 2.97)	0.83
Rural region	1.10	(0.70 - 1.73)	0.69	1.38	(0.30 - 6.38)	0.68
Other mental health disorder	1.83	(0.95 - 3.51)	0.07	NA	NA	NA
Substance use disorder	2.21	(1.61 - 3.03)	<.001	3.63	(1.20 - 10.99)	0.02
Antipsychotic medication**	0.95	(0.69 - 1.30)	0.73	0.56	(0.20 - 1.58)	0.28
Office-based care plus psychotherapy**	1.13	(0.79 - 1.61)	0.50	0.45	(0.12 - 1.67)	0.23
Intensive treatment**	0.70	(0.41 - 1.18)	0.18	6.88	(2.51 - 18.92)	<.001

*Excludes ED visits and hospital admissions in the 30-day period following the FEP diagnosis.

**In 30-day period following FEP diagnosis.

5. CONCLUSION

This descriptive study estimated the prevalence of psychosis among Maryland commercial insurance enrollees ages 15 to 30, examined patterns of behavioral health treatment following a diagnosis of FEP, and explored how demographic characteristics and treatment patterns following an FEP diagnosis related to clinical outcomes in the year following diagnosis. The prevalence of psychosis was 0.34 percent in this population. Enrollees with psychosis had high rates of comorbid mental health disorders and SUD relative to the general age cohort targeted in the study. They also were more likely to be male and reside in the more urban areas of the state. These results are generally consistent with findings from other studies[9,10,11] that find higher psychosis prevalence among males and urban residents and high rates of mental health and SUD comorbidity. The overall prevalence rate of 0.34 percent is in the range of reported prevalence estimates, though age-specific rates are difficult to find and reported rates vary by the methodical approach used to produce the prevalence estimates.

A very high percentage of enrollees with FEP received some type of treatment in the year following their diagnosis. The most common types of treatment were pharmacotherapy, office-based visits, and psychotherapy. More intensive treatments, e.g., intensive outpatient treatment and residential treatment were less common, particularly in the rural regions of the state. Despite the high rate of SUD comorbidity, specific SUD treatment was also rare, although substance use issues might have been addressed in the context of the other services provided.

The specific services that characterize CSC—medication management, care coordination, and supportive employment—were coded very infrequently in the claims, preventing CSC-specific analyses. However, the patterns of care by age group appear inconsistent with a basic tenet of CSC which is to aggressively treat the first psychotic episode. Younger enrollees were treated more often with psychotherapy and less often with antipsychotic medication. This might reflect patient and family choice, i.e., a hesitancy to initiate pharmacotherapy with anti-psychotic medications at a young age, however, it is inconsistent with current clinical recommendations for treating FEP and the evidence that early, aggressive treatment may mitigate the progression to more severe psychosis and functional impairment.[1][2]

The final analyses examined associations with treatment for FEP in the month following diagnosis and ED use and inpatient hospitalizations for behavioral health concerns in the subsequent 11-month period. Individuals were not randomly assigned to any particular treatment type, and these results do not reflect causal relationships between treatment and the clinical outcomes. Approximately 34 percent of enrollees had an ED visit in the follow-up period. ED use was more common among the youngest age group and among enrollees with comorbid mental health and SUD. None of the treatment types were significantly associated with ED use. Enrollees with SUD and those with intensive outpatient treatment in the month following their diagnosis were significantly more likely to have an inpatient admission. This suggests that more complex and higher need beneficiaries drive hospital admissions.

There were some data limitations that prevented carrying out all of the planned analyses. Most notably, the Medicaid data were unavailable and the Medicare sample was too small for detailed analyses. We were able to complete most of the planned analyses with the commercia data, however, the commercial data were missing most of the data on race and ethnicity so we were unable to examine race disparities in service use and outcomes. Further, as described, it was not possible to use the commercial claims to identify CSC, however, we were able to define treatment patterns of varying intensity, including a more intensive level of service that included care coordination and intensive outpatient treatment.

Nonetheless, the study findings provide an initial investigation of behavioral health service use and outcomes for Maryland commercial enrollees with FEP. Further studies might investigate the impact of more granular patterns of treatment, for example, pharmacological treatment continued over a longer time period, or a deeper exploration of SUD comorbidity. It also would be informative to investigate racial and ethnic differences in care should race and ethnicity data be made available for the commercial sample. The Medicaid study, as initially proposed, would bring additional value, as psychosis prevalence rates may be higher in the Medicaid population, and it would be useful to compare the treatment patterns and outcomes for the Medicaid population to commercial enrollees.

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APPENDIX A. MEDICARE RESULTS

	With Psychosis* - Point Enrollment		With Psychosis* - Continuous Enrollment 1 Year Prior		With FEP** - Continuous Enrollment 1 Year Prior	
	n	%	n	%	n	%
Total	1,101	100.0%	896	100.0%	320	100.0%
Age at time of incident visit						
15 to 18	0	0.0%	0	0.0%	0	0.0%
19 to 25	390	35.4%	294	32.8%	106	33.1%
26 to 30	830	75.4%	700	78.1%	215	67.2%
Sex						
Male	688	62.5%	570	63.6%	202	63.1%
Female	413	37.5%	326	36.4%	118	36.9%
Race/ethnicity						
Unknown	140	12.7%	104	11.6%	29	9.1%
White non-Hispanic	356	32.3%	296	33.0%	130	40.6%
Black non-Hispanic	555	50.4%	458	51.1%	144	45.0%
Other	10	0.9%	8	0.9%	5	1.6%
Asian	15	1.4%	11	1.2%	3	0.9%
Hispanic	23	2.1%	17	1.9%	7	2.2%
North American Native	2	0.2%	2	0.2%	2	0.6%

*One inpatient stay or two outpatient visits on different days with a primary psychosis diagnosis code (Appendix B) between 1/1/2017 and 12/31/2018. The first encounter establishes the beginning of the episode (incident visit).

**Subset to enrollees with psychosis to exclude enrollees with any claim with a primary psychosis diagnosis code (Appendix B) in the one-year period prior to incident visit.

APPENDIX B. ICD-10 DIAGNOSIS CODES USED TO IDENTIFY PSYCHOSIS

ICD-10 Code	Description
F200	Paranoid schizophrenia
F201	Disorganized schizophrenia
F202	Catatonic schizophrenia
F203	Undifferentiated schizophrenia
F205	Residual schizophrenia
F2081	Schizophreniform disorder
F2089	Other schizophrenia
F209	Schizophrenia, unspecified
F22	Delusional disorders
F23	Brief psychotic disorder
F24	Shared psychotic disorder
F250	Schizoaffective disorder, bipolar type
F251	Schizoaffective disorder, depressive type
F258	Other schizoaffective disorders
F259	Schizoaffective disorder, unspecified
F28	Other psychotic disorder not due to a substance or known physiological condition
F29	Unspecified psychosis not due to a substance or known physiological condition
F302	Manic episode, severe with psychotic symptoms
F312	Bipolar disorder, current episode manic severe with psychotic features
F315	Bipolar disorder, current episode depressed, severe, with psychotic features
F3164	Bipolar disorder, current episode mixed, severe, with psychotic features
F323	Major depressive disorder, single episode, severe with psychotic features
F333	Major depressive disorder, recurrent, severe with psychotic symptoms

APPENDIX C. MARYLAND REGIONS

Region	Counties in Region
Capital	Frederick, Montgomery, Prince George's
Central	Anne Arundel, Baltimore City, Baltimore, Carroll, Harford, Howard
Eastern Shore	Caroline, Cecil, Dorchester, Kent, Queen Anne's, Somerset, Talbot, Wicomico, Worcester
Southern	Calvert, Charles, St. Mary's
Western	Allegany, Garrett, Washington

APPENDIX D. PROCEDURE CODES AND CLAIM LINE COUNTS FOR PROCEDURES USED TO DEFINE TREATMENT CATEGORIES, BASED ON ANALYSIS OF ENROLLEES WITH FIRST EPISODE PSYCHOSIS, 2017-2018

Code Type	Procedure Code	Procedure Code Description	Treatment Category Abbreviation	Count of Claim lines for Enrollees with FEP
HC/CPT	90867	Transcranial magnetic stimulation treatment (stimulates nerve cells in brain to improve symptoms of depression)	ALT	13
HC/CPT	90868	Transcranial magnetic stimulation treatment (stimulates nerve cells in brain to improve symptoms of depression), per session	ALT	587
HC/CPT	90869	Transcranial magnetic stimulation treatment (stimulates nerve cells in brain to improve symptoms of depression)	ALT	14
HC/CPT	90870	Shock treatment and monitoring	ALT	119
HC/CPT	97810	Acupuncture 1 or more needles, first 15 minutes	ALT	26
HC/CPT	97811	Acupuncture 1 or more needles	ALT	24
HC/CPT	97813	Acupuncture 1 or more needles with electrical stimulation, first 15 minutes	ALT	2
HC/CPT	97814	Acupuncture 1 or more needles with electrical stimulation and re-insertion of needles	ALT	2
ICD	GZB0ZZZ	Electroconvulsive Therapy, Unilateral-Single Seizure	ALT	122
ICD	GZB1ZZZ	Electroconvulsive Therapy, Unilateral-Multiple Seizure	ALT	2
ICD	GZB2ZZZ	Electroconvulsive Therapy, Bilateral-Single Seizure	ALT	12
ICD	GZB4ZZZ	Other Electroconvulsive Therapy	ALT	8
HC/CPT	90887	Explanation of psychiatric, medical examinations, procedures, and data to other than patient	CC	11
HC/CPT	99350	Established patient home visit, typically 60 minutes	CC	31
HC/CPT	99495	Transitional care management services, moderately complexity, requiring face-to-face visits within 14 days of discharge	CC	12
HC/CPT	99496	Transitional care management services, highly complexity, requiring face-to-face visits within 7 days of discharge	CC	15
HC/CPT	G0129	Occupational therapy services requiring the skills of a qualified occupational therapist, furnished as a component of a partial hospitalization treatment program, per session (45 minutes or more)	CC	47
HC/CPT	G0152	Services performed by a qualified occupational therapist in the home health or hospice setting, each 15 minutes	CC	25
HC/CPT	G0177	Training and educational services related to the care and treatment of patient's disabling mental health problems per session (45 minutes or more)	CC	37
HC/CPT	H2014	Skills training and development, per 15 minutes	CC	5
HC/CPT	T2022	Case management, per month	CC	1
HC/CPT	T2023	Targeted case management; per month	CC	375
HC/CPT	99281	Emergency department visit, self-limited or minor problem	ED	1,062
HC/CPT	99282	Emergency department visit, low to moderately severe problem	ED	77

Code Type	Procedure Code	Procedure Code Description	Treatment Category Abbreviation	Count of Claim lines for Enrollees with FEP
HC/CPT	99283	Emergency department visit, moderately severe problem	ED	441
HC/CPT	99284	Emergency department visit, problem of high severity	ED	828
HC/CPT	99285	Emergency department visit, problem with significant threat to life or function	ED	1,534
HC/CPT	99291	Critical care delivery critically ill or injured patient, first 30-74 minutes	ED	63
HC/CPT	99292	Critical care delivery critically ill or injured patient	ED	10
HC/CPT	G0380	Level 1 hospital emergency department visit provided in a type b emergency department; (the ed must meet at least one of the following requirements: (1) it is licensed by the state in which it is located	ED	1
HC/CPT	99217	Hospital observation care on day of discharge	HOSP	24
HC/CPT	99219	Hospital observation care, typically 50 minutes	HOSP	12
HC/CPT	99220	Hospital observation care, typically 70 minutes	HOSP	35
HC/CPT	99221	Initial hospital inpatient care, typically 30 minutes per day	HOSP	118
HC/CPT	99222	Initial hospital inpatient care, typically 50 minutes per day	HOSP	697
HC/CPT	99223	Initial hospital inpatient care, typically 70 minutes per day	HOSP	636
HC/CPT	99225	Subsequent observation care, typically 25 minutes per day	HOSP	16
HC/CPT	99226	Subsequent observation care, typically 35 minutes per day	HOSP	10
HC/CPT	99231	Subsequent hospital inpatient care, typically 15 minutes per day	HOSP	1,239
HC/CPT	99232	Subsequent hospital inpatient care, typically 25 minutes per day	HOSP	7,196
HC/CPT	99233	Subsequent hospital inpatient care, typically 35 minutes per day	HOSP	1,913
HC/CPT	99238	Hospital discharge day management, 30 minutes or less	HOSP	615
HC/CPT	99239	Hospital discharge day management, more than 30 minutes	HOSP	491
HC/CPT	99251	Inpatient hospital consultation, typically 20 minutes	HOSP	19
HC/CPT	99252	Inpatient hospital consultation, typically 40 minutes	HOSP	34
HC/CPT	99253	Inpatient hospital consultation, typically 55 minutes	HOSP	43
HC/CPT	99254	Inpatient hospital consultation, typically 80 minutes	HOSP	75
HC/CPT	99255	Inpatient hospital consultation, typically 110 minutes	HOSP	50
HC/CPT	99357	Prolonged inpatient or observation hospital service each 30 minutes beyond first hour	HOSP	1
HC/CPT	G0378	Hospital observation service, per hour	HOSP	102
HC/CPT	H0035	Mental health partial hospitalization, treatment, less than 24 hours	IOP	1,973
HC/CPT	S0201	Partial hospitalization services, less than 24 hours, per diem	IOP	815
HC/CPT	S9480	Intensive outpatient psychiatric services, per diem	IOP	1,120
HC/CPT	90863	Management of prescriptions and review of medication	MED	7
ICD	GZ3ZZZZ	Medication Management	MED	14
HC/CPT	90791	Psychiatric diagnostic evaluation	OFF	1,334
HC/CPT	90792	Psychiatric diagnostic evaluation with medical services	OFF	1,075
HC/CPT	90899	Psychiatric service or procedure	OFF	138
HC/CPT	96101	Psychological testing with interpretation and report by psychologist or physician per hour	OFF	26

Code Type	Procedure Code	Procedure Code Description	Treatment Category Abbreviation	Count of Claim lines for Enrollees with FEP
HC/CPT	96116	Neurobehavioral status examination, interpretation, and report by psychologist or physician per hour	OFF	13
HC/CPT	96127	Brief emotional or behavioral assessment	OFF	127
HC/CPT	96160	Administration and interpretation of patient-focused health risk assessment	OFF	22
HC/CPT	98966	Telephone assessment and management service, 5-10 minutes of medical discussion	OFF	14
HC/CPT	98968	Telephone assessment and management service, 21-30 minutes of medical discussion	OFF	28
HC/CPT	99050	Services provided in the office when the office is normally closed	OFF	10
HC/CPT	99051	Services provided in an office during regularly scheduled office hours, evening, weekend, or holiday	OFF	32
HC/CPT	99201	New patient office or other outpatient visit, typically 10 minutes	OFF	17
HC/CPT	99202	New patient office or other outpatient visit, typically 20 minutes	OFF	15
HC/CPT	99203	New patient office or other outpatient visit, typically 30 minutes	OFF	84
HC/CPT	99204	New patient office or other outpatient visit, typically 45 minutes	OFF	120
HC/CPT	99205	New patient office or other outpatient visit, typically 60 minutes	OFF	173
HC/CPT	99211	Established patient office or other outpatient visit, typically 5 minutes	OFF	380
HC/CPT	99212	Established patient office or other outpatient visit, typically 10 minutes	OFF	227
HC/CPT	99213	Established patient office or other outpatient visit, typically 15 minutes	OFF	3,508
HC/CPT	99214	Established patient office or other outpatient, visit typically 25 minutes	OFF	4,292
HC/CPT	99215	Established patient office or other outpatient, visit typically 40 minutes	OFF	817
HC/CPT	99242	Patient office consultation, typically 30 minutes	OFF	17
HC/CPT	99243	Patient office consultation, typically 40 minutes	OFF	41
HC/CPT	99244	Patient office consultation, typically 60 minutes	OFF	34
HC/CPT	99245	Patient office consultation, typically 80 minutes	OFF	27
HC/CPT	99349	Established patient home visit, typically 40 minutes	OFF	12
HC/CPT	99354	Prolonged office or other outpatient service first hour	OFF	20
HC/CPT	99385	Initial new patient preventive medicine evaluation age 18-39 years	OFF	56
HC/CPT	99394	Established patient periodic preventive medicine examination, age 12 through 17 years	OFF	43
HC/CPT	99395	Established patient periodic preventive medicine examination age 18-39 years	OFF	107
HC/CPT	99441	Physician telephone patient service, 5-10 minutes of medical discussion	OFF	11
HC/CPT	99442	Physician telephone patient service, 11-20 minutes of medical discussion	OFF	82

Code Type	Procedure Code	Procedure Code Description	Treatment Category Abbreviation	Count of Claim lines for Enrollees with FEP
HC/CPT	G0463	Hospital outpatient clinic visit for assessment and management of a patient	OFF	94
ICD	GZ11ZZZ	Psychological Tests, Personality and Behavioral	OFF	3
HC/CPT	H0002	Behavioral health screening to determine eligibility for admission to treatment program	OFF	1
HC/CPT	H0031	Mental health assessment, by non-physician	OFF	3
HC/CPT	T1002	Rn services, up to 15 minutes	OFF	31
HC/CPT	90785	Interactive complexity	PSY	244
HC/CPT	90832	Psychotherapy, 30 minutes	PSY	559
HC/CPT	90833	Psychotherapy, 30 minutes	PSY	1,741
HC/CPT	90834	Psychotherapy, 45 minutes	PSY	5,631
HC/CPT	90836	Psychotherapy, 45 minutes	PSY	430
HC/CPT	90837	Psychotherapy, 60 minutes	PSY	8,304
HC/CPT	90838	Psychotherapy, 60 minutes	PSY	77
HC/CPT	90839	Psychotherapy for crisis, first 60 minutes	PSY	105
HC/CPT	90840	Psychotherapy for crisis	PSY	14
HC/CPT	90846	Family psychotherapy, 50 minutes	PSY	187
HC/CPT	90847	Family psychotherapy including patient, 50 minutes	PSY	873
HC/CPT	90849	Multiple-family group psychotherapy	PSY	57
HC/CPT	90853	Group psychotherapy	PSY	1,410
HC/CPT	90876	Individual psychophysiological therapy incorporating biofeedback training with psychotherapy, 45 minutes	PSY	13
HC/CPT	G0410	Group psychotherapy other than of a multiple-family group, in a partial hospitalization setting, approximately 45 to 50 minutes	PSY	131
ICD	GZ50ZZZ	Individual Psychotherapy, Interactive	PSY	8
ICD	GZ51ZZZ	Individual Psychotherapy, Behavioral	PSY	7
ICD	GZ56ZZZ	Individual Psychotherapy, Supportive	PSY	8
ICD	GZ58ZZZ	Individual Psychotherapy, Cognitive-Behavioral	PSY	2
ICD	GZ63ZZZ	Other Counseling	PSY	24
ICD	GZ72ZZZ	Family Psychotherapy	PSY	15
ICD	GZHZZZZ	Group Psychotherapy	PSY	148
HC/CPT	H2019	Therapeutic behavioral services, per 15 minutes	PSY	68
HC/CPT	H0017	Behavioral health; residential (hospital residential treatment program), without room and board, per diem	RES	117
HC/CPT	H0018	Behavioral health; short-term residential (non-hospital residential treatment program), without room and board, per diem	RES	392
HC/CPT	H0019	Behavioral health; long-term residential (non-medical, non-acute care in a residential treatment program where stay is typically longer than 30 days), without room and board, per diem	RES	111
HC/CPT	T2048	Behavioral health; long-term care residential (non-acute care in a residential treatment program where stay is typically longer than 30 days), with room and board, per diem	RES	23

Code Type	Procedure Code	Procedure Code Description	Treatment Category Abbreviation	Count of Claim lines for Enrollees with FEP
HC/CPT	G0443	Brief face-to-face behavioral counseling for alcohol misuse, 15 minutes	SUD	1
HC/CPT	H0001	Alcohol and/or drug assessment	SUD	15
HC/CPT	H0005	Alcohol and/or drug services; group counseling by a clinician	SUD	29
HC/CPT	H0009	Alcohol and/or drug services; acute detoxification (hospital inpatient)	SUD	25
HC/CPT	H0010	Alcohol and/or drug services; sub-acute detoxification (residential addiction program inpatient)	SUD	228
HC/CPT	H0012	Alcohol and/or drug services; sub-acute detoxification (residential addiction program outpatient)	SUD	14
HC/CPT	H0015	Alcohol and/or drug services; intensive outpatient (treatment program that operates at least 3 hours/day and at least 3 days/week and is based on an individualized treatment plan), including assessment	SUD	1,029
HC/CPT	H0020	Alcohol and/or drug services; methadone administration and/or service (provision of the drug by a licensed program)	SUD	55
HC/CPT	H2035	Alcohol and/or other drug treatment program, per hour	SUD	30
HC/CPT	H2036	Alcohol and/or other drug treatment program, per diem	SUD	49
ICD	HZ2ZZZZ	Detoxification Services for Substance Abuse Treatment	SUD	13
ICD	HZ30ZZZ	Individual Counseling for Substance Abuse Treatment, Cognitive	SUD	11
ICD	HZ31ZZZ	Individual Counseling for Substance Abuse Treatment, Behavioral	SUD	1
ICD	HZ32ZZZ	Individual Counseling for Substance Abuse Treatment, Cognitive-Behavioral	SUD	1
ICD	HZ40ZZZ	Group Counseling for Substance Abuse Treatment, Cognitive	SUD	1
ICD	HZ41ZZZ	Group Counseling for Substance Abuse Treatment, Behavioral	SUD	1
ICD	HZ51ZZZ	Individual Psychotherapy for Substance Abuse Treatment, Behavioral	SUD	1
ICD	HZ81ZZZ	Medication Management for Substance Abuse Treatment, Methadone Maintenance	SUD	1
ICD	HZ84ZZZ	Medication Management for Substance Abuse Treatment, Naltrexone	SUD	3
ICD	HZ89ZZZ	Medication Management for Substance Abuse Treatment, Other Replacement Medication	SUD	2
ICD	HZ98ZZZ	Pharmacotherapy for Substance Abuse Treatment, Psychiatric Medication	SUD	1
HC/CPT	S9475	Ambulatory setting substance abuse treatment or detoxification services, per diem	SUD	16

Key:

CC: Care Coordination

PSY: Psychotherapy

OFF: Office-based care

ALT:	Alternative treatment (ECT, TMS, Acupuncture)
SUD:	SUD treatment
IOP:	Intensive outpatient treatment
MED:	Medication management
RES:	Residential treatment
ED:	Emergency department
HOSP:	Hospital