




Treatment and Outcomes Among North Carolina Medicaid-Insured Youth With Depression

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Objective: Youth depression is increasing and is associated with adverse concurrent and long-term outcomes. Understanding receipt of depression treatment and outcomes is critical for population-level efforts to address youth depression. This study aimed to understand treatment patterns and their association with depression-related outcomes.



Method: North Carolina Medicaid claims were used to conduct a retrospective cohort study of treatment and depression-related outcomes in pediatric Medicaid beneficiaries. The sample included 34,623 youth ages 5 to 21 years with an incident depression diagnosis. Psychotherapy and antidepressant medication were assessed for 6 months following diagnosis. Depression-related outcomes including suicidal or self-harming behaviors, emergency department use, and psychiatric hospitalization were analyzed using Cox proportional hazards models to calculate hazard ratios.

Results: Among youth with depression, 86% received treatment (39% psychotherapy, 16% medication, 31% combined), but few youth received guideline-recommended treatment duration. At 6 and 18 months, youth who received combined treatment had higher risk of adverse outcomes compared with the other groups. The untreated group had lower risk of outcomes other than all-cause emergency department visits. Single-session psychotherapy and inconsistent medication fills were also associated with poor outcomes; however, more psychotherapy sessions were associated with lower risk of all-cause emergency department visits.

Conclusion: These data show that the majority of youth who received depression treatment had suboptimal adherence to recommended guidelines. Youth who received combined treatment (both medication and therapy) had more adverse depression outcomes. As claims records do not include clinical data, the effect of treatment type, dose, depression severity, or a combination of these factors cannot be readily disentangled; therefore, these findings do not support a conclusion that combined treatment leads to poor outcomes. Rather, it is possible that youth with a more severe clinical profile are more likely to be prescribed combined treatment or to have poor adherence and thus worse outcomes. Understanding how to improve adherence in real-world settings is needed. Results suggest that many youth continue to struggle despite receipt of mental health care, indicating a call for enhancing existing treatment strategies. Research should aim to better understand population-level care for depression and to promote receipt of and adherence to recommended treatment duration across modalities.

Diversity & Inclusion Statement: One or more of the authors of this paper self-identifies as a member of one or more historically underrepresented racial and/or ethnic groups in science. One or more of the authors of this paper self-identifies as a member of one or more historically underrepresented sexual and/or gender groups in science.

Key words: antidepressant treatment; Medicaid; outcomes; psychotherapy; youth depression

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Rates of youth depression have increased in recent years, with current estimates indicating that approximately 11% of youth experience depression.^{1,2} Youth depression is associated with other psychiatric problems as well as a range of negative outcomes in adulthood.^{3–5} In addition, depression is increasingly associated with greater use of emergency services and inpatient hospitalization and higher suicide rate for youth.^{4–6} Youth who have previously received care at the emergency department (ED) or had an inpatient hospitalization for depression are

at particularly high risk for repeated use of those services.⁷ Effective medication and psychosocial treatments exist, but studies have also shown that youth response to depression treatment varies, and more work is needed to understand factors that impact depression treatment outcomes.^{8–13} Understanding receipt of depression treatment and outcomes for youth with depression is critical for population-level efforts to address youth depression.

Practice guidelines have been developed to assist providers in appropriate prescribing and treatment monitoring

and to provide education about optimal psychosocial interventions.^{14,15} Newer models such as collaborative care and child psychiatry access lines provide additional avenues to connect youth with depression treatment through psychiatric consultation to pediatric providers and provision of resources for psychotherapy.^{16,17} However, many youth may not receive needed care for depression, including youth at high risk following inpatient hospitalization.¹⁸

Access to and engagement in depression treatment are impacted by factors such as training and comfort of primary care physicians, availability of specialists, and a range of individual youth and family factors.^{19,20} Among privately insured youth identified with depression, one study found that only about half received any treatment for depression (ie, either medication or psychotherapy).²¹ Studies of Medicaid-insured youth have generally shown higher proportions receiving treatment for depression, including one study that examined data from 9 states and found that 84% of youth received some level of treatment.²² Importantly, individual treatment trajectories may vary with respect to timing, duration, and receipt of singular vs combined therapy, which also impacts observed treatment outcomes, and few studies have addressed questions related to treatment quality.²³

Although the need for depression care has risen steadily in recent decades, there is heightened concern for youth depression since the start of the COVID-19 pandemic.^{1,24} Given the resulting public health priority of mitigating adverse events associated with depression, the current study sought to understand treatment patterns and depression-related outcomes, including use of ED services, hospitalization, and suicidal or self-harming behaviors. Our primary

goal was to describe the types and amounts of treatment received by North Carolina (NC) Medicaid-insured youth with new onset of depression, including psychotherapy, psychotropic medication, and both psychotherapy and medication at some time during the study treatment assessment period (ie, combined treatment). We also examined associations between receipt of treatment and depression-related outcomes.

METHOD

Study Design and Source

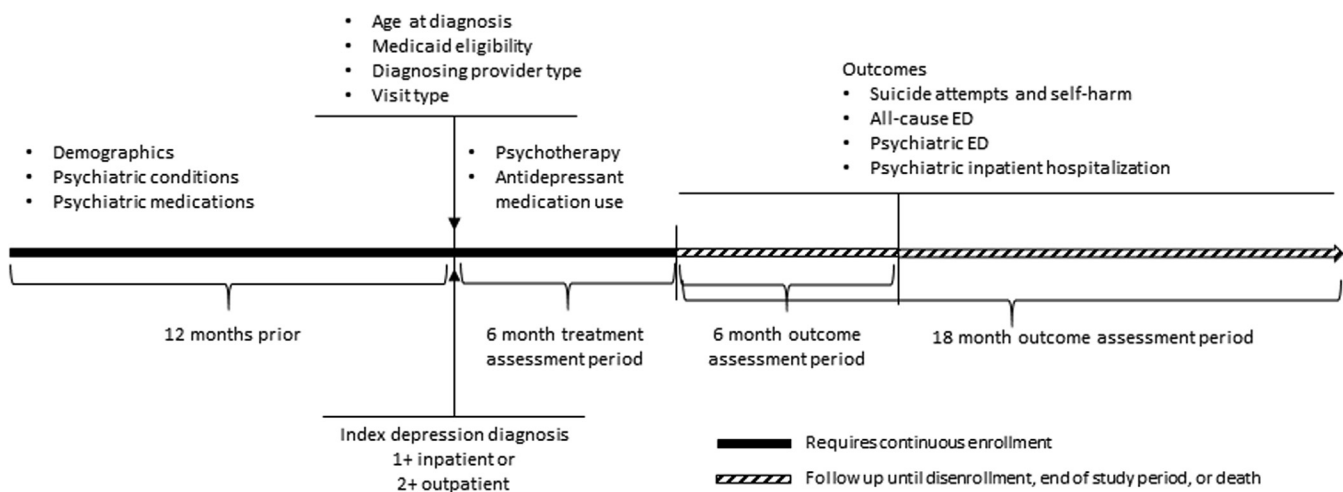
We conducted a retrospective cohort study of pediatric NC Medicaid beneficiaries ages 5 to 21 years with an incident diagnosis of depression. Using a landmark analysis, we assessed depression treatment of beneficiaries with psychotherapy and antidepressant medication use for 6 months following incident diagnosis. Next, we evaluated their outcomes at 6 and 18 months after the 6-month treatment period.^{25,26} See Figure 1 for details of the study timeline.

We used NC Medicaid professional, institutional, and prescription claims from 2016 to 2019 to identify health care service use and prescription medication fills. Beneficiary characteristics were abstracted from the enrollment file. The Duke University Institutional Review Board and NC Department of Health and Human Services approved this study.

Study Sample

The study sample consisted of youth ages 5 to 21 years with an incident diagnosis of depression between January 1, 2017, and December 31, 2019. Incident depression was

FIGURE 1 Study Timeline



Note: ED = emergency department.

defined as having ≥ 2 outpatient claims or ≥ 1 inpatient claims with an *ICD-10* depression diagnosis code (F32.x, F33.x, F34.1) in any position on the claim. The first claim date with a depression diagnosis was considered the incident date. We searched claims between 2016 and 2019 and required a lookback period of at least 1 year of continuous Medicaid enrollment before the incident date to identify incident, not prevalent, depression. We also required at least 6 months (180 days) of Medicaid enrollment following the incident date to assess treatment received.

We excluded youth who had an *ICD-10* diagnosis code for bipolar disorder (F31.x, F34.0) or schizophrenia (F20.x, F22, F23, F25.x, F28, F29) on any claim or if they had a prescription medication fill for lithium in the 1-year lookback period. Youth who were dually enrolled in Medicare during the 1-year lookback period or 6-month assessment period were also excluded.

Variables of Interest

Depression treatment was assessed during the 6-month assessment period, inclusive of the incident date. Psychotherapy was defined as the number of unique therapy visits, based on claims with an eligible *CPT* code for a maximum of one per day (Table S1, available online). Number of visits was categorized into 0, 1, 2 to 3, 4 to 7, 8 to 11, or ≥ 12 visits. Antidepressant medication use was identified by searching the prescription fill claims for the generic names of antidepressants (Table S1, available online). The days' supply value on the claim was summed within-person across claims, truncated at 180 days and counting prior fills that extended into the assessment period. This value was divided by 180 days to calculate proportion of days covered (PDC) and categorized into 0%, 0% to 33%, 34% to 66%, or 67% to 100%. Psychotherapy and antidepressant medication use were dichotomized (0 vs ≥ 1 therapy visits, 0% vs $>0\%$ PDC) for the main treatment variable. Youth were classified as receiving both psychotherapy and antidepressant (ie, combined treatment; may or may not be concurrent treatment), psychotherapy only, antidepressant only, or neither.

Adverse outcomes associated with depression included suicide attempt or self-harm, inpatient psychiatric hospitalization, all-cause ED visit, and ED visit for psychiatric reason. Outcomes were assessed beginning the day following the landmark date (end of treatment assessment period) through the first occurrence of each outcome; youth without that event were censored at the earliest occurrence of disenrollment from Medicaid, enrollment as a dual beneficiary in Medicare, maximum of 180 days or 545 days for the respective 6- and 18-month outcomes, or end of study period (December 31, 2019). Suicide attempt or

intentional self-harm was coded as the first claim with an *ICD-10-CM* code that indicated a suicide attempt or self-harm in any position on the claim based on injury diagnosis and external cause of injury codes.²⁷ All-cause ED was identified as the first claim with revenue code 0981 or 045* or *CPT* code 99281, 99282, 99283, 99284, 99285, or 99288. Psychiatric ED was identified as an ED visit with at least one depression or other behavioral health diagnosis in any position (Table S2, available online). Psychiatric inpatient medical hospitalization was defined as the first inpatient claim with a depression or other behavioral health diagnosis in the primary position (Table S2, available online). An exploratory outcome of inpatient psychiatric facility admission was defined as the first institutional claim with place of service equal to inpatient psychiatric facility, regardless of diagnosis.

Patient-level characteristics included age at diagnosis and self- or parent-identified race, ethnicity, and sex. Patients' county of residence was classified as rural or urban using guidelines from the NC Office of State Budget and Management. The program through which the beneficiary qualified for Medicaid on the incident date was categorized. Clinical characteristics were identified in the 1-year lookback period, including behavioral health conditions identified through ≥ 2 outpatient or ≥ 1 inpatient claims and psychotropic medication fills (Table S2, available online). Because our goal was to examine depression-related outcomes in newly diagnosed youth, we adjusted for these characteristics rather than excluding these cases. The conditions of the visit at which depression was diagnosed included type of visit (ED, inpatient, or outpatient) and diagnosing provider type on that claim (Table S3, available online), categorized by taxonomy code. We included 1-year prior intensive behavioral health services (Table S4, available online), psychotherapy, antidepressant use, and self-harm. Finally, pregnancy or childbirth during the 6-month treatment assessment period was identified,²⁸ as these factors may impact psychotropic medication prescribing during the treatment period.

Statistical Analysis

We characterized the sample using descriptive statistics of counts and proportions for categorical variables. For continuous variables, we used means and standard deviations or medians and first and third quartiles. Treatment received was graphed as the proportion in each category. We calculated and graphed Kaplan-Meier estimates for the 6- and 18-month outcomes. We used Cox regression models to calculate unadjusted and adjusted associations between depression treatment variable (psychotherapy only, antidepressant only,

both, or neither) and each outcome. Covariates were selected based on clinical relevance. We also modeled outcomes using a dose-response to treatment model. This model used psychotherapy visit count categories and antidepressant PDC categories during the 6-month treatment assessment period. All tests were 2-sided with significance set at $\alpha = .05$. SAS version 9.4 (SAS Institute Inc., Cary, North Carolina) was used for all analyses.

RESULTS

Our sample included 34,623 youth ages 5 to 21 years with incident depression during the study period. Sociodemographic and clinical characteristics are shown in Table 1. The average age at diagnosis was 14.4 years. Most youth with a depression diagnosis were between 12 and 17 years of age (64%), with the remainder evenly divided between younger (ages 5-11 years [18%]) and older (ages 18-21 years [18%]) youth. More than half of the sample was female (64%). The sample was 49% White, non-Hispanic, 28% Black, non-Hispanic, 16% Hispanic, 5% other race, non-Hispanic, and 2% unreported. A majority of youth (83%) were eligible for Medicaid through financial need-based general pediatrics programs. The remaining 17% were Medicaid eligible-based disability, pregnancy, adult-based income limits, categorically or medically needy, or NC Health Choice.

Approximately half of youth received their index depression diagnosis from behavioral health providers (55%), followed by primary care providers (29%), emergency medicine providers (7%), and other provider types (eg, obstetrics [10%]). Depression diagnoses were most commonly first assigned at an outpatient visit (84%). Almost half of the sample was already identified with another behavioral health diagnosis in the year before the index depression diagnosis, including attention-deficit/hyperactivity disorder (20%), anxiety and obsessive-compulsive disorders (14%), and adjustment disorder (10%). In addition, about one-third of youth were already taking a psychotropic medication at the time of the index depression diagnosis, including 16% already taking an antidepressant.

Rates of receiving treatment within 6 months of the index depression diagnosis were examined (Figure 2). The majority of the sample, 29,874 youth (86%), received treatment for depression during this period, with 10,868 youth (31%) receiving combined psychotherapy and antidepressant medication treatment. Further, 39% ($n = 13,613$) received only psychotherapy, and 16% ($n = 5,393$) received only antidepressant medication.

Overall, 71% of the sample received psychotherapy. The mean (SD) number of therapy visits in the 6-month

assessment period was 7.4 (6.7) for youth who received only psychotherapy and 6.7 (5.8) for youth who received combination therapy. Overall, 10.4% of all patients (14.7% of patients receiving psychotherapy) had one therapy visit; only 13.7% (19.4% of patients receiving psychotherapy) had ≥ 12 sessions in the 6-month period. One in 3 patients (36.7%) had a psychotherapy visit on the day of their index depression diagnosis.

Among the 47% of patients who filled antidepressant prescriptions, the mean (SD) PDC during the 6-month period was 52% (30.2%) for the antidepressant-only group and 56% (29.9%) for the combined treatment group. In total, 17.2% of the sample (36.6% of antidepressant-treated patients) had high PDC (67%-100%). Additional details about number of therapy visits and proportion of days covered are available in Table S5, available online, and Figure S1, available online.

Cumulative incidence significantly varied by treatment group for all outcomes at 6 months (Figure 3; Tables S6a, S6b, S7a, S7b, available online). Overall, all-cause ED visit was the most commonly occurring outcome (31%) and was least common for the psychotherapy only group (26%). Suicide attempt or self-harm occurred in 1% of the overall sample, with worse outcomes among youth who received combined treatment (2%). Inpatient psychiatric hospitalization occurred for 4% of youth overall and was highest in the combined treatment group (7%) compared with 3% in all other groups. ED visits for psychiatric reasons occurred for 11% of youth overall, with the highest rate in the combined treatment group (16%).

Similar distributions of outcomes were found at the 18-month follow-up time point with the combined treatment group experiencing the highest incidence of suicide attempt/intentional self-harm, inpatient psychiatric hospitalization, and ED use for psychiatric reasons (Figure S2, available online; Tables S6a, S6b, available online). The psychotherapy only group continued to show the lowest incidence of all-cause ED visits. For the exploratory outcome psychiatric facility admission (Figure S3, available online), similar patterns were observed with higher incidence in the combined treatment group at 6 and 18 months compared with the other groups.

We used adjusted Cox regression models to examine associations between depression treatment and each outcome at 6 months (Table 2; Table S8, available online). The psychotherapy only group had a lower hazard of all outcomes compared with the combined treatment reference group. There was a significantly lower risk of suicide attempt/intentional self-harm (hazard ratio [HR] 0.56, 95% CI 0.44–0.71, $p < .001$), all-cause ED visits (HR 0.86,

TABLE 1 Sociodemographic and Clinical Characteristics of Medicaid Enrollees Ages 5 to 21 With Incident Depression (N = 34,623)

Variable	Mean	(SD)
Demographics		
Age, y	14.4	(3.3)
	n	(%)
Age group		
Pediatric, 5-11 y	6,258	(18.1)
Adolescent, 12-17 y	22,142	(64.0)
Young adult, 18-21 y	6,223	(18.0)
Sex		
Female	22,281	(64.4)
Male	12,342	(35.6)
Race/ethnicity		
Black, non-Hispanic	9,740	(28.1)
Hispanic	5,504	(15.9)
Other race, non-Hispanic	1,763	(5.1)
Unreported	548	(1.6)
White, non-Hispanic	17,068	(49.3)
County of residence		
Rural	8,361	(24.1)
Urban	26,262	(75.9)
Medicaid eligibility program		
Blind/disabled	2,597	(7.5)
Pregnant women and BCC	111	(0.3)
Income adult	13	(0.0)
General pediatrics	28,635	(82.7)
Other program	3,267	(9.4)
Clinical characteristics		
Index diagnosis		
Provider type at index diagnosis		
Behavioral health provider	18,967	(54.8)
Primary care provider	10,053	(29.0)
Emergency medicine	2,297	(6.6)
Other provider type	3,306	(9.5)
Visit type at index diagnosis		
Inpatient hospitalization	721	(2.1)
ED visit	2,505	(7.2)
Outpatient visit	29,200	(84.3)
Other visit type	2,197	(6.3)
Psychiatric comorbidities		
Any behavioral health disorder	14,983	(43.3)
Attention-deficit/hyperactivity disorder	6,923	(20.0)
Anxiety and obsessive-compulsive disorders	4,849	(14.0)
Adjustment disorder	3,526	(10.2)
Disruptive, impulse-control, and conduct disorders	3,118	(9.0)

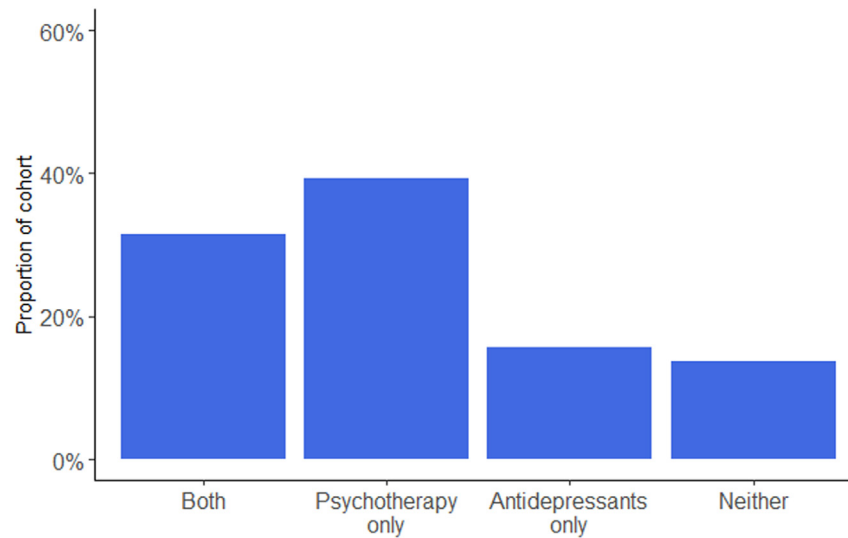
(continued)

TABLE 1 Continued

Variable		
Trauma- and stress-related disorders	1,895	(5.5)
Disruptive mood dysregulation disorder	789	(2.3)
Autism spectrum disorder	746	(2.2)
Substance use disorders	626	(1.8)
Intellectual disability	286	(0.8)
Other behavioral health condition	785	(2.3)
Psychiatric medications		
Any psychotropic medications	11,889	(34.3)
Any antidepressants	5,629	(16.3)
SSRIs	5,091	(14.7)
SNRIs	271	(0.8)
Other, non-SSRI/SNRI	665	(1.9)
Any psychotropic medications excluding antidepressants	9,711	(28.0)
Tricyclic antidepressants	602	(1.7)
Mood stabilizers	1,056	(3.0)
Antipsychotics	1,709	(4.9)
Stimulants	4,890	(14.1)
Benzodiazepines	900	(2.6)
Alpha agonists	3,304	(9.5)
Sedating antihistamine	2,115	(6.1)
Other insomnia medications	1,079	(3.1)

Note: BCC = breast and cervical cancer coverage; ED = emergency department; SNRI = serotonin and norepinephrine reuptake inhibitor; SSRI = selective serotonin reuptake inhibitor.

95% CI 0.81–0.91, $p < .001$), ED psychiatric visits (HR 0.63, 95% CI 0.57–0.69, $p < .001$), and psychiatric inpatient hospitalization (HR 0.53, 95% CI 0.46–0.62, $p < .001$). Similarly, youth who received antidepressants only had a lower hazard of all outcomes compared with the combined treatment group: suicide attempt/intentional self-harm (HR 0.55, 95% CI 0.40–0.75, $p < .001$), all-cause ED visits (HR 0.93, 95% CI 0.88–0.99, $p = .03$), ED psychiatric visits (HR 0.84, 95% CI 0.76–0.93, $p < .001$), and psychiatric inpatient hospitalization (HR 0.59, 95% CI 0.49–0.71, $p < .001$). The untreated group did not differ significantly from the combined treatment group in terms of all-cause ED visits. However, the untreated group had a lower risk of the other outcomes, ranging from 26% to 48% lower risk. Similar trends were evident when examining the psychiatric facility admission outcome (Table S9,

FIGURE 2 Depression Treatment Received Within 6 Months of Index Depression Diagnosis

Summary	Both	Psychotherapy	Antidepressants	Neither
N (%)	10,868 (31.4%)	13,613 (39.3%)	5,393 (15.6%)	4,749 (13.7%)
Therapy visits, mean (SD)	6.7 (5.8)	7.4 (6.7)	-	-
Therapy visits, median (Q1, Q3)	5 (2, 9)	5 (2, 10)	-	-
Antidepressant PDC, mean (SD)	55.9% (29.9%)	-	51.7% (30.2%)	-
Antidepressant PDC, median (Q1, Q3)	53.9% (32.8%, 83.3%)	-	50.0% (18.3%, 81.1%)	-

Note: PDC = proportion of days covered.

available online), with lower risk for the psychotherapy group (40%), antidepressant group (40%), and untreated group (51%) compared with the combined treatment group. Similar trends were observed at the 18-month follow-up with more adverse event risk associated with combined treatment (Table S10, available online). The one marked change was that all-cause ED was no longer significantly different for the antidepressant only group compared with the combined treatment group.

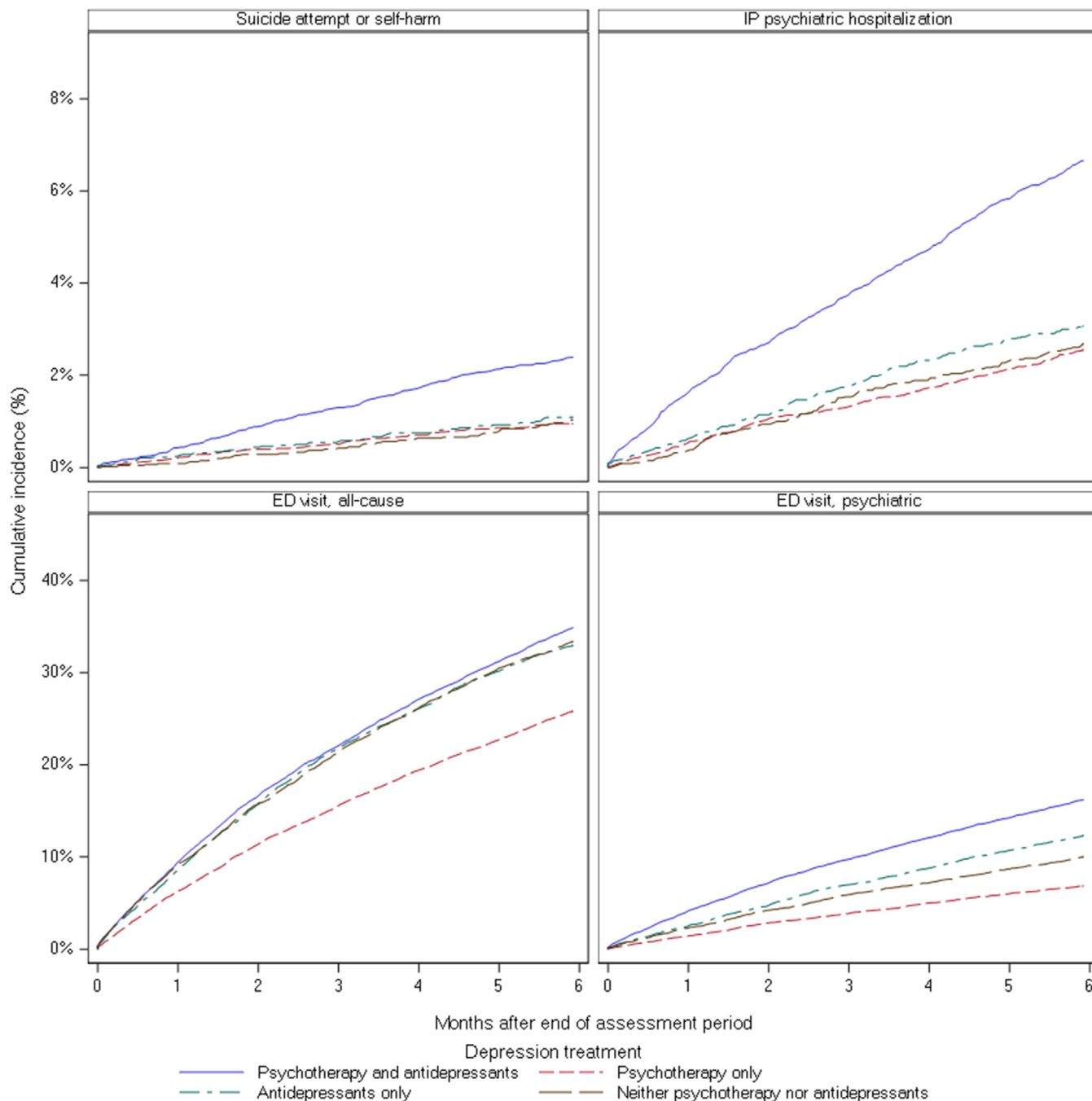
We also examined dose-response to treatment. For number of therapy visits, patterns were inconsistent. Generally, having 1 visit, compared with no visits or >1 visit, had the highest incidence of outcomes (Table S7a, available online). For antidepressants, the highest incidence varied across PDC categories (0.1%-33%, 34%-66%, 67%-100%), while those youth with no antidepressant use had the lowest incidence (Table S7b, available online). Next, we modeled outcomes looking at the dose-response to treatment using groups based on the number of psychotherapy visits received and the proportion of days treated with an antidepressant (Figure S1, available online; Table S11, available online). The reference group was the highest

treatment group (ie, ≥ 12 psychotherapy visits or 67%-100% PDC). Results varied based on outcome with no consistent patterns. However, we did observe that more psychotherapy sessions were associated with a lower risk of all-cause ED visits. Additionally, compared with the optimal antidepressant adherence reference group (67%-100% PDC), youth with slightly less adherence (34%-66% PDC) had 46% higher risk of suicide attempt/intentional self-harm and 10%-17% higher risk of all-cause ED visits (0.1%-33% and 34%-66% PDC).

DISCUSSION

The high rate of youth depression and its associated negative outcomes are a major public health concern. The current study aimed to examine treatment for youth depression and associations between treatment and known adverse outcomes associated with depression with the broader goal of informing relevant policies. We found the vast majority of youth in our sample received treatment to address their depression, with only about 13% receiving no treatment during the 6-month postdiagnosis assessment period. Our results also indicated

FIGURE 3 Cumulative Incidence of Outcomes During the 6-Month Follow-up Period, by Depression Treatment Group



Note: ED = emergency department; IP = inpatient.

that the majority of youth received suboptimal treatment as indicated by fewer therapy visits and lower proportion of days covered than recommended by most guidelines during this period. Importantly, this high rate of treatment receipt in our assessment period may be a reflection of the study design, in that youth had to disclose their symptoms to a provider to receive a diagnosis and subsequently to be connected with

treatment. Similarly high treatment levels have been reported in other claims data studies.²³ However, studies that rely on survey or interview to detect depression cases continue to suggest a high level of unmet treatment need for youth depression.^{4,29} Youth who self-report depression in a nonclinical setting (eg, a national research survey) may not share their concerns with parents or health care providers and

TABLE 2 Adjusted Hazard Ratios for Associations Between Depression Treatment and Outcomes at 6 Months

Treatment	Suicide attempt/ intentional self-harm		ED use, all-cause		ED use, psychiatric		Inpatient medical hospitalization, psychiatric	
	HR	(95% CI)	HR	(95% CI)	HR	(95% CI)	HR	(95% CI)
Both psychotherapy and antidepressants	Reference		Reference		Reference		Reference	
Psychotherapy only	0.56	(0.44-0.71)***	0.86	(0.81-0.91)***	0.63	(0.57-0.69)***	0.53	(0.46-0.62)***
Antidepressants only	0.55	(0.40-0.75)***	0.93	(0.88-0.99)*	0.84	(0.76-0.93)***	0.59	(0.49-0.71)***
Neither psychotherapy nor antidepressants	0.52	(0.37-0.73)***	0.96	(0.90-1.03)	0.74	(0.66-0.82)***	0.53	(0.43-0.65)***

Note: Models include the main treatment predictor and are adjusted for the covariates shown in Table 1. ED = emergency department; HR = hazard ratio.

* $p < .05$; *** $p < .001$.

thus may not be able to access treatment through the medical system. Broad initiatives to mitigate depression-associated risk may require provision of treatment through other systems (eg, schools).

Psychotherapy is recommended as a first-line treatment for youth with mild depression and is recommended alone or in conjunction with medication for moderate/severe depression.³⁰ In this Medicaid sample, more youth received psychotherapy, either alone or in combination with medication, compared with youth who received only medication. The observed high rate of psychosocial treatment stands in contrast to some prior findings, which have found greater uptake of medication management compared with therapy.³¹ This sample of Medicaid beneficiaries had insurance coverage, which reduces one barrier to accessing psychotherapy services. However, access is not sufficient for treatment engagement, and access does not equate with quality treatment.¹⁹ Although we were not able to assess quality or fidelity to evidence-based models, we found that youth received an average of 7 treatment visits during the 6-month period, which suggests that a substantial proportion were not receiving as many sessions as would typically be prescribed through an evidence-based treatment (eg, 8-15 weekly sessions).^{32,33} Similarly, we found that youth who received medication were treated about half of the days in the assessment period, which is substantially less than recommended.³⁴ Thus, across both treatment modalities, many youth received inadequate care based on practice guidelines and recommendations.

Overall, we found that youth who received more treatment (ie, combined psychotherapy and medication management) tended to experience more of the adverse depression outcomes that we assessed, including suicide attempt/self-harm, inpatient hospitalization, and ED visits

for psychiatric reasons. These findings were similar in the longer 18-month follow-up period and were also consistent with results from a prior study of Medicaid youth.²³ One notable exception in our results was that our multivariable adjusted dose-response modeling showed that a higher count of psychotherapy sessions (≥ 12) was associated with a lower risk of all-cause emergency department visit. Although clinical trials often show that combined treatment is more effective than monotherapy, delivery of combined treatment in the real world may differ in key ways (eg, training of therapists, time with prescribing provider) that could impact outcomes such as those we observed.³⁵

In contrast, our findings showed that outcome risk was consistently lower for the untreated youth with depression. Youth assigned a diagnosis of depression who did not receive treatment may have presented with mild or transient symptoms, leading to lower likelihood of treatment initiation and fewer adverse outcomes. Similarly, it is possible that greater treatment utilization is associated with a more severe and complex clinical profile, which may explain the observed adverse outcomes. In fact, individuals with more severe depression may choose to engage in combined approaches, as shown in prior work on patient treatment selection.³⁶ Further, clinical trials for youth depression have shown that youth with more severe depression may not respond as well to combined treatment compared with medication only and that clinical severity is associated with various treatment trajectories, suggesting that outcomes are not uniform despite receipt of optimal care.^{37,38} Because claims data do not provide clinical information, associations between symptom severity and treatment quantity will need to be examined in future studies.

Importantly, our data also suggest a relatively high incidence of outcomes for youth who attended only one

psychotherapy visit. It is possible that this group of youth had high clinical concerns to prompt a psychotherapy visit, but may have experienced patient- or family-level barriers to continuing in treatment. It is also possible that the inconsistent use of medication may play a similar role, as our findings suggested that antidepressant use at the intermediate level (34%-66%) was associated with poorer outcomes. Overall, our data suggest that mental health risks remain for youth who initiate treatment through therapy or medication but do not follow up. Nonadherence is a common challenge and has been associated with higher baseline severity and poor outcomes.³⁹⁻⁴¹ Future work may benefit from understanding barriers to continued treatment as well as associations between symptom severity and treatment engagement.

Several limitations are worth noting. Because we were not able to access data about depression severity, psychotherapy modality, and progress monitoring, our understanding of treatment effects in NC youth is limited. Without individualized clinical information, it is possible that some of the identified cases were misdiagnosed. Further, the variability inherent to depression may limit a full understanding of treatment associations in this sample. In addition, although we controlled for many variables that were considered to be clinically relevant, we cannot fully address questions about the impact of other psychopathology in the context of depression. We were also unable to address factors such as adverse childhood experiences and other personal, community, and structural factors that may exacerbate depression and/or impact treatment adherence, engagement, or persistence.

Youth depression rates have increased in recent years and are affecting increasing numbers of young people. Among NC youth, mental health concerns and associated outcomes of depression have seen a comparable increase, with suicide currently noted as the leading cause of death for children ages 10 to 14.⁴² Our work demonstrates a need for continued research to best support these youth, including developing methods to better understand depression care at a population level with a particular focus on ensuring access to high-quality, evidence-based treatments.^{15,43} Measurement-based care and collaborative care initiatives are central to support youth while ensuring quality care received at a population level. Despite acknowledged challenges in data collection, these programs

should be evaluated more robustly as their implementation expands.⁴⁴ In addition, there is a clear need for effectiveness trials of psychotherapy, antidepressant medication, and the combination in real-world settings with a goal of identifying and addressing barriers to adherence. Future research should aim to incorporate mixed methods such as qualitative data to better understand the perspectives of behavioral providers and patients as well as other factors that may be contributing to our results (eg, patient clinical severity, psychotherapy quality, lack of medication titration, patient response to treatment). Such work could guide the broader public health need to track the types, quality, and outcomes of treatment for youth with depression.

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Drs. Davis, Jones, French, McMickens, Heilbron, Maslow, and Ms. Greiner are with the Duke University School of Medicine, Durham, North Carolina. At the time of the study, Dr. Lea was with the Duke University School of Medicine, Durham, North Carolina. Dr. Lea is currently with the University of Pennsylvania, Philadelphia, Pennsylvania.

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Dr. Jones and Ms. Greiner served as the statistical experts for this research.

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