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Use of Mental Health Services in Transition Age Youth with Bipolar Disorder

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Abstract

Objectives—There is concern that treatment of serious mental illness in the United States declines precipitously following legal emancipation at age 18 years and transition from specialty youth clinical settings. We examined age transition effects on treatment utilization in a sample of youth with bipolar disorder.

Methods—Youth with bipolar disorder ($N = 413$) 7–18 years of age were assessed approximately twice per year (mean interval 8.2 months) for at least 4 years. Annual use of any individual, group, and family therapy, psychopharmacology visits, and hospitalization at each year of age, and monthly use from ages 17 through 19 years, were examined. The effect of age transition to 18 years on monthly visit probability was tested in the subsample with observed transitions ($n = 204$). Putative sociodemographic moderators and the influence of clinical course were assessed.

Results—Visit probabilities for the most common modalities—psychopharmacology, individual psychotherapy, and home-based care—generally fell from childhood to young adulthood. For example, the annual probability of at least one psychopharmacology visit was 97% at age 8, 75% at age 17, 60% at age 19, and 46% by age 22. Treatment probabilities fell in transition-age youth from age 17 through 19, but a specific transition effect at age 18 was not found. Declines did not vary based on sociodemographic characteristics and were not explained by changing severity of the bipolar illness or functioning.

Conclusions—Mental health treatment declined with age in this sample of youth with bipolar disorder, but reductions were not concentrated during or after the transition to age 18 years. Declines were unrelated to symptom severity or impairment.

Keywords

bipolar disorder; longitudinal studies; treatment use; transition-age youth; children; adolescents

Mental health advocates,^{1–3} public health authorities,⁴ and health services researchers⁵ have expressed concern that young people with mental illness are at risk for disruption in clinical and social services when transitioning from adolescence to young adulthood, especially when they turn 18 years of age. Concerns focus in part on how cessation in eligibility for adolescent and school-based services, changes in residence, and shortcomings in the ability of adult treatment settings and providers to engage young people and their families may create treatment obstacles. In addition, the growing independence and legal emancipation of young people in late adolescence may lead them to reject diagnosis and treatment. Because the risk of incident mental illness (i.e., first illness onset) during later adolescence and young adulthood is high⁶ and the clinical, educational, and legal outcomes commonly reported for transition-age youth with mental illness are poor,^{7–10} disruptions in care for this population may have highly adverse public health impacts.

Young people with bipolar disorder (BD) may experience particularly elevated psychiatric and physical health risks during this age transition. BD is a severe and chronic illness that has been increasingly recognized in childhood and adolescence.¹¹ Youth with BD are at high risk for suicidality and for developing comorbid conditions,^{12–16} and they incur greater behavioral and general medical health care costs than youth with many other mental disorders.¹⁷ Professional associations recommend early intervention,^{18–24} and practice parameters based on data from trials conducted in adults and youth recommend maintenance treatments.^{11,25–27}

Despite widespread concern, data on patterns of treatment for youth with serious mental illness transitioning to young adulthood are scarce. A national survey of specialty mental health treatment programs conducted in 1997 found that population-adjusted inpatient, outpatient, and residential treatment rates fell almost 50% between ages 16–17 years (34 per 1,000 civilian population) and ages 18–19 years (18 per 1,000 civilian population) and subsequently climbed slowly through age 25 (21 per 1,000 civilian population for ages 20–21, 22 per 1,000 civilian population for ages 22–23, and 24 per 1,000 civilian population for ages 24–25).²⁸ Furthermore, there are almost no specific data on mental health treatment of transition-age youth with BD. One recent national epidemiologic study of U.S. adolescents 13–18 years of age found no evidence of age effects on probability of lifetime treatment for a number of psychiatric disorders, including BD, but it did not present specific service use findings concerning 18 year olds.²⁹ A study of treatment utilization in a sample of youth with BD found older age was associated with increased probability of any treatment, and with increased volume of treatment in the 6 months following study enrollment, but all participants were under 18 years of age at enrollment, and no test was done for a specific transition-age effect.³⁰

Using data from a well characterized longitudinal sample of youth with BD, the study presented here for the first time tested whether transition to age 18 years is associated with distinctive declines in use of the most common treatment modalities. We also examined whether clinical and sociodemographic characteristics influenced observed age trends in treatment use.

Methods

Participants

Participants were from the naturalistic longitudinal Course and Outcome of Bipolar Youth (COBY) study. The study and subsequent analyses were approved by the institutional review boards at the three participating sites: the University of Pittsburgh Medical Center, Brown University, and the University of California at Los Angeles. Study procedures and participants are described in detail elsewhere.^{31,32}

Briefly, participants were recruited from outpatient clinics (67.6%), inpatient units (14.3%), advertisements (13.3%), and referrals from other physicians (4.8%) at the three diverse sites to increase generalizability of the sample. A total of 413 participants were included in the longitudinal sample examined in this report, with a subsample of 204 participants observed for at least 1 year before and after transition to age 18 years.

At intake, participants: 1) were aged 7 years 0 months to 17 years 11 months; 2) fulfilled criteria for DSM-IV BD type I (BD-I) ($n = 244$), BD type II (BD-II) ($n = 28$), or study-operationalized criteria for BD not otherwise specified (BD-NOS) ($n = 141$)³²; and 3) had normal intellectual functioning. If concern about the possibility of low intellectual functioning was raised by clinical interview, child/parent-report, or history of academic achievement, intellectual functioning was assessed using the Wechsler Abbreviated Scales of Intelligence.³³ Ages in the total longitudinal sample ranged from 7 to 23 years, and the number of participants providing data varied at each month of age. Ages 10 to 21 years were consistently represented by more than 100 participants. Ages at the end of the age span were more sparsely represented.

The retention rate over longitudinal assessment was 86%, with 93% of the participants completing at least one follow-up interview. Except for lower rates of anxiety disorders in youths who dropped out of the study (54.5% compared with 38.7%; $p = 0.02$), there were no

other demographic or clinical differences between those who continued in the study and those who withdrew.

Procedures

Participants were assessed approximately every 6 months (mean interval 8.2 months) for a minimum of 4 years (mean follow-up $5.1 \pm$ standard deviation [SD] 1.8 years). For younger participants (younger than 12 years of age; 44.8%), the child and parent were interviewed together. For older participants (12 years of age and older; 55.2%), the parents were interviewed separately from the child. Following transition to age 18, the adult participants could choose whether to include a report from a parent or other secondary informant (e.g., a spouse).

Measures

Mental health service use—Service use was assessed using the Treatment Schedule of the Adolescent Longitudinal Interval Follow-Up Evaluation (A-LIFE), the adolescent version of the LIFE.³⁴ Informants were asked to report the number of visits for individual therapy, group therapy, family therapy, in-home services, and psychopharmacology the participant attended each week, as well as the number of days spent in inpatient and partial hospitalization per week. While service use measures of the LIFE have not been validated on their own, the LIFE as a whole yields excellent reliability and external validity.^{35,36}

Mood and functional measures—Weekly changes in mood episode severity since the previous evaluation were tracked using A-LIFE Psychiatric Status Rating (PSR) scales.³⁶ These scales use numeric values that have been operationally linked to DSM-IV-TR criteria; DSM-IV-TR criteria information is gathered in the interview and then translated into ratings for each week of the follow-up period. For mood episode severity, scores on the PSR scales range from 1 for no symptoms to 2–4 for varying levels of subthreshold symptoms and impairment to 5–6 for meeting full criteria with different degrees of severity or impairment. For analytic purposes, mania and hypomania scores were combined in one scale (1–8), where ratings of 5 and 6 indicated syndromal hypomania and ratings of 7 and 8 indicated syndromal mania. Consensus scores obtained after interviewing parents and their children were used for the analyses. The most severe weekly rating during each month was used as the monthly score.

Monthly changes in psychosocial functioning since the previous evaluation were tracked using the A-LIFE Psychosocial Functioning Scale (PSF). The PSF has sound psychometric properties in individuals with affective disorders^{37,38} and has been widely used in studies examining functional outcome in BD³⁹ and in studies involving other adolescent clinical populations.⁴⁰ The instrument examines functioning in four domains: 1) work (including employment, academic, and household); 2) interpersonal relations (including relatives and friends); 3) recreational activities and hobbies (e.g., reading, spectator or participant sports, listening to music, socializing, community organizations); and 4) global satisfaction. Ratings reflect the participant's functioning during the worst week of the preceding month as follows: 1 (very good), 2 (good), 3 (fair/slightly impaired), 4 (poor/moderately impaired), and 5 (very poor/severely impaired). The rater's assessment of the participant's global social adjustment takes into consideration what is known about these four domains of psychosocial functioning, and the PSF is scored based on the participant's usual level of social adjustment since the last interview. For analytic purposes, the global social adjustment score was utilized as the measure of psychosocial functioning.

Sociodemographic measures—The sociodemographic characteristics that were measured included self-reported sex, race (white or non-white), ethnicity (Latino and non-

Latino), and a five level measure of Hollingshead socioeconomic status (SES) based on parental reports of their occupation and education.⁴¹ In statistical analyses, SES was dichotomized as low (Hollingshead level IV or V) or high (levels I-III).

Statistical Analyses

All analyses were conducted with SAS 9.3 (Cary, North Carolina).

Describing the sample—Selected baseline sociodemographic and clinical characteristics of the total sample and the subsample with observed age transition were described. Contrasts were conducted with a *t*-test for continuous variables and a χ^2 -test for categorical variables between those participants included in versus excluded from the subsample.

Describing age trends in treatment use—We first sought to describe age trends in treatment use throughout the age range observed in order to examine potential changes in transition-age youth within the broader developmental context. We limited reporting trends to those ages for which at least 30 participants provided data, which resulted in an age range of 8 to 22 years. We considered options for potential annual measures of treatment use and ultimately selected a categorical measure of whether, for each treatment modality, a participant received at least one visit during each year of age (Figure 1). Second, we sought to describe monthly changes in treatment use during the period surrounding transition to age 18 years in order to observe in greater temporal detail the form of a putative transition effect. We therefore calculated, for each modality, the monthly proportion of participants with at least one visit in the month over the period from 17 to 19 years in the subsample with observed age transition (Figure 2).

Testing the effect of age transition on treatment use—In order to test the effect of age transition, monthly probability of any treatment use in youth who transitioned to age 18 during the study was modeled using generalized estimating equations (GEE),⁴² using a binomial distribution with a logit link for the categorical dependent variable of whether any treatment was received during the month. Clustering of observations within individuals (i.e., 25 monthly observations per person) was accounted for in each model using a first order autoregressive (AR1) structure (used for time series analyses). A separate model was built for each treatment modality. Monthly age was included as both a continuous, linearly increasing predictor variable (termed “advancing age”) and a binary predictor variable of transition (coded 0 for age < 18 years versus 1 for age ≥ 18 years and termed “age transition”).

We first fit a set of models using the predictor advancing age in order to observe the linear rate of monthly changes in treatment probabilities over the period (Model 1 in Table 3). We included as covariates the number of years the participants participated in the study by age 18 (equal to 18 minus participant age at study entry) and study recruitment site to adjust for effects of study participation and of site on treatment use. We then fit a second set of models adding the transition variable and the interaction term advancing age*age transition (Model 2 in Table 3). We tested for two types of age transition effects: an abrupt change in probability of utilization, tested by the main effect of the binary variable age transition, and a change in the prevailing trend of treatment utilization over time, tested by the interaction effect of age transition*advancing age.

Testing the effects of sociodemographic characteristics on age trends in treatment use—We fit a third set of models, including all sociodemographic characteristics, to examine putative effects on the probability of treatment and test moderation of age effects by sociodemographic predictors (whether observed age effects

differed among sociodemographic groups) (Model 3 in Table 3). To do so, we reserved the significant age terms from Model 2, and added sociodemographic characteristics as main effects. We retained non-significant effects in this model to enable comparison across treatment modalities. For sociodemographic characteristics with significant main effects, we further tested whether an interaction term with the continuous age variable was significant in order to examine whether age effects differed between groups defined by the sociodemographic characteristic.

Testing the effects of mood and functional characteristics on age trends in treatment use—Finally, we refit a fourth set of models, adding time-varying mood symptom, episode, and disorder characteristics in order to examine the effects of clinical change on treatment probability, and to test whether variation in clinical characteristics explained the observed effects of age on use of each treatment modality (Model 4 in Table 3). In order to prevent model over-specification, non-significant sociodemographic variables were removed prior to the introduction of additional clinical and functional characteristics.

Presenting the magnitude of age effects—In order to simplify interpretation of age effects from model parameters, the linear effect of advancing age was presented so that the odds ratio represented the effect of aging 1 year (the odds of treatment at age $[x+12 \text{ months}]$ divided by the odds at age x).

Results

Sample Characteristics

The selected sociodemographic and clinical characteristics of the total study sample ($N = 413$) and sub-sample with observed age transition ($n = 204$) are presented in Table 1. Participants in the sub-sample with observed age transition were older at study entry, had a later mean age of illness onset, and were more likely to be diagnosed with BD type II and to be female and of low SES status than other participants. Sample sizes and selected sociodemographic and clinical characteristics of the total study sample for selected ages are presented in Table 2. These characteristics reflect both changes within participants over time and the entry and exit of participants from the longitudinal sample due to rolling enrollment. The proportion of participants with high baseline SES status appeared to decline with age, from 59.7% of the sample at age 8 to 22.7% at age 22. This relationship reflected both lower average baseline SES in older than younger participants at study entry and higher average baseline SES of participants recruited in later compared with earlier years of the study. Clinical and social characteristics were similar at selected ages with the exception of mean mania severity, which declined from 3.1 at age 8 to 1.9 at age 22.

Age Trends in Treatment Use from Ages 8 to 22 Years

Age trends in annual treatment use from ages 8 to 22 years—showing probability of at least one visit during each year of age—are presented in Figure 1. The two most commonly used treatment modalities were psychopharmacology sessions and individual therapy, and annual probabilities of visits for these treatments appeared to decline most sharply starting at age 16 and 17 years, respectively. The annual proportion of youth receiving at least one pharmacotherapy visit was 97% at age 8, 93% at age 12, 75% at age 17, 60% at age 19, and 46% by age 22. The annual proportion of youth utilizing at least one individual therapy visit was 72% at age 8, 63% at age 12, 63% at age 17, 38% at age 19, and 26% by age 22.

Annual visits for group therapy, family therapy, and hospitalization (inpatient or partial hospitalization) were less commonly reported throughout the age range. The proportion of youth with at least one home based visit was 47% at age 8, 21% at age 12, 14% at age 17,

and 0% by age 21. Utilization of both group and family therapy peaked during ages 12–13 years (11%–14% for group therapy, and 12%–19% for family therapy) and became extremely rare after age 19 years (less than 5%). The proportion of youth with at least one hospitalization remained fairly stable with age, dropping below 10% only at ages 20 and 21 years.

Monthly Age Trends in Treatment Use from Ages 17 to 19 Years

Monthly age trends in treatment use from ages 17 to 19 years in the study subsample with observed age transition are presented in Figure 2. Proportions of youth with at least one visit in the month declined consistently for the two most common modalities—psychopharmacology and individual therapy—within this narrower age range, while proportions receiving other treatments remained low throughout the period. For example, psychopharmacology visits were utilized by 38% in the first month after turning age 17, by 35% in the first month after turning 18, and by 27%, in the twelfth month after turning age 18.

Age Effects on Probability of Treatment

Results from fitting a first set of models testing the effect of advancing age on monthly treatment probabilities over the period are presented in Model 1 in Table 3. Advancing age was significantly associated with declining probability of monthly treatment for the following treatment modalities: psychopharmacology visits (odds ratio [OR] = 0.69, 95% confidence interval [CI] = 0.61–0.78), individual therapy (0.54, 0.48–0.69), home-based services (0.54, 0.37–0.78), and inpatient hospitalization (0.48, 0.28–0.69). For example, the OR of 0.69 for psychopharmacology visits indicates that the odds of having at least one visit in a month declined 31% with each advancing year of age (12 months). By contrast, no age transition effect was observed for any treatment modality, as indicated by the failure of either the age transition effect or the advancing age*age transition interaction term to achieve significance at $p < 0.05$ in Model 2 in Table 3. Longer duration of participation in the study was associated with lower probabilities of psychopharmacology and individual therapy visits. For example, the OR of 0.84 for psychopharmacology indicates that each additional year of study participation was associated with a 16% reduction in odds of a visit.

Sociodemographic, Mood, and Functional Effects

A third set of models, including all sociodemographic characteristics and testing whether observed age effects varied across any sociodemographic groups, is presented under Model 3 in Table 3. Compared to low SES youth, higher SES youth were more likely to receive individual therapy (adjusted OR [AOR] 1.76, 95% CI 1.06–2.93), but SES did not moderate the effect of advancing age on probability of treatment ($\chi^2(1) = 0.38, p > 0.05$). No other sociodemographic characteristics significantly predicted treatment. A consistent, large, but statistically non-significant trend was observed which suggested fewer visits by non-white youth for all modalities except home-based treatment. After adjusting for all listed sociodemographic characteristics, age remained significant for psychopharmacology visits, individual therapy, home services, and inpatient hospitalization.

The effects of mood and functional change on treatment probability are presented in Model 4 in Table 3. Higher depressive symptomatology was associated with greater monthly probability of psychopharmacology visits (AOR 1.10, CI 1.03–1.19), individual therapy (1.08, 1.02–1.13), and inpatient hospitalization (1.39, 1.10–1.75), while greater manic symptomatology was significantly associated only with increasing probability of inpatient hospitalization (1.28, 1.07–1.54). Each increase in one point on the global social functioning score—indicating worse functioning—was associated with a greater monthly probability of psychopharmacology visits (AOR 1.16, CI 1.00–1.33), and markedly elevated odds of

inpatient hospitalization (AOR 2.12, 95% CI 1.34–3.37). Each increase in one point on the interpersonal functioning score—indicating worse functioning—was associated with a greater monthly probability of psychopharmacology visits (AOR 0.86, CI 0.75–1.00). After adjusting for clinical and functional characteristics as well as demographic characteristics, advancing age continued to significantly predict reduced probability of psychopharmacology visits, individual therapy, home services, and inpatient hospitalization visits, and the magnitudes of age effects were essentially unchanged from those observed in Model 1.

Discussion

Mental health treatment declined with age in this sample of youth with BD, but reductions were not concentrated during or after the transition to age 18 years. Declines were not explained by changes in underlying illness severity or functional impairment and were similar across sociodemographic groups. Although the risks of treatment disruption with transition to young adulthood do not appear to be focused around the precise transition to age 18 years, findings support broad concern about declining treatment of young people with bipolar illness as they age into late adolescence and young adulthood.

Data on age-related trends in treatment use are limited and, to our knowledge, no previous longitudinal studies have used sociodemographic characteristics and repeated clinical assessments to examine age trends in the treatment of youth with BD. A cross-sectional, national survey of mental health treatment programs found a pattern of sharply lower population-adjusted mental health treatment rates at ages 18–19 than 16–17 years, as well as rising rates during ages 20–25 years.²⁸ This pattern may be driven by both declining treatment among 17–18 year olds with onset of illness in childhood or adolescence as well as initiation of new treatment by young adults, who experience high incidence risk (probability of first illness onset) for many of the most common mental illnesses. By contrast, our longitudinal cohort of youth with BD excluded adult onset cases who might seek assessment and treatment following symptom emergence. Similarly, the marked annual increases in the rate of outpatient and inpatient visits for community diagnosed bipolar illness observed in cross-sectional outpatient and inpatient provider surveys are likely driven by newly treated youth, rather than intensification of treatment among existing cases.^{43–45} A recent analysis of a national epidemiologic sample of U.S. adolescents aged 13–18 years found no evidence of age effects on probability of prior treatment for mood disorders,²⁹ but that study reported only on the presence of any lifetime treatment and did not characterize treatment trajectory over time.

While greater symptomatology—as measured by more impaired social and interpersonal adjustment, depression, and mania—predicted hospitalization in transition-age youth, temporal changes in symptoms did not explain the age-related treatment declines that we observed. Lower SES was associated with reduced probability of individual psychotherapy and we observed a large, consistent, but non-significant trend of lesser treatment for non-white youth, but we did not observe moderation effects by these characteristics on age trends. Taken together, these patterns support the impression that declining treatment use is largely independent of the course of mood disorder symptoms and sociodemographic influences and may be driven by other processes. It may be steady growth in the independence of adolescents and young adults, rather than the hypothesized acute effects of emancipation and changing clinical program eligibility at 18 years that drive the movement away from treatment. Alternatively, it may be that, in the context of persisting symptoms, perceptions of the lack of treatment efficacy or burden of adverse effects may prompt decreased treatment seeking.

We found that longer participation in the study—reflecting younger age at study entry—was associated with reduced probability of visits for the most frequent treatment modalities, psychopharmacology and psychotherapy. Because many participants were referred by community clinicians, it may be that longer study participation was a proxy for a longer history of mental health treatment, and that the gradual age-related treatment declines we observed occurred at younger ages in participants who were younger when they first entered treatment. Because we lacked information on the age at which participants received their first mental health treatment for BD, we could not directly test this explanation. While we were able to exclude cohort effects as the cause of the observed effect of longer study participation, we could not exclude the unlikely possibility that study participation itself reduced participation in community treatment, perhaps by being perceived as a substitute for care. Whatever the cause of the association between age at study entry and treatment, it did not explain the robust effects of advancing age on declining treatment in our models.

The most promising psychosocial treatment modalities developed to date to treat youth with BD focus on the family unit,^{13,38,46–49} which experiences high levels of parenting stress,⁵⁰ and yet we found family therapy was infrequently used. Barriers to family treatment include unwillingness on the part of some family members to attend therapy, cost of treatment and restrictive payer limits on the number of family sessions reimbursed, lack of education regarding treatment benefits as an adjunct to psychopharmacology, low availability of providers, and logistic considerations such as arranging transportation and coordinating schedules. Future research should explore the factors involved in receipt of family treatment for families of youth with BD and the content of family care provided in routine clinical settings.

Limitations

The results of this study must be considered within the context of certain limitations. The majority of the sample was clinically referred to the study by treating psychiatrists, physicians, and therapists. Therefore, results may not readily generalize to epidemiological samples of youth diagnosed with BD. Our data also cannot inform concerns that pediatric BP may be over-diagnosed in community treatment settings. Diagnostic assessment of COBY participants was extensive and consisted of standardized interviews and clinical case consultations. Therefore youth whose community diagnosis of BP was deemed erroneous were excluded from the study. The nature of repeated assessments in the longitudinal study may have skewed the sample to overestimate treatment seeking, as the participants were willing to engage in multiple follow-up interviews. Our results do not characterize the treatment trajectories of the majority of youth with BD, since most youth are untreated and the first contact with mental health treatment typically occurs after age 18 years.^{51,52} The study sample was representative of the general population at the three study sites (8% Hispanic and 17% non-White race), but our sample sizes were too small to allow stratified analyses by race and ethnicity and may have contributed to our failure to demonstrate significance of race differences in youth mental health treatment, which have been observed elsewhere.^{52,53} We only began collecting data on participants' residence, current employment, and school enrollment in later follow-up assessments, so we could not meaningfully evaluate the degree to which changes in these characteristics explained observed age trends. Data were not obtained on therapeutic orientation of treatment providers or type of individual psychotherapy delivered (e.g., cognitive behavioral, interpersonal and social rhythm therapy, psychodynamic) which could be related to psychosocial treatment utilization. Information associated with potential barriers to services (i.e., why treatment was not received) was not ascertained from participants. Finally, we did not examine age-related patterns in medication prescribing, adherence, and adverse effects,

which are clearly of interest but require dedicated analyses and discussion exceeding the space constraints of the current study.

Clinical Implications

Earlier analyses of these longitudinal data indicate that the symptom course for youth with BD is characterized largely by episodic depressive and mixed manic illness and rapid mood changes,⁵⁴ and large scale epidemiologic data demonstrate that lifetime persistence of BD symptoms is high.⁵⁵ The current study suggests that treatment of youth with BD decreases with age, irrespective of symptomatic course and sociodemographic characteristics, raising concern that these youth are increasingly exposed to the risks of untreated illness. Unfortunately, the pervasiveness of this decline in our data precludes easy answers for how best to support maintenance treatment through late adolescence and young adulthood. Improvements in available pharmacotherapies, which currently suffer from high adverse effect burdens and limited efficacy except for the treatment of acute mania in young people,¹¹ may promote greater utilization and improve treatment outcomes. Evidence on supporting continuity of care in young people for other disorders, such as attention-deficit/hyperactivity disorder, suggests the importance of parental attitudes toward illness and treatment.^{56,57} Efforts to educate families may partly reduce risk of discontinuation of individual treatment modalities and offer an important opportunity to deliver evidence-based interventions. Despite growing public perception that neurobiological processes (rather than failed morals or character) cause mental disorders, stigmatization of mental illness remains high.^{58,59} Stigma may increasingly discourage treatment seeking over the course of development as young people gain awareness of the social and occupational consequences of being identified as an individual with mental illness. Broad cultural efforts to counter perceptions of those with mental illness as dangerous and incompetent remain important tasks for mental health advocates and public health authorities. Finally, greater attention to logistic barriers to treatment may reveal clear areas for remediation.

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References

1. Laugharne R, Priebe S. Trust, choice and power in mental health: A literature review. *Soc Psychiatry Psychiatr Epidemiol*. 2006; 41:843–52. [PubMed: 17072503]
2. Schimmelmann BG, Conus P, Schacht M, et al. Predictors of service disengagement in first-admitted adolescents with psychosis. *J Am Acad Child Adolesc Psychiatry*. 2006; 45:990–9. [PubMed: 16865042]
3. O'Brien A, Fahmy R, Singh SP. Disengagement from mental health services. A literature review. *Soc Psychiatry Psychiatr Epidemiol*. 2009; 44:558–68. [PubMed: 19037573]
4. Substance Abuse and Mental Health Services Administration (SAMHSA). NSDUH Series H-46, HHS Publication No (SMA) 13-4795. Rockville, MD: SAMHSA; 2013. Results from the 2012 National Survey on Drug Use and Health: Summary of national findings. available at <http://samhsa.gov/data/NSDUH/2012SummNatFindDetTables/NationalFindings/NSDUHresults2012.pdf> [accessed September 17, 2013]
5. Davis M, Sondheimer DL. State child mental health efforts to support youth in transition to adulthood. *J Behav Health Serv Res*. 2005; 32:27–42. [PubMed: 15632796]
6. Merikangas KR, He JP, Burstein M, et al. Lifetime prevalence of mental disorders in U.S. adolescents: Results from the National Comorbidity Survey Replication–Adolescent Supplement (NCS-A). *J Am Acad Child Adolesc Psychiatry*. 2010; 49:980–9. [PubMed: 20855043]
7. Manteuffel B, Stephens RL, Sondheimer DL, et al. Characteristics, service experiences, and outcomes of transition-aged youth in systems of care: Programmatic and policy implications. *J Behav Health Serv Res*. 2008; 35:469–87. [PubMed: 18618264]
8. Davis M, Banks S, Fisher W, et al. Longitudinal patterns of offending during the transition to adulthood in youth from the mental health system. *J Behav Health Serv Res*. 2004; 31:351–66. [PubMed: 15602138]
9. Davis M, Vander Stoep A. The transition to adulthood for youth who have serious emotional disturbance: Develop -mental transition and young adult outcomes. *J Ment Health Adm*. 1997; 24:400–27. [PubMed: 9364110]
10. Vander Stoep A, Beresford SA, Weiss NS, et al. Community-based study of the transition to adulthood for adolescents with psychiatric disorder. *Am J Epidemiol*. 2000; 152:352–62. [PubMed: 10968380]
11. McClellan J, Kowatch R, Findling RL. Practice parameter for the assessment and treatment of children and adolescents with bipolar disorder. *J Am Acad Child Adolesc Psychiatry*. 2007; 46:107–25. [PubMed: 17195735]
12. Strober M, Schmidt-Lackner S, Freeman R, et al. Recovery and relapse in adolescents with bipolar affective illness: A five-year naturalistic, prospective follow-up. *J Am Acad Child Adolesc Psychiatry*. 1995; 34:724–31. [PubMed: 7608045]
13. Pavuluri MN, Graczyk PA, Henry DB, et al. Child- and family-focused cognitive-behavioral therapy for pediatric bipolar disorder: Development and preliminary results. *J Am Acad Child Adolesc Psychiatry*. 2004; 43:528–37. [PubMed: 15100559]
14. Brent DA, Kolko DJ, Wartella ME, et al. Adolescent psychiatric inpatients' risk of suicide attempt at 6-month follow-up. *J Am Acad Child Adolesc Psychiatry*. 1993; 32:95–105. [PubMed: 8428891]
15. Lewinsohn PM, Klein DN, Seeley JR. Bipolar disorders in a community sample of older adolescents: Prevalence, phenomenology, comorbidity, and course. *J Am Acad Child Adolesc Psychiatry*. 1995; 34:454–63. [PubMed: 7751259]
16. Wozniak J, Biederman J, Kiely K, et al. Mania-like symptoms suggestive of childhood-onset bipolar disorder in clinically referred children. *J Am Acad Child Adolesc Psychiatry*. 1995; 34:867–76. [PubMed: 7649957]

17. Peele PB, Axelson DA, Xu Y, et al. Use of medical and behavioral health services by adolescents with bipolar disorder. *Psychiatr Serv.* 2004; 55:1392–6. [PubMed: 15572567]
18. Melle I, Larsen TK, Haahr U, et al. Reducing the duration of untreated first-episode psychosis: Effects on clinical presentation. *Arch Gen Psychiatry.* 2004; 61:143–50. [PubMed: 14757590]
19. Addington J, Leriger E, Addington D. Symptom outcome 1 year after admission to an early psychosis program. *Can J Psychiatry.* 2003; 48:204–7. [PubMed: 12728745]
20. McGorry PD, Yung AR. Early intervention in psychosis: An overdue reform. *Aust N Z J Psychiatry.* 2003; 37:393–8. [PubMed: 12873322]
21. Berk M, Hallam K, Lucas N, et al. Early intervention in bipolar disorders: Opportunities and pitfalls. *Med J Aust.* 2007; 187:S11–4. [PubMed: 17908017]
22. Berk M, Hallam K, Malhi GS, et al. Evidence and implications for early intervention in bipolar disorder. *J Ment Health.* 2010; 19:113–26. [PubMed: 20433320]
23. Preston NJ, Stirling ML, Perera K, et al. A statewide evaluation system for early psychosis. *Aust N Z J Psychiatry.* 2003; 37:421–8. [PubMed: 12873326]
24. Craig TK, Garety P, Power P, et al. The Lambeth Early Onset (LEO) Team: Randomised controlled trial of the effectiveness of specialised care for early psychosis. *BMJ.* 2004; 329:1067. [PubMed: 15485934]
25. Kowatch RA, Fristad M, Birmaher B, et al. Treatment guidelines for children and adolescents with bipolar disorder. *J Am Acad Child Adolesc Psychiatry.* 2005; 44:213–35. [PubMed: 15725966]
26. Malhi GS, Adams D, Lampe L, et al. Clinical practice recommendations for bipolar disorder. *Acta Psychiatr Scand Suppl.* 2009; 439:27–46. [PubMed: 19356155]
27. Goodwin GM. Evidence-based guidelines for treating bipolar disorder: Revised second edition—recommendations from the British Association for Psychopharmacology. *J Psychopharmacol.* 2009; 23:346–88. [PubMed: 19329543]
28. Pottick KJ, Bilder S, Vander Stoep A, et al. US patterns of mental health service utilization for transition-age youth and young adults. *J Behav Health Serv Res.* 2008; 35:373–89. [PubMed: 18026842]
29. Merikangas KR, He JP, Burstein M, et al. Service utilization for lifetime mental disorders in U.S. adolescents: Results of the National Comorbidity Survey–Adolescent Supplement (NCS-A). *J Am Acad Child Adolesc Psychiatry.* 2011; 50:32–45. [PubMed: 21156268]
30. Rizzo CJ, Esposito-Smythers C, Swenson L, et al. Factors associated with mental health service utilization among bipolar youth. *Bipolar Disord.* 2007; 9:839–50. [PubMed: 18076533]
31. Axelson D, Birmaher B, Strober M, et al. Phenomenology of children and adolescents with bipolar spectrum disorders. *Arch Gen Psychiatry.* 2006; 63:1139–48. [PubMed: 17015816]
32. Birmaher B, Axelson D, Strober M, et al. Clinical course of children and adolescents with bipolar spectrum disorders. *Arch Gen Psychiatry.* 2006; 63:175–83. [PubMed: 16461861]
33. Weschler Abbreviated Scale of Intelligence (WASI). San Antonio: Harcourt Brace and Company; 1999.
34. Keller MB, Lavori PW, Friedman B, et al. The Longitudinal Interval Follow-up Evaluation. A comprehensive method for assessing outcome in prospective longitudinal studies. *Arch Gen Psychiatry.* 1987; 44:540–8. [PubMed: 3579500]
35. Warshaw MG, Keller MB, Stout RL. Reliability and validity of the Longitudinal Interval Follow-up Evaluation for assessing outcome of anxiety disorders. *J Psychiatr Res.* 1994; 28:531–45. [PubMed: 7699612]
36. Warshaw MG, Dyck I, Allsworth J, et al. Maintaining reliability in a long-term psychiatric study: An ongoing inter-rater reliability monitoring program using the Longitudinal Interval Follow-up Evaluation. *J Psychiatr Res.* 2001; 35:297–305. [PubMed: 11591433]
37. Leon AC, Solomon DA, Mueller TI, et al. A brief assessment of psychosocial functioning of subjects with bipolar I disorder: The LIFE-RIFT. Longitudinal Interval Follow-up Evaluation–Range Impaired Functioning Tool. *J Nerv Ment Dis.* 2000; 188:805–12. [PubMed: 11191580]
38. Morris CD, Miklowitz DJ, Waxmonsky JA. Family-focused treatment for bipolar disorder in adults and youth. *J Clin Psychol.* 2007; 63:433–45. [PubMed: 17417810]

39. Miklowitz DJ, Otto MW, Frank E, et al. Intensive psychosocial intervention enhances functioning in patients with bipolar depression: Results from a 9-month randomized controlled trial. *Am J Psychiatry*. 2007; 164:1340–7. [PubMed: 17728418]
40. Phillips KA, Didie ER, Menard W, et al. Clinical features of body dysmorphic disorder in adolescents and adults. *Psychiatry Res*. 2006; 141:305–14. [PubMed: 16499973]
41. Hollingshead, AB. Four-factor index of social status. New Haven, CT: Yale University; 1975.
42. Liang KY, Zeger SL. Longitudinal data analysis using generalized linear models. *Biometrika*. 1986; 73:13–22.
43. Moreno C, Laje G, Blanco C, et al. National trends in the outpatient diagnosis and treatment of bipolar disorder in youth. *Arch Gen Psychiatry*. 2007; 64:1032–9. [PubMed: 17768268]
44. Case BG, Olfson M, Marcus SC, et al. Trends in the inpatient mental health treatment of children and adolescents in US community hospitals between 1990 and 2000. *Arch Gen Psychiatry*. 2007; 64:89–96. [PubMed: 17199058]
45. Blader JC, Carlson GA. Increased rates of bipolar disorder diagnoses among U.S. child, adolescent, and adult inpatients, 1996–2004. *Biol Psychiatry*. 2007; 62:107–14. [PubMed: 17306773]
46. Miklowitz DJ, George EL, Axelson DA, et al. Family-focused treatment for adolescents with bipolar disorder. *J Affect Disord*. 2004; 82(Suppl 1):S113–28. [PubMed: 15571785]
47. Lofthouse N, Fristad MA. Psychosocial interventions for children with early-onset bipolar spectrum disorder. *Clin Child Fam Psychol Rev*. 2004; 7:71–88. [PubMed: 15255173]
48. Miklowitz DJ. Family-focused treatment for children and adolescents with bipolar disorder. *Isr J Psychiatry Relat Sci*. 2012; 49:95–101. [PubMed: 22801288]
49. Miklowitz DJ, Axelson DA, Birmaher B, et al. Family-focused treatment for adolescents with bipolar disorder: Results of a 2-year randomized trial. *Arch Gen Psychiatry*. 2008; 65:1053–61. [PubMed: 18762591]
50. Sisson DP, Fristad MA. A survey of stress and support for parents of children with early-onset bipolar disorder. *Bipolar Disorders*. 2001; 3(Suppl. 1):58. [PubMed: 11333063]
51. Merikangas KR, Akiskal HS, Angst J, et al. Lifetime and 12-month prevalence of bipolar spectrum disorder in the National Comorbidity Survey Replication. *Arch Gen Psychiatry*. 2007; 64:543–52. [PubMed: 17485606]
52. Merikangas KR, He JP, Burstein M, et al. Service utilization for lifetime mental disorders in U.S. adolescents: Results of the National Comorbidity Survey-Adolescent Supplement (NCS-A). *J Am Acad Child Adolesc Psychiatry*. 2011; 50:32–45. [PubMed: 21156268]
53. Alegria M, Vallas M, Pumariega AJ. Racial and ethnic disparities in pediatric mental health. *Child Adolesc Psychiatr Clin N Am*. 2010; 19:759–74. [PubMed: 21056345]
54. Birmaher B, Axelson D, Goldstein B, et al. Four-year longitudinal course of children and adolescents with bipolar spectrum disorders: The Course and Outcome of Bipolar Youth (COBY) study. *Am J Psychiatry*. 2009; 166:795–804. [PubMed: 19448190]
55. Nierenberg AA, Akiskal HS, Angst J, et al. Bipolar disorder with frequent mood episodes in the National Comorbidity Survey Replication (NCS-R). *Mol psychiatry*. 2010; 15:1075–87. [PubMed: 19564874]
56. DosReis S, Mychailyszyn MP, Evans-Lacko SE, et al. The meaning of attention-deficit/hyperactivity disorder medication and parents' initiation and continuity of treatment for their child. *J Child Adolesc Psychopharmacol*. 2009; 19:377–83. [PubMed: 19702489]
57. Larson JJ, Yoon Y, Stewart M, et al. Influence of care-givers' experiences on service use among children with attention-deficit hyperactivity disorder. *Psychiatr Serv*. 2011; 62:734–9. [PubMed: 21724785]
58. Pescosolido BA, Martin JK, Long JS, et al. “A disease like any other”? A decade of change in public reactions to schizophrenia, depression, and alcohol dependence. *Am J Psychiatry*. 2010; 167:1321–30. [PubMed: 20843872]
59. Michalak E, Livingston JD, Hole R, et al. ‘It’s something that I manage but it is not who I am’: Reflections on internalized stigma in individuals with bipolar disorder. *Chronic Illness*. 2011; 7:209–24. [PubMed: 21357643]

Figure 1. Proportion of youth with bipolar disorder aged 8 to 22 years receiving at least one treatment visit in a year, by age and treatment modality

Annual proportions are the proportion of the sample ($N = 413$) reporting at least one visit for the treatment modality at each age. Because participants were enrolled on a rolling basis with varying follow-up durations, annual proportions are based on subsamples of the overall sample (see Table 2).

Figure 2. Proportion of transition age youth with bipolar disorder receiving at least one treatment visit in a month, by age in months surrounding the 18th birthday and treatment modality

Findings are for the subset ($n = 204$) of participants whose transition to age 18 occurred during study follow-up. Each monthly proportion is based on the subsample who were enrolled in the study at that time, ranging from $n = 165$ at age 17 years and 0 months to $n = 175$ at age 18 years and 12 months.

Table 1
Sociodemographic and clinical characteristics at study entry of the total study sample and the sub-sample with observed age transition to 18 years

Characteristic	Total sample (N = 413)	Sub-sample with observed age transition (n = 204)	Statistical contrast* t or χ^2
Age at entry, mean	12.6 (413)	15.2 (204)	123.3**
Age at entry, % (n)			
7-12 years	51.3 (212)	11.3 (23)	
13-17 years	48.7 (201)	88.7 (181)	
Sex, % (n)			6.8**
Male	53.5 (221)	47.1 (96)	
Female	46.5 (192)	52.9 (108)	
Race, % (n)			0.2
White	82.1 (339)	82.8 (169)	
Non-white	17.9 (74)	17.2 (35)	
Ethnicity, % (n)			1.6
Hispanic	6.3 (26)	7.8 (16)	
Non-Hispanic	93.7 (387)	92.2 (188)	
Socioeconomic status, % (n)			11.8**
High	45.8 (189)	37.3 (76)	
Low	54.2 (224)	62.8 (128)	
Study site, % (n)			4.8
Los Angeles, CA	17.9 (74)	21.6 (44)	
Pittsburgh, PA	49.4 (204)	49.5 (101)	
Providence, RI	32.7 (135)	28.9 (59)	
Age of bipolar onset, mean	9.2 (413)	11.7 (204)	47.4**
Bipolar type, % (n)			13.6**
Bipolar I	59.1 (244)	60.8 (124)	
Bipolar II	6.8 (28)	10.8 (22)	
Bipolar NOS	34.1 (141)	28.4 (58)	

* Contrasts were conducted with a t-test for continuous variables and a χ^2 -test for categorical variables.

** p < 0.01

Socioeconomic status: High = Hollingshead Levels I-III, Low = Hollingshead Levels IV-V

Table 2
Selected sociodemographic and clinical characteristics of the bipolar youth sample at selected ages

	Age (years)						
	8 (n = 72)	12 (n = 180)	16 (n = 225)	17 (n = 228)	18 (n = 204)	19 (n = 174)	22 (n = 66)
<i>Sociodemographic characteristics, % (n)</i>							
Female sex	36.1 (26)	35.6 (64)	47.1 (106)	51.3 (117)	52.9 (108)	54.0 (94)	63.6 (42)
White race	84.7 (61)	84.4 (152)	81.8 (184)	82.5 (188)	82.4 (168)	83.9 (146)	83.3 (55)
Hispanic ethnicity	6.9 (5)	4.4 (8)	6.2 (14)	7.5 (17)	7.8 (16)	6.9 (12)	6.1 (4)
High socioeconomic status at entry	59.7 (43)	54.4 (98)	42.2 (95)	37.3 (85)	36.8 (75)	33.3 (58)	22.7 (15)
<i>Time-varying mood and functional characteristics</i>							
Bipolar type I, % (n)	56.9 (41)	62.2 (112)	67.1 (151)	66.7 (152)	67.6 (138)	68.4 (119)	66.7 (44)
Depression severity, ^a mean	2.8 (72)	2.6 (180)	2.6 (225)	2.5 (225)	2.5 (204)	2.5 (174)	2.6 (66)
Mania severity, ^b mean	3.1 (72)	2.6 (180)	2.4 (225)	2.4 (225)	2.1 (204)	2.2 (174)	1.9 (66)
Global social functioning, ^c mean	3.2 (72)	3.1 (180)	3.1 (225)	3.0 (225)	2.9 (204)	2.9 (174)	3.0 (66)
Interpersonal functioning, ^d mean	2.1 (72)	2.3 (180)	2.4 (225)	2.4 (225)	2.4 (204)	2.3 (174)	2.2 (66)

Socioeconomic status: High = Hollingshead Levels I–III, Low = Hollingshead Levels IV–V.

^a Depression severity: Psychiatric Status Rating (PSR) range 1–6 (1 = no symptoms, 2–4 = varying levels of sub threshold symptoms and impairment, 5–6 = meeting full criteria with different degrees of severity or impairment).

^b Mania severity: PSR range 1–8 (5–6 = syndromal hypomania, 7–8 = syndromal mania).

^c Global social functioning: Rater's assessment of participant's usual level of social adjustment since the last interview based on the A-LIFE Psychosocial Functioning Scale (PSF).

^d Interpersonal functioning: Participant's interpersonal functioning with relatives and friends since the last interview based on the PSF.

Table 3
Adjusted odds ratios of monthly probability of at least one mental health treatment visit by bipolar youth aged 17-19, by patient characteristic and visit treatment modality

Characteristic (vs. reference level)	Adjusted odds ratio of monthly visit, by visit treatment modality (95% confidence interval)				
	Psycho-pharmacology	Individual	Home	Inpatient	Group
Model 1: Testing linear age effect over time					
Advancing age, in years [†]	0.69 (0.61–0.78)**	0.54 (0.48–0.69)**	0.54 (0.37–0.78)**	0.48 (0.28–0.69)**	0.54(0.28–1.13)
Years participated in study by age 18	0.84 (0.75–0.94)**	0.84 (0.73–0.97)*	1.27(0.93–1.73)	0.78(0.55–1.09)	1.08(0.74–1.56)
Model 2: Testing age transition effects					
Advancing age, in years [†]	0.78 (0.61–1.00)*	0.61 (0.48–0.98)**	0.54 (0.32–1.00)*	0.61 (0.25–1.43)	0.89(0.37–2.01)
Years participated in study by age 18	0.84 (0.75–0.94)**	0.85 (0.73–0.98)*	1.19(0.87–1.62)	0.79(0.56–1.10)	1.09(0.76–1.56)
Age transition (18 vs <18)	0.83 (0.64–1.06)	0.91 (0.69–1.19)	0.63 (0.39–1.01)	0.62 (0.23–1.68)	0.57(0.21–1.51)
Advancing age* age transition	1.00(0.96–1.04)	0.97(0.93–1.02)	0.89(0.78–1.01)	0.94(0.81–1.08)	1.04(0.88–1.22)
Model 3: Testing age effects in the context of socio-demographic effects					
Advancing age, in years [†]	0.69 (0.61–0.78)**	0.54 (0.42–0.69)**	0.54 (0.37–0.78)**	0.48 (0.28–0.69)**	0.54(0.25–1.13)
Years participated in study by age 18	0.83 (0.70–0.98)*	0.90(0.73–1.11)	1.55 (0.99–2.44)	0.81(0.57–1.15)	1.06(0.64–1.76)
Calendar year of birth, i.e. cohort	1.10(0.49–2.48)	0.68(0.27–1.73)	0.26(0.03–2.05)	0.78(0.22–2.73)	0.64 (0.09–4.54)
Female sex (vs. male)	1.04(0.72–1.51)	1.06(0.66–1.71)	0.81 (0.28–2.36)	1.23 (0.70–2.16)	0.64(0.23–1.78)
Non-white race (vs. white)	0.56(0.30–1.06)	0.58(0.32–1.06)	1.01 (0.27–3.87)	0.40(0.16–1.01)	0.41 (0.04–4.06)
Hispanic ethnicity (vs. non-Hispanic)	1.46(0.72–3.00)	0.98(0.38–2.50)	0.64(0.13–3.03)	0.92 (0.33–2.55)	0.64 (0.06–7.27)
High SES at baseline (vs. low)	1.33 (0.87–2.03)	1.76 (1.06–2.93)*	0.74(0.25–2.22)	0.81 (0.40–1.65)	0.63 (0.21–1.94)
Model 4: Testing age effects in the context of time-varying mood, functional and social effects^{†,‡}					
Advancing age, in year [†]	0.69 (0.61–0.99)**	0.54 (0.48–0.69)**	0.54 (0.37–0.78)**	0.48 (0.32–0.78)**	0.61(0.37–1.13)
Years participated in study by age 18	0.84 (0.75–0.94)**	0.86 (0.74–0.99)*	1.23 (0.90–1.68)	0.90(0.62–1.29)	1.05(0.73–1.51)
Bipolar type I (vs. type II or NOS)	1.12(0.75–1.67)	1.01 (0.64–1.60)	2.25 (0.84–6.03)	1.68(0.79–3.57)	0.76(0.20–2.98)
Depression severity	1.10 (1.03–1.19)**	1.08 (1.02–1.13)**	1.00(0.95–1.05)	1.39 (1.10–1.75)**	1.01 (0.96–1.07)
Mania severity	0.96(0.89–1.02)	0.96(0.92–1.01)	1.00(0.90–1.11)	1.28 (1.07–1.54)**	1.10(0.99–1.22)
Global social functioning	1.16 (1.00–1.33)*	0.95 (0.84–1.07)	1.00(0.75–1.34)	2.12 (1.34–3.37)**	1.07(0.89–1.28)
Interpersonal functioning	0.86 (0.75–1.00)*	1.07(0.96–1.19)	1.16(0.89–1.50)	1.22 (0.94–1.57)	1.11 (0.87–1.43)

All models include subject study site as a covariate.

[†] Adjusted odds ratio represents effect of aging one year (12 months);

^{††} Denotes controlling for significant Model 3 effects

* $p < 0.05$;

** $p < 0.01$; ORs significantly different from 1 at $p < 0.05$ shown in **bold**

Socio-economic status (SES): high = Hollingshead Levels I-III, low = Hollingshead Levels W-V. Depression severity: Psychiatric Status Rating (PSR) range 1-6 (1 = no symptoms, 2-4 = varying levels of sub threshold symptoms and impairment, 5-6 = meeting full criteria with different degrees of severity or impairment). Mania severity: PSR range 1-8 (5-6 = syndromal hypomania, 7-8=syndromal mania). Global social functioning: Rater's assessment of participant's usual level of social adjustment since the last interview. Interpersonal functioning: Participant's interpersonal functioning with relatives and friends since the last interview.