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Psychotropic Medication Treatment of Adolescents: Results from the National Comorbidity Survey–Adolescent Supplement

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Abstract

Objective—To examine the 12-month prevalence of psychotropic medication use among adolescents and the match between mental disorder diagnoses and past year antidepressant and stimulant use.

Method—Data are from the National Comorbidity Survey–Adolescent Supplement (2002–2004), a nationally representative survey of 10,123 adolescents ages 13 to 18 years, that assesses *DSM-IV* disorders using a fully structured diagnostic interview, a modified version of the World Health Organization Composite International Diagnostic Interview (CIDI). Rates of 12-month psychotropic medication use are stratified by respondent socio-demographic characteristics and the distribution of 12-month *DSM-IV* CIDI disorders is estimated among past 12-month use of antidepressants and stimulants.

Results—During a one year period, 7.0% of adolescents used at least one psychotropic medication; these medications were most commonly antidepressants (3.9%) followed by stimulants (2.8%), anxiolytics (0.8%), antipsychotics (0.5%) and mood stabilizers (0.4%). Nearly three-quarters (74.1%) of adolescents with any past year psychotropic medication use had at least one CIDI mental disorder and many had disorders for which the specific medication class is clinically indicated. Among adolescents using antidepressants, 48.8% had a past 12 month depressive or anxiety disorder and an additional 20.3% had a lifetime depressive or anxiety disorder. Nearly one half (49.1%) of adolescents using stimulants met past 12 month attention-deficit/hyperactivity disorder (ADHD) criteria and an additional 13.1% met lifetime criteria for ADHD.

Conclusions—Most adolescents who are treated with psychotropic medications have one or more psychiatric disorders and many, though far from all, have mental disorders for which the specific medications are clinically indicated.

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Keywords

psychotropic medications; *DSM-IV* disorders; National Comorbidity Survey–Adolescent Supplement (NCS-A)

A substantial proportion of young people in America are treated with psychotropic medications.¹ In the course of 12 months, approximately 3.9% of adolescents receive an antidepressant¹ and 3.2% receive a stimulant.² Little is known, however, about the psychiatric status of young people who use these medications. Specifically, reliable information is not currently available concerning the extent to which adolescents who are treated with antidepressants, stimulants, and other psychotropic medications have mental disorders for which the medications are likely to be effective.

Much of what little is known about the psychiatric status of youth who receive psychotropic medications derives from physician surveys,³ medical record reviews,⁴ and administrative claims.⁵ Yet psychiatric diagnoses in clinical settings commonly differ from those derived from systematic application of formal diagnostic criteria.⁶ According to one meta-analysis, there is only a fair level of agreement between clinical and structured psychiatric diagnoses in young people ($\kappa=0.39$).⁷

The strength of evidence for psychotropic treatment of adolescent psychiatric disorders varies widely across medication class and disorder. Clinical trials provide modest support for the short-term efficacy of antidepressants for major depressive disorder and moderate support for several anxiety disorders in adolescents⁸ and stimulants are a well established treatment for adolescent attention-deficit/hyperactivity disorder (ADHD).⁹ By contrast, there are currently no well established psychiatric indications of anxiolytics or mood stabilizers for adolescents and antipsychotic use, outside of schizophrenia, bipolar I mania, mixed mania, and autism, has only limited empirical support.¹⁰

The present study provides national rates of psychotropic treatment of adolescents in 2002–2004. A description is provided of the psychiatric diagnostic characteristics of adolescents who report past year use of antidepressants, stimulants, anxiolytics, antipsychotics, and mood stabilizers. Data come from the National Comorbidity Survey–Adolescent Supplement (NCS-A),¹¹ a nationally representative sample of U.S. adolescents using direct interviews to assess a broad range of mental disorders. Prior to conducting the analyses, we hypothesized that most adolescents with past year use of antidepressants would have a depressive or anxiety disorder and that most with recent stimulant use would have ADHD or a disruptive behavior disorder. Information on prescription medication patterns among youth with specific disorders is provided in a parallel set of analyses reported elsewhere.¹²

METHOD

Sample and Procedure

The NCS-A is a nationally-representative face-to-face survey of 10,123 adolescents aged 13–18 years in the continental US (2002–2004).¹¹ The survey was administered by the Institute for Social Research (University of Michigan). The measures, design, and clinical validity of the NCS-A are described elsewhere.¹¹ The survey sample was based on a nationally representative household ($n=879$ adolescents) and school ($n=9,244$ adolescents) sample with a combined response rate of 82.9%. In addition to the adolescent face-to-face interviews, parents (or parent surrogates) of adolescents were mailed a self-administered questionnaire that included information on adolescent socio-demographic characteristics, developmental background, mental and physical health, service use, and other factors.¹¹

Anxiety disorders (31.9%) were the most common followed by behavior (19.6%), mood (14.3%), substance use (11.4%), and eating (2.7%) disorders.¹³

Measures

Sociodemographic factors—Socio-demographic variables include respondent age in years, sex, race/ethnicity, urbanicity, parental marital status, parent education, and parent income. The 2000 census definitions were used to distinguish large metropolitan areas from smaller metropolitan areas and rural areas.

Diagnostic assessment—Adolescents were administered a modified version of the World Health Organization (WHO) Composite International Diagnostic Interview Version 3.0 (CIDI), a structured interview administered by trained lay interviewers to generate *DSM-IV* diagnoses.¹⁴ Major classes of past year disorders included mood disorders (major depressive disorder, dysthymia, bipolar disorder), anxiety disorders (panic disorder, post-traumatic stress disorder [PTSD], generalized anxiety disorder [GAD], social anxiety disorder, and a residual group including specific phobia, agoraphobia, and separation anxiety disorder), eating disorder (anorexia nervosa, bulimia nervosa), behavior disorder (attention-deficit/hyperactivity disorder [ADHD], oppositional defiant disorder [ODD], and conduct disorder [CD]), and substance use disorders (alcohol abuse/dependence, drug use/dependence). Subthreshold ADHD, CD, ODD, and major depressive disorder were defined as one symptom fewer than required for the *DSM-IV* disorder.

Mental health service use—All respondents were asked whether they had received treatment “for problems with [their] emotions or behavior” in the last 12 months. Mental health specialty service use included visits to a psychiatrist, psychologist, social worker or family counselor outside an outpatient clinic, inpatient care visits including overnight hospitalization and emergency department visits, and visits to an outpatient clinic. Separate variables defined past 12 month mental health inpatient service use and emergency mental health service use. Any service use includes all sources of mental health care.

Psychotropic medication use—Psychotropic medication use was assessed by presenting participants with a list of 215 generic and proprietary names of psychotropic medications. Participants were asked which medications they had taken during the past 12 months for problems with their “emotions, nerves, mental health, substance use, energy, concentration, sleep, or ability to cope with stress” prescribed by any health care professional without regard to specialty. Participants were asked to check the medication bottle for the exact name of the medications.

Psychotropic medications were sorted by medication class (antidepressants, stimulants, anxiolytics, mood stabilizers, and antipsychotics). If the respondent reported having a seizure disorder and no 12-month *DSM-IV* disorders, mood stabilizers other than lithium were not considered psychotropic medications.

Analysis Procedures

The data were weighted to adjust for the differential probability of selection of respondents within the school and household samples, for differential non-response, and for residual differences between the sample and the U.S. population and the full NCS-A sample on the cross-classification of socio-demographic variables. Cross tabulations were used to calculate the percentage of adolescents who reported using each of the major classes of psychotropic medications by socio-demographic strata. Logistic regression analyses were used to examine socio-demographic correlates of psychotropic drug use (Table 1). Column percentages indicating 12-month *DSM-IV* disorders and other mental health service use variables are

presented by past year use of antidepressants and stimulants and *DSM-IV* disorder groups by past year use of anxiolytics, antipsychotics, and mood stabilizers. Unadjusted odds ratios were estimated from logistic regression models with adolescent characteristic as the independent variable and psychotropic medication use (yes, no) as the dependent variable. Adjusted odds ratios with age, sex, race/ethnicity, urbanicity, parental marital status, and education as covariates, were also estimated. Each odds ratio is from a separate regression. Similar analyses were performed to assess associations between antidepressant use and subthreshold depression and between stimulant use and the subthreshold behavior disorders. Among adolescents with antidepressant use but not 12-month depression or anxiety disorders, the frequency distributions of 6 mutually exclusive hierarchically organized groups were examined: 1) 12-month subthreshold depression, 2) lifetime depression or anxiety disorder, 3) lifetime subthreshold depression, 4) 12-month other CIDI disorder, 5) lifetime other CIDI disorder, and 6) none of these conditions. Corresponding analyses were performed with stimulant users without past 12-month ADHD and 8 hierarchical groups: 1) 12-month subthreshold ADHD, 2) lifetime ADHD, 3) lifetime subthreshold ADHD, 4) 12-month ODD or CD, 5) lifetime ODD or CD, 6) 12-month other CIDI disorder, 7) lifetime other CIDI disorder, and 8) none of these conditions. In evaluating these patterns, it is important to recognize that effective treatment or spontaneous recovery can result in an adolescent meeting past (lifetime) but not current criteria for a disorder. Because sample sizes were not sufficient for detailed analyses of anxiolytics, mood stabilizers, and antipsychotics, these results are presented by broad diagnostic groups. Results were adjusted for design effects using the Taylor series method in SUDAAN version 10. Statistical significance was based on two-sided design-based tests ($\alpha=0.05$).

RESULTS

Overall Rates of Psychotropic Use

During the course of one year, 7.0% of adolescents were treated with a psychotropic medication. Most of these adolescents (74.1%) had one or more 12-month *DSM-IV* disorder. Antidepressants (3.9%) and stimulants (2.8%) were the most commonly used psychotropic medication class. Anxiolytics (0.8%), antipsychotic medications (0.5%), and mood stabilizers (0.4%) were far less commonly used (Table 1). Most of the antidepressant use was SSRIs (67.8%) followed by other second-generation antidepressants (25.2%), tricyclics and other older antidepressants (6.8%), and a residual group that could not be classified (0.2%).

Psychotropic Use Stratified by Socio-Demographic Groups

Antidepressant use varied across socio-demographic groups. They were more commonly used by females than males, older than younger adolescents, and whites than other racial or ethnic groups. Antidepressant use did not significantly differ between black, non-Hispanic (1.6%), Hispanic (1.9%), and the other race or ethnic group (2.8%) ($p = .56$). Adolescents whose parents had never married and those whose parents had never attended college were significantly less likely to use antidepressants, respectively, than their peers whose parents had married or attended college. Stimulant use was significantly more prevalent among male than female adolescents, white adolescents than other racial or ethnic groups, and among youth from higher than lower income families (Table 1).

Mood stabilizers were used significantly more frequently by white, non-Hispanic adolescents than by minorities. Similar, though statistically non-significant, trends occurred for anxiolytics and antipsychotic medications. Antipsychotic medications were used more commonly by adolescents whose parents had never married than by adolescents whose parents were married or cohabiting (Table 1).

Characteristics of Antidepressant Users

Roughly three quarters (77.0%) of adolescents who used antidepressants in the last year had at least one *DSM-IV* disorder. Most antidepressant use was SSRIs (67.8%) followed by other second-generation antidepressants (25.2%), tricyclics and other older antidepressants (6.8%) and a residual group that could not be classified (0.2%). The median duration of antidepressant use was 3.9 (SE=0.6) months.

Approximately one-half (48.8%) of antidepressant users had a past 12-month depression or anxiety disorder. Among antidepressant users without these disorders, approximately one-quarter had a past 12-month subthreshold depression (1.6%), a lifetime depression or anxiety disorder (20.3%), or lifetime subthreshold depression (1.2%). Nearly one-half (46.6%) of the antidepressant users without recent or past depression or anxiety disorders or subthreshold depression had another past 12 month CIDI disorder, 5.2% had another lifetime CIDI disorder, and 25.1% had none of these conditions.

ADHD criteria were met by 27.1% of adolescents with past 12 month antidepressant use. The adjusted odds of antidepressant use were six times greater for adolescents with ADHD as compared to without ADHD (Table 2). After controlling for mood and anxiety disorders, ADHD remained significantly correlated with antidepressant use (odds ratio [OR]: 5.7, 95%: 3.7–8.8).

Antidepressant use was strongly correlated with use of the other classes of psychotropic medications. Although most adolescents who used antidepressants had not used these other psychotropic medications during the past 12 months, stimulant, anxiolytic, antipsychotic, and especially mood stabilizer use markedly increased the odds of antidepressant use (Table 2).

Characteristics of Stimulant Users

The median duration of stimulant use was 6.4 (SE=1.0) months. Stimulant use did not significantly differ between black, non-Hispanic (0.9%), Hispanic (2.0%), and the other race or ethnic group (1.1%) ($p = .34$). Most adolescents who used stimulants (82.0%) had at least one past 12-month *DSM-IV* disorder. Past 12-month ADHD, which increased by over 10-fold the odds of stimulant use, was present in nearly one-half (49.1%) of stimulant users (Table 3). Among stimulant users without past 12-month ADHD, many met criteria for past 12-month subthreshold ADHD (18.6%), lifetime ADHD (13.1%), or lifetime subthreshold ADHD (3.0%). An additional one in ten had either past 12-month (6.9%) or lifetime (3.1%) ODD or CD. Approximately an additional quarter had either another past 12 month CIDI disorder (19.7%) or another lifetime CIDI disorder (4.4%). This left slightly less than one-third (31.2%) or 15% of all past year stimulant users that had none of these conditions, past 12-month, or lifetime CIDI disorders.

Eating and depressive disorders were also significantly associated with stimulant use, with odds ratios of 6.1(1.9–19.3) and 3.7(1.2–11.5), after controlling for ADHD and the socio-demographic variables. As compared with antidepressant use, stimulant use was much less strongly linked to mental health specialty service use. Mental health inpatient and emergency service use were not significantly related to stimulant treatment (Table 3).

Characteristics of Users of Other Psychotropic Drugs

Most adolescents who were treated with anxiolytics had a *DSM-IV* disorder. Approximately one half had an anxiety disorder and a similar proportion had a disruptive behavior disorder. Mood and substance use disorders were also common among adolescents who used anxiolytics. Nearly all adolescents (90.3%) who were treated with mood stabilizers had a

DSM-IV disorder. These were most commonly disruptive behavior disorders followed by anxiety disorders (Table 4). A total of 8.8% of adolescents who were treated with mood stabilizers met criteria for mania or hypomania. Most adolescents prescribed antipsychotics also met criteria for one of the CIDI *DSM-IV* disorders. In this regard, it is important to note that the CIDI does not assess autistic disorder, other pervasive developmental disorders, schizophrenia, or other psychotic disorders. Most youth treated with antipsychotic disorders had disruptive behavior disorders and a substantial minority had anxiety or mood disorders (Table 4).

DISCUSSION

Most adolescents who are treated with psychotropic medications have at least one psychiatric disorder. Although psychotropic medication use is concentrated among youth with objective mental health needs, medication use only partially aligns with the psychiatric disorders for which they have been demonstrated to be effective in clinical trials. While psychotropic prescribing is far from indiscriminate, apparent clinical mismatches are nevertheless common between individual medication classes and psychiatric disorders.

Antidepressants, which were prescribed to 3.9% of adolescents or approximately 757,000 adolescents nationwide, were the most commonly used psychotropic medication class.¹ Increasing antidepressant use with adolescent age and greater use among females than males mirrors the underlying prevalence of adolescent mood and anxiety disorders.¹³ Comparatively low antidepressant use by adolescents of non-white racial/ethnic ancestry may be partially explained by not having a usual source of medical care, lack of health insurance, and lower family income¹⁵ as well as culturally mediated health beliefs and perceptions.¹⁶ Higher rates of antidepressant use in rural than metropolitan areas are in keeping with national geographic patterns of antidepressant treatment for depression.¹⁷

Unlike adult antidepressant prescriptions that are primarily provided by primary care physicians,¹⁸ it is somewhat reassuring, given concerns related to antidepressant associated suicidality,¹⁹ that approximately three-quarters of adolescent antidepressant users received past year specialty mental health care. It is not known, however, whether community mental health psychosocial care achieves the same protective safety effects observed experimentally by combining cognitive behavioral therapy with fluoxetine.²⁰

Roughly one-half of adolescent antidepressant use occurred among individuals with a past year anxiety or depression disorder. Clinical trials support antidepressant efficacy for adolescent major depression and anxiety disorders with the strongest effects for non-OCD anxiety disorders, intermediate effects for OCD, and modest effects for depression.⁸ Antidepressants, especially selective serotonin reuptake inhibitors (SSRIs), are also superior to placebo for adult bulimia nervosa,²¹ although there are no positive controlled trials for adolescent anorexia or bulimia nervosa.²²

Approximately one in five adolescents with past year antidepressant use who did not meet criteria for past year mood or anxiety disorders met lifetime criteria for one of these disorders. These adolescents may have responded to antidepressants and are continuing to receive maintenance treatment. In the Treatment for Adolescents with Depression (TADS) Study, fluoxetine and cognitive behavioral therapy achieved similar response rates for adolescent major depressive disorder at long-term (36 week) follow-up.²³ A non-trivial proportion of past year antidepressant users did not meet criteria for past or recent depressive or anxiety disorders or subthreshold depressive symptoms. Without additional clinical information we are unable to determine how many of these adolescents are “false positives” (i.e., clinicians thought they were treating an anxiety or depressive disorder) and

how many were being intentionally treated for conditions with limited empirical support of antidepressant efficacy.

Many adolescent antidepressant users had ADHD. This may be partially a consequence of the high prevalence of depressive²⁴ and anxiety disorders²⁵ among youth with ADHD. Yet many antidepressant users without mood or anxiety disorders had ADHD. A role of antidepressants in the treatment adolescent ADHD remains controversial. Fluoxetine appears to have no effect on ADHD symptoms.²⁶ Bupropion is efficacious for children²⁷ and adults²⁸ with ADHD, though it has not been studied in controlled trials of adolescent ADHD. Tricyclic antidepressants may also help control behavioral problems associated with adolescent ADHD.²⁹ Antidepressants are also recommended for ADHD that is stimulant non-responsive.³⁰ The commonness with which antidepressants are used in youth with ADHD that is uncomplicated by anxiety and depression suggests a need for research aimed at determining its effectiveness for youth with ADHD who have not responded to stimulant monotherapy.

Stimulants were prescribed to approximately 2.8% of adolescents which is slightly below the 3.2% rate estimated in a 2002 national household survey.² Higher rates of stimulant use among males than females and among whites than non-whites are consistent with prior work.² While the sex difference in stimulant use likely reflects underlying sex differences in the prevalence of adolescent ADHD,¹³ significant racial/ethnic group differences in adolescent ADHD¹³ or ADHD symptoms³¹ have not been consistently reported raising the possibility that ethnic/racial differences exist in access or preferences for stimulants.³² In line with earlier research, stimulant use was not significantly related to family factors.³² In accord with the clinical trial literature,³³ ADHD is especially strongly associated with stimulants accounting for nearly one-half of all adolescent stimulant use.

More than one-third of adolescent stimulant users without past 12-month ADHD had recent or past subthreshold ADHD symptoms or a history of ADHD. This pattern may reflect ongoing maintenance treatment to consolidate clinical gains.³⁴ While the finding that 15.2% of stimulant users had no past or present mental disorders raises complex clinical and policy issues, some overtreatment is an expected consequence of efforts to reduce undertreatment of ADHD.³⁵ Early intervention, increasing public acceptance of psychotropic medications,³⁶ commercial influences, and minimization of past symptoms may contribute to stimulant use without a related self-reported mental disorder.

CD and ODD were common among adolescent stimulant users. Yet only about one in ten stimulant users without past year ADHD had CD or ODD. One short-term trial supports efficacy of methylphenidate for CD.⁴³ Although no published clinical trials directly address stimulant efficacy for ODD, sub-analyses of studies designed to assess treatment of ADHD suggest that stimulants are efficacious for hostile behaviors that are common in ODD.³⁷ Nearly three-quarters of stimulant users had ADHD or another disruptive behavior disorder or subthreshold symptoms of these disorders.

The association between stimulants and depression was independent of ADHD. Stimulant efficacy in adolescent depression has not been demonstrated. In addition, treatment with anxiolytics occurred in 0.8% of adolescents and none of these medications have a well supported role in the treatment of adolescent mental disorders. Support for use of mood stabilizers in adolescents, which were used by approximately 0.4% of adolescents, is limited.³⁸ Controversy over antipsychotic use in young people, which occurred in 0.5% of adolescents, has been fueled by increasing use,³⁹ adverse metabolic effects,⁴⁰ and prescribing outside of FDA indications.⁴¹

The NCS-A has several strengths for evaluating psychotropic medication use patterns, including a large sample, structured psychiatric assessment, and evaluations of use over a range of psychotropic medications in a nationally representative sample. However, the analysis also has a number of limitations. First, the NCS-A under-represents adolescents who are not enrolled in school, are homeless, or do not speak English. Second, clinician appraisals of medication effectiveness were not available. Third, respondent recall of medications is susceptible to under reporting. Fourth, no information was available concerning health care insurance. Fifth, structured assessments were not available for several severe mental disorders. Including assessments of all *DSM-IV* diagnoses would in all likelihood have lowered estimates of the proportion of psychotropic use without a disorder. Finally, the data were collected in 2002–2004 and do not reflect subsequent changes in prescribing practices. Analysis of youth commercial insurance claims indicates an 18% increase in antipsychotic use between 2003/2004 and 2007/2008,³⁹ a 10% increase in stimulant use between 2002 and 2005,⁴² and an 18% decrease in antidepressant use between 2002 and 2005.⁴³

In adolescence, psychiatric problems commonly present with a confusing array of overlapping and poorly defined psychiatric symptoms. With limited guidance from well controlled clinical trials, physicians, adolescents, and their parents face difficult judgments that pit the probabilities of symptom relief against safety considerations. It is therefore perhaps not surprising that while most psychotropic medications are prescribed to youth who have psychiatric disorders, medications are also prescribed to adolescents without disorders for which the medications have been found to be effective in short-term clinical trials. Enduring challenges remain in building the empirical foundation of psychopharmacological effectiveness and reducing the number of adolescents who receive psychotropic medications without a clear clinical justification.

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References

1. Vitiello B, Zuvekas SH, Norquist GS. National estimates of antidepressant medication use among U.S. children, 1997–2002. *J Am Acad Child Adolesc Psychiatry*. 2006; 45(3):271–279. [PubMed: 16540811]
2. Zuvekas SH, Vitiello B, Norquist GS. Recent trends in stimulant medication use among U.S. children. *Am J Psychiatry*. 2006; 163(4):579–585. [PubMed: 16585430]
3. Olfson M, Blanco C, Liu L, Moreno C, Laje G. National trends in the outpatient treatment of children and adolescents with antipsychotic drugs. *Arch Gen Psychiatry*. 2006; 63(6):679–685. [PubMed: 16754841]
4. Weiss M, Worling D, Wasdell M. A chart review study of the inattentive and combined types of ADHD. *J Atten Disord*. 2003; 7(1):1–9. [PubMed: 14738177]
5. Zito JM, Safer DJ, dosReis S, et al. Rising prevalence of antidepressants among U.S. youths. *Pediatrics*. 2002; 109(5):721–727. [PubMed: 11986427]
6. Pogge DL, Wayland-Smith D, Zaccario M, et al. Diagnosis of manic episodes in adolescent inpatients: structured diagnostic procedures compared to clinical chart diagnoses. *Psychiatry Res*. 2001; 101(1):47–54. [PubMed: 11223119]

7. Rettew DC, Lynch AD, Achenbach TM, et al. Meta-analyses of agreement between diagnoses made from clinical evaluations and standardized diagnostic interviews. *Int J Methods Psychiatr Res.* 2009; 18(3):169–184. [PubMed: 19701924]
8. Bridge JA, Iyengar S, Salary CB, et al. Clinical response and risk for reported suicidal ideation and suicide attempts in pediatric antidepressant treatment: a meta-analysis of randomized controlled trials. *JAMA.* 2007; 297(15):1683–1696. [PubMed: 17440145]
9. Kaplan G, Newcorn JH. Pharmacotherapy for child and adolescent attention-deficit hyperactivity disorder. *Pediatr Clin North Am.* 2011; 58(1):99–120. [PubMed: 21281851]
10. Vitiello B, Correll C, van Zwieten-Boot B, et al. Antipsychotics in children and adolescents: increasing use, evidence for efficacy and safety concerns. *Eur Neuropsychopharmacol.* 2009; 19(9):629–635. [PubMed: 19467582]
11. Merikangas K, Avenevoli S, Costello J, et al. National comorbidity survey replication adolescent supplement (NCS-A): I. Background and measures. *J Am Acad Child Adolesc Psychiatry.* 2009; 48(4):367–369. [PubMed: 19242382]
12. Merikangas K, He JP, Rapoport J, et al. Medication use in US youth with mental disorders [published online December 3, 2012]. *Arch Ped Adolesc Med.* 10.1001/jamapediatrics.2013.431
13. 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(10):980–989. [PubMed: 20855043]
14. Kessler RC, Ustun TB. The World Mental Health (WMH) Survey Initiative Version of the World Health Organization (WHO) Composite International Diagnostic Interview (CIDI). *Int J Methods Psychiatr Res.* 2004; 13(2):93–121. [PubMed: 15297906]
15. Kirby JB, Hudson J, Miller GE. Explaining racial and ethnic differences in antidepressant use among adolescents. *Med Care Res Rev.* 2010; 67:342–363. [PubMed: 19915066]
16. Cooper LA, Gonzales JJ, Gallo JJ, et al. The acceptability of treatment for depression among African-American, Hispanic, and white primary care patients. *Med Care.* 2003; 41:479–489. [PubMed: 12665712]
17. Fortney JC, Harman JS, Xu S, Dong F. The association between rural residence and the use, type, and quality of depression care. *J Rural Health.* 2010; 26:205–213. [PubMed: 20633088]
18. Mark TL, Levit KR, Buck JA. Datapoints: psychotropic drug prescriptions by medical specialty. *Psychiatr Serv.* 2009; 60(9):1167. [PubMed: 19723729]
19. Valluri S, Zito JM, Safer DJ, et al. Impact of the 2004 Food and Drug Administration pediatric suicidality warning on antidepressant and psychotherapy treatment for new-onset depression. *Med Care.* 2010; 48(11):947–954. [PubMed: 20856141]
20. Emslie G, Kratochvil C, Vitiello B, et al. Treatment for Adolescents with Depression Study (TADS): safety results. *J Am Acad Child Adolesc Psychiatry.* 2006; 45:144–1455.
21. Shapiro JR, Berkman ND, Brownley KA, Sedway JA, Lohr KN, Bulik CM. Bulimia nervosa treatment: a systematic review of randomized controlled trials. *Int J Eat Disord.* 2007; 40(4):321–336. [PubMed: 17370288]
22. Reinblatt SP, Redgrave GW, Guarda AS. Medication management of pediatric eating disorders. *Int Rev Psychiatry.* 2008; 20(2):183–188. [PubMed: 18386210]
23. The TADS Team. Treatment for Adolescents with Depression Study (TADS): long-term effectiveness and safety outcomes. *Arch Gen Psychiatry.* 2007; 64:1132–1144. [PubMed: 17909125]
24. Daviss WB. A review of co-morbid depression in pediatric ADHD: etiology, phenomenology, and treatment. *J Child Adolesc Psychopharmacol.* 2008; 18(6):565–571. [PubMed: 19108661]
25. Larson K, Russ SA, Kahn RS, Halfon N. Patterns of comorbidity, functioning, and service use for U.S. children with ADHD, 2007. *Pediatrics.* 2011; 127(3):462–470. [PubMed: 21300675]
26. Abikoff H, McGough J, Vitiello B, et al. Sequential pharmacotherapy for children with comorbid attention-deficit/hyperactivity and anxiety disorders. *J Am Acad Child Adolesc Psychiatry.* 2005; 44(5):418–427. [PubMed: 15843763]
27. Conners CK, Casat CD, Gualtieri CT, et al. Bupropion hydrochloride in attention deficit disorder with hyperactivity. *J Am Acad Child Adolesc Psychiatry.* 1996; 35(10):1314–1321. [PubMed: 8885585]

28. Wilens TE, Spencer TJ, Biederman J, et al. A controlled clinical trial of bupropion for attention deficit hyperactivity disorder in adults. *Am J Psychiatry*. 2001; 158(2):282–288. [PubMed: 11156812]
29. Spencer T, Biederman J. Non-stimulant treatment for Attention-Deficit/Hyperactivity Disorder. *J Atten Disord*. 2002; 6 (Suppl 1):S109–119. [PubMed: 12685525]
30. Pliszka SR, Crismon ML, Hughes CW, et al. The Texas Children’s Medication Algorithm Project: revision of the algorithm for pharmacotherapy of attention-deficit/hyperactivity disorder. *J Am Acad Child Adolesc Psychiatry*. 2006; 45(6):642–657. [PubMed: 16721314]
31. Cuffe SP, Moore CG, McKeown RE. Prevalence and correlates of ADHD symptoms in the National Health Interview Survey. *J Att Dis*. 2005; 9:392–401.
32. Hudson JL, Miller GE, Kirby JB. Explaining racial and ethnic differences in children’s use of stimulant medications. *Med Care*. 2007; 45(11):1068–1075. [PubMed: 18049347]
33. Wolraich ML, Wibbelsman CJ, Brown TE, et al. Attention-deficit/hyperactivity disorder among adolescents: a review of the diagnosis, treatment, and clinical implications. *Pediatrics*. 2005; 115(6):1734–1746. [PubMed: 15930238]
34. The MTA Cooperative Group. A 14-month randomized clinical trial of treatment strategies for attention-deficit/hyperactivity disorder. *Arch Gen Psychiatry*. 1999; 56(12):1073–1086. [PubMed: 10591283]
35. Druss BG, Wang PS, Sampson NA, et al. Understanding mental health treatment in persons without mental diagnoses: results from the National Comorbidity Survey Replication. *Arch Gen Psychiatry*. 2007; 64(10):1196–1203. [PubMed: 17909132]
36. Mojtabai R. Americans’ attitudes toward psychiatric medications: 1998–2006. *Psychiatr Serv*. 2009; 60(8):1015–1023. [PubMed: 19648187]
37. Klein RG, Abikoff H, Klass E, et al. Clinical efficacy of methylphenidate in conduct disorder with and without attention deficit hyperactivity disorder. *Arch Gen Psychiatry*. 1997; 54(12):1073–1080. [PubMed: 9400342]
38. Wagner KD, Redden L, Kowatch RA, et al. A double-blind, randomized, placebo-controlled trial of divalproex extended-release in the treatment of bipolar disorder in children and adolescents. *J Am Acad Child Adolesc Psychiatry*. 2009; 48(5):519–532. [PubMed: 19325497]
39. Alexander GC, Gallagher SA, Mascola A, et al. Increasing off-label use of antipsychotic medications in the United States, 1995–2008. *Pharmacoepidemiol Drug Saf*. 2011; 20(2):177–184. [PubMed: 21254289]
40. Correll CU, Manu P, Olshanskiy V, et al. Cardiometabolic risk of second-generation antipsychotic medications during first-time use in children and adolescents. *JAMA*. 2009; 302(16):1765–1773. [PubMed: 19861668]
41. Crystal S, Olfson M, Huang C, Pincus H, Gerhard T. Broadened use of atypical antipsychotics: safety, effectiveness, and policy challenges. *Health Aff (Millwood)*. 2009; 28(5):770–781.
42. Castle L, Aubert RE, Verbrugge RR, Khalid M, Epstein RS. Trends in medication treatment for ADHD. *J Atten Disord*. 2007; 10(4):335–342. [PubMed: 17449832]
43. Hassanin H, Harbi A, Saif A, et al. Changes in antidepressant medications prescribing trends in children and adolescents in Hawai’i following the FDA black box warning. *Hawaii Med J*. 2010; 69(1):17–19. [PubMed: 20222492]

Table 1

Rates of past year psychotropic medication use per 100 adolescents overall and stratified by socio-demographic group (N=10,123).

Characteristic	Antidepressants (n=346)		Stimulants (n=229)		Anxiolytics (n=75)		Mood stabilizers (n=46)		Antipsychotics (n=51)	
	%	OR (95%CI)	%	OR (95%CI)	%	OR (95%CI)	%	OR (95%CI)	%	OR (95%CI)
Total	3.9		2.8		0.8		0.4		0.5	
Age, years										
13-14 (n=3870)	2.5	1.00	3.2	1.00	0.5	1.00	0.3	1.00	0.5	1.00
15-16 (n=3897)	4.9	2.04(1.28-3.23)	2.6	0.79(0.44-1.40)	0.9	1.84(0.81-4.22)	0.4	1.38(0.52-3.63)	0.5	1.02(0.38-2.72)
17-18 (n=2356)	4.5	1.87(1.16-3.01)	2.4	0.73(0.41-1.29)	0.8	1.52(0.71-3.27)	0.5	1.64(0.70-3.80)	0.3	0.58(0.16-2.12)
Sex										
Female (n=5,170)	4.7	1.00	1.3	1.00	0.8	1.00	0.2	1.00	0.4	1.00
Male (n=4,953)	3.2	0.66(0.49-0.89)	4.2	3.36(2.2-4.98)	0.7	0.86(0.43-1.74)	0.5	2.42(1.00-5.86)	0.6	1.79(0.76-4.22)
Race/Ethnicity										
White, non-Hispanic (n=5,634)	5.0	1.00	3.5	1.00	0.9	1.00	0.5	1.00	0.6	1.00
Other race (n=4,489)	1.9	0.36(0.22-0.60)	1.4	0.38(0.23-0.63)	0.5	0.52(0.24-1.16)	0.2	0.45(0.20-0.99)	0.3	0.51(0.25-1.02)
Parent marital status ^a										
Married/Cohabiting (n=4,602)	3.6	1.00	3.2	1.00	0.6	1.00	0.3	1.00	0.3	1.00
Previously married (n=1,009)	5.6	1.58(0.95-2.62)	2.8	0.89(0.45-1.77)	0.8	1.19(0.33-4.24)	0.2	0.86(0.21-3.58)	1.0	2.98(0.91-9.74)
Never married (n=308)	1.5	0.41(0.20-0.81)	2.4	0.76(0.13-4.35)	0.4	0.66(0.08-5.40)	0.4	1.39(0.33-5.93)	2.6	7.71(1.28-46.40)
Urbanicity										
Metropolitan (n=4,508)	3.4	1.00	2.7	1.00	1.0	1.00	0.3	1.00	0.4	1.00
Other urban (n=3,304)	3.9	1.15(0.74-1.81)	3.1	1.16(0.66-2.05)	0.6	0.59(0.26-1.33)	0.2	0.69(0.31-1.54)	0.5	1.09(0.34-3.52)
Rural (n=2,311)	5.6	1.69(1.09-2.62)	2.3	0.87(0.43-1.77)	0.5	0.54(0.17-1.78)	0.9	2.67(1.25-5.71)	0.7	1.70(0.81-3.57)
Parent education										
<High school (n=1,684)	2.7	0.54(0.34-0.87)	2.2	0.64(0.38-1.07)	0.7	1.09(0.42-2.84)	0.2	0.46(0.12-1.71)	0.6	1.38(0.39-4.85)
High school (n=3,081)	2.9	0.59(0.35-1.01)	2.5	0.75(0.41-1.35)	0.6	0.87(0.32-2.36)	0.3	0.55(0.19-1.62)	0.4	0.92(0.29-2.91)
Some college (n=1,998)	5.0	1.04(0.70-1.55)	2.6	0.76(0.47-1.24)	1.3	2.00(0.74-5.42)	0.4	0.81(0.26-2.50)	0.8	1.94(0.59-6.33)
College graduate (n=3,360)	4.8	1.00	3.4	1.00	0.6	1.00	0.5	1.00	0.4	1.00
Parent income										
PIR <=1.5 (n=1,717)	3.1	0.75(0.49-1.15)	1.4	0.43(0.22-0.85)	0.6	0.66(0.25-1.75)	0.3	0.73(0.21-2.55)	0.5	1.01(0.27-3.81)

Characteristic	Antidepressants (n=346)		Stimulants (n=229)		Anxiolytics (n=75)		Mood stabilizers (n=46)		Antipsychotics (n=51)	
	%	OR (95% CI)	%	OR (95% CI)	%	OR (95% CI)	%	OR (95% CI)	%	OR (95% CI)
PIR ≤6.0 (n=5,124)	4.1	0.99(0.79–1.24)	2.9	0.91(0.61–1.34)	0.6	0.67(0.30–1.48)	0.4	0.76(0.33–1.76)	0.5	0.90(0.35–2.28)
PIR >6.0 (n=3,282)	4.1	1.00	3.2	1.00	1.0	1.00	0.5	1.00	0.5	1.00

Note: PIR = poverty income ratio.

^aUnknown parent marital status is not shown.

Table 2

Diagnostic and mental health service use characteristics of adolescents by past 12-month use of antidepressant.

	Antidepressants (%)		OR (95% CI)	aOR (95% CI) ^f
	Use (n=3,46)	Non-Use (n=9,777)		
12-month DSM-IV disorders				
Any mood disorder^a	35.5	8.9	5.65(4.00–7.98)	5.62(3.91–8.08)
Depression	27.5	6.8	5.15(3.64–7.28)	4.96(3.43–7.19)
Bipolar	8.9	2.2	4.35(2.70–7.01)	4.30(2.69–6.89)
Any substance use disorder^a	19.9	8.0	2.85(1.93–4.21)	2.53(1.66–3.86)
Alcohol abuse/dependence	11.8	4.5	2.80(1.84–4.27)	2.32(1.49–3.61)
Drug abuse/dependence	15.4	5.3	3.23(2.09–4.99)	3.00(1.91–4.71)
Any anxiety disorder^{a,d}	35.7	19.1	2.35(1.63–3.39)	2.45(1.67–3.60)
Panic disorder	8.4	1.6	5.56(3.07–10.08)	5.30(2.91–9.66)
PTSD	14.2	2.8	5.65(3.14–10.16)	4.93(2.69–9.07)
GAD	2.3	0.5	4.84(2.21–10.57)	4.49(2.08–9.71)
Social anxiety disorder	8.9	4.7	1.95(1.11–3.43)	1.91(1.04–3.53)
Other ^b	19.1	13.7	1.49(0.97–2.28)	1.62(1.03–2.55)
Any eating disorder^a	5.2	1.4	3.82(1.74–8.41)	4.05(1.56–10.51)
Any behavior disorder	42.0	14.5	4.28(2.89–6.33)	4.77(3.24–7.03)
Attention-deficit/hyperactivity disorder ^c	27.1	6.4	5.42(3.41–8.62)	6.66(4.41–10.04)
Oppositional Defiant disorder ^b	17.3	5.3	3.76(2.37–5.97)	3.83(2.48–5.92)
Conduct disorder ^b	19.4	8.1	2.73(1.75–4.24)	2.88(1.81–4.57)
Subthreshold depression	1.1	1.0	1.11(0.27–4.47)	1.13(0.26–4.97)
12-month other medication use^d				
Stimulants	20.6	2.5	10.29(6.06–17.48)	13.39(7.41–24.19)
Anxiolytics	4.3	0.5	9.43(4.16–21.35)	8.35(3.53–19.75)
Mood stabilizers	5.9	0.1	60.54(17.24–212.6)	62.42(18.26–213.3)
Antipsychotics	4.5	0.4	0.72(4.61–35.11)	15.17(5.57–41.31)
12-month service use^e				
Mental health specialty service use	77.8	10.8	28.74(17.30–47.76)	31.48(18.71–52.95)
Mental health inpatient service use	14.9	1.6	10.96(5.31–22.66)	12.84(7.61–21.65)
Emergency mental health service use	5.3	0.5	10.65(4.35–26.11)	10.18(4.18–24.78)
Any mental health service use	96.5	25.1	82.08(30.89–218.10)	94.54(34.25–260.90)

Note: GAD = generalized anxiety disorder; PTSD = posttraumatic stress disorder.

^aDiagnoses based on adolescent reports (n=10,123).

^bAssessed using adolescent and parent' reports (n = 6,483).

^cAssessed with parent's reports (n=6,483).

^dIncludes specific phobia, agoraphobia, and separation anxiety disorder.

^eBoth adolescent and parent reports (n=6,483).

^fAdjusted for age, sex, race/ethnicity, urbanicity, parental marital status, and education.

Table 3

Diagnostic and mental health service use characteristics of adolescents by past 12-month use of stimulants

	Stimulants (%)		OR(95%CI)	aOR (95% CI) ^f
	Use (n=229)	Non-Use (n=9894)		
12-month DSM-IV disorders				
Any mood disorder^a	19.4	9.6	2.26(1.19–4.28)	3.31(1.74–6.28)
Depression	14.9	7.5	2.17(1.03–4.55)	3.24(1.47–7.11)
Bipolar	5.1	2.4	2.22(0.89–5.54)	2.84(1.21–6.66)
Any substance use disorder^a	12.5	8.4	1.57(0.89–2.76)	1.56(0.83–2.94)
Alcohol abuse/dependence	5.7	4.8	1.20(0.54–2.66)	1.14(0.49–2.62)
Drug abuse/dependence	10.4	5.6	1.96(1.08–3.53)	1.96(1.02–3.79)
Any anxiety disorder^{a,d}	20.6	19.7	1.06(0.67–1.67)	1.38(0.89–2.12)
Panic disorder	1.2	1.9	0.62(0.20–1.92)	0.73(0.23–2.34)
PTSD	4.3	3.3	1.34(0.58–3.12)	2.15(0.94–4.94)
GAD	0.1	0.6	0.22(0.03–1.76)	0.29(0.03–2.48)
Social anxiety disorder	3.4	4.9	0.67(0.29–1.54)	0.86(0.37–2.00)
Other ^b	14.9	13.9	1.08(0.63–1.85)	1.39(0.82–2.36)
Any eating disorder^a	4.7	1.5	3.31(1.11–9.90)	5.74(2.20–14.95)
Any behavior disorder	67.4	13.9	12.78(7.20–22.68)	13.10(7.32–23.45)
ADHD ^c	49.1	5.9	12.78(8.61–27.63)	13.59(8.16–22.65)
Oppositional Defiant disorder ^b	25.2	5.1	15.43(3.36–11.64)	6.24(3.18–12.23)
Conduct disorder ^b	28.5	7.9	6.26(2.44–8.83)	4.92(2.56–9.45)
Subthreshold ADHD	15.2	2.4	4.64(2.43–21.55)	7.64(2.71–21.50)
Subthreshold CD or ODD	3.8	7.8	0.47(0.19–1.16)	0.45(0.18–1.14)
12-month other medication use^d				
Antidepressants	26.3	3.3	10.29(6.06–17.48)	13.45(7.45–24.28)
Anxiolytics	1.0	0.6	1.57(0.20–12.26)	2.11(0.27–16.29)
Mood stabilizers	3.2	0.2	13.80(2.59–73.59)	9.93(2.45–40.25)
Antipsychotics	3.6	0.4	8.57(1.80–40.74)	6.69(2.02–22.11)
12-month service use^e				
Mental health specialty service use	50.8	12.2	7.45(3.91–14.20)	8.38(4.38–16.03)
Mental health in-patient service use	3.3	2.0	1.64(0.60–4.47)	1.92(0.70–5.27)
Emergency mental health service use	1.6	0.7	2.42(0.60–9.78)	2.68(0.57–12.58)
Any mental health service use	94.0	25.8	45.57(21.12–98.34)	51.36(23.17–113.80)

Note: ADHD = attention-deficit/hyperactivity disorder; CD = conduct disorder; GAD = generalized anxiety disorder; ODD = oppositional defiant disorder; PTSD = posttraumatic stress disorder.

^aDiagnoses based on adolescent reports (n=10,123).

^bAssessed using adolescent and parent' reports (n = 6,483).

^c Assessed with parent's reports (n=6,483).

^d Includes specific phobia, agoraphobia, and separation anxiety disorder.

^e Adolescent and parent reports (n=6,483).

^f Adjusted for age, sex, race/ethnicity, urbanicity, parental marital status, and education.

Mental disorder and mental health service use characteristics of adolescents with past year anxiolytics, mood stabilizers, and antipsychotics use.

Table 4

	Medication Users						No psychotropic use	
	Anxiolytics		Mood stabilizers		Antipsychotics			
	n=75		n=46		n=51		N=9,543	
	%	aOR (95% CI)	%	aOR (95% CI)	%	aOR (95% CI)	%	aOR (95% CI)
12-month <i>DSM-IV</i> disorder ^a								
Any mood disorders	38.9	5.82 (2.87–11.79)	19.7	2.79 (1.17–6.65)	24.8	3.92 (1.76–8.77)	8.5	0.20 (0.14–0.28)
Any substance use disorders	30.7	4.12 (1.54–11.00)	22.4	2.66 (1.01–7.02)	18.2	2.45 (0.75–7.98)	7.8	0.41 (0.29–0.59)
Any anxiety disorders	51.0	4.42 (2.03–9.61)	33.9	2.74 (1.31–5.71)	38.3	2.93 (1.26–6.78)	18.8	0.42 (0.32–0.54)
Any eating disorders	2.8	1.70 (0.55–5.25)	0.4	0.36 (0.04–2.98)	2.7	2.02 (0.70–5.81)	1.4	0.26 (0.12–0.54)
Any behavior disorders	52.0	6.32 (2.33–17.20)	69.0	12.66 (3.23–49.57)	59.1	7.71 (2.28–26.15)	13.1	0.15 (0.10–0.21)
Number of classes of disorders ^b								
0	82.5	7.99 (2.52–25.36)	90.3	18.10 (3.01–108.64)	73.1	5.40 (1.34–21.84)	34.1	0.14 (0.09–0.21)
1	17.5	0.13 (0.04–0.40)	9.7	0.06 (0.01–0.33)	26.9	0.19 (0.05–0.75)	65.9	7.16 (4.79–10.71)
2	28.7	1.31 (0.49–3.53)	60.6	4.89 (1.26–18.94)	42.5	2.46 (0.85–7.12)	23.7	0.45 (0.33–0.60)
3+	26.6	3.31 (1.01–10.85)	12.8	1.53 (0.49–4.79)	14.3	2.08 (0.67–6.49)	7.5	0.22 (0.13–0.37)
	27.3	8.74 (2.00–38.13)	16.9	8.34 (2.31–30.04)	16.4	6.79 (2.18–21.13)	2.9	0.21 (0.13–0.34)
12-month treatment ^c								
Mental health specialty	46.7	5.31 (2.03–13.94)	77.8	27.95 (7.30–107.04)	74.3	20.63 (3.92–108.62)	9.9	0.06 (0.04–0.10)
Mental health in-patient	15.5	8.84 (3.01–25.94)	32.9	44.39 (14.71–133.93)	30.9	28.10 (7.60–103.90)	1.4	0.09 (0.06–0.16)
Emergency mental health	6.7	9.44 (3.32–26.82)	15.1	33.57 (8.73–129.06)	12.5	23.73 (4.33–130.01)	0.5	0.12 (0.04–0.32)
Any	86.5	17.03 (4.96–58.48)	91.8	33.17 (3.81–289.07)	81.8	11.64 (1.70–79.47)	23.1	0.02 (0.01–0.03)

Note:

^aDiagnoses of mood, anxiety, eating and substance use disorders are based on adolescent reports (n=10,123); oppositional-defiant disorder, conduct disorder were assessed using adolescent and parent reports (n = 6,483), attention-deficit/hyperactivity disorder (ADHD) was assessed with parent's reports exclusively in the same subsample (n=6,483).

^bExcluding eating disorders.

^cAdolescent and parent reports in Parent Self-Administered Questionnaire (PSAQ) sample n=6,483.