

# Medication Use in US Youth With Mental Disorders

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**Objective:** To evaluate the prevalence, demographic and clinical correlates, and specificity of classes of psychotropic medications indicated for mental disorders.

**Design:** Cross-sectional survey.

**Setting:** Direct household interviews of combined household and school samples representative of the general population of adolescents in the United States.

**Participants:** Ten thousand one hundred twenty-three adolescents aged 13 to 18 years who participated in the National Comorbidity Survey Adolescent Supplement.

**Main Exposures:** *Diagnostic and Statistical Manual of Mental Disorders* (Fourth Edition) (DSM-IV) mental disorders and neurodevelopmental disorders.

**Outcome Measure:** Psychotropic medication use in the past 12 months.

**Results:** Among youth with any DSM-IV mental disorder, 14.2% reported that they had been treated with a psychotropic medication in the past 12 months. Strong associations emerged between specific disorders and classes of medications with evidence for efficacy. Antidepressants were most frequently used among those with primary mood disorders (14.1%); stimulant use was most common among those with attention-deficit/hyperactivity disorder (20.4%); and antipsychotic use was infrequent and mostly seen among those with serious developmental disorders. Less than 2.5% of adolescents without a 12-month mental disorder had been prescribed psychotropic medications, and most had evidence of psychological distress or impairment reflected in a previous mental disorder, subthreshold condition, or developmental disorder. Appropriate medication use was significantly more frequent among those in treatment in the mental health specialty sector than general medicine or other settings.

**Conclusions:** These findings challenge recent concerns over widespread overmedication and misuse of psychotropic medications in US youth. In fact, these data highlight the need for greater recognition and appropriate treatment of youth with mental health disorders.

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**S**UBSTANTIAL CONCERN HAS BEEN raised about inappropriate prescribing of psychotropic medications to children and adolescents.<sup>1-4</sup> However, these criticisms have been primarily based on anecdotal reports,<sup>1-3</sup> studies of small unrepresentative clinical samples,<sup>4</sup> and secondary analyses of large databases on prescription drug use that lack detailed clinical information about individual patients.<sup>5-9</sup> Although there has been a striking increase in prescriptions for psychotropic medications in youth over the past decade,<sup>10,11</sup> there is a lack of empirical data on patterns of medication use among youth with specific mental disorders. Without systematic clinical assessments, it is not possible to evaluate relationships between community psychotropic prescribing practices and psychiatric disorders.

Previous reports on medication treatment patterns among youth with specific disorders in community samples of specific regions of the United States<sup>12-15</sup>

*For editorial comment  
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have generated widely variable rates of medication use for attention-deficit/hyperactivity disorder (ADHD) (eg, 7.0%-72.2%<sup>13,14,16-18</sup>) and depression (7.4%-31.0%<sup>10,19,20</sup>) primarily because of methodologic and sample differences. However, to our knowledge, no previous study has examined patterns of specific classes of psychotropic medication use among youth across the full range of common mental disorders and service sectors in a large nationally representative sample of adolescents.

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Evaluation of patterns of inappropriate medication prescription relies on empirical evidence that includes information on both clinical diagnosis of specific disorders and specific medications. In the present study, we examine medication overuse, defined as prescriptions to youth without disorders, and misuse, defined as prescriptions to youth for conditions for which they are not indicated. Even though there is still insufficient evidence to establish clinical practice guidelines for all child and adolescent mental disorders,<sup>21</sup> a growing body of well-controlled clinical trial data can be used to establish medication treatment guidelines for several specific disorders including ADHD,<sup>15,22-25</sup> bipolar disorder,<sup>26-28</sup> major depressive disorder,<sup>27,29-31</sup> anxiety,<sup>32,33</sup> conduct disorder and other behavior disorders,<sup>34,35</sup> obsessive-compulsive disorder,<sup>36</sup> and autism spectrum and developmental disorders.<sup>37</sup>

This article reports on patterns of psychotropic medication use among youth with specific mental disorders during the past year in data from the National Comorbidity Survey Adolescent Supplement (NCS-A), a nationally representative sample of US adolescents based on direct interviews. The aims of this study were to (1) present empirical data on psychotropic medication use among youth with specific mental disorders who received mental health services; (2) assess the association between specific primary disorders and the use of medications that are indicated for that disorder; and (3) examine sociodemographic and clinical correlates of specific classes of medication among youth with specific mental disorders. These results were used to examine the extent of medication overuse and misuse in US adolescents.

## METHODS

### SAMPLE AND PROCEDURE

The NCS-A is a nationally representative survey of 10 123 adolescents aged 13 to 18 years in the continental United States conducted between February 2001 and January 2004.<sup>38,39</sup> The background, measures, design, and clinical validity of the NCS-A are described elsewhere.<sup>40,41</sup> The survey was based on a dual-frame design that included a household sample (n=879 adolescents; response rate 85.9%) and a school sample (n=9244; response rate 74.7%). Adolescents were directly interviewed by professional interviewers coordinated by the Institute for Social Research at the University of Michigan. Parents (or surrogates) were mailed a self-administered questionnaire that included information on adolescent sociodemographic characteristics, developmental background, mental and physical health, and service use. The parent self-administered questionnaire was completed by 6483 parents, yielding an overall conditional response rate of 83.3%. The recruitment and consent procedures were approved by the human subjects committees of both Harvard Medical School and the University of Michigan.

## MEASURES

### Sociodemographic Characteristics

The sample was weighted to provide a nationally representative sample of households and schools based on the most recent US census. Sociodemographic variables assessed in the NCS-A include respondent age in years, sex, race/ethnicity, par-

ent education, parental marital status, urbanicity, region, and family income. Approximately one-half of the sample was male (51.3%) and the mean (SE) age was 15.2 (0.1) years. The sample was predominantly non-Hispanic white (65.6%). A great majority (84.5%) of the adolescents had parents who had completed at least high school, and more than three-fourths (78.6%) of the sample lived with currently married or cohabiting parents. A relatively small proportion (14.9%) of adolescents lived in rural areas, and 18.1% of adolescents lived in the Northeast region; 23.3%, in the Midwest; 36.0%, in the South; and 22.6%, in the West. The poverty index ratio was calculated as the ratio of family income divided by the poverty line based on family size; 14.7% of the adolescents resided in poor families (<1.5 times poverty index ratio).

### Diagnostic Assessment

Adolescents were administered a modified version of the World Health Organization Composite International Diagnostic Interview version 3.0, a fully structured interview administered by trained lay interviewers.<sup>41</sup> Computerized algorithms were developed to generate *Diagnostic and Statistical Manual of Mental Disorders* (Fourth Edition) (DSM-IV) diagnoses. Major classes of past-year disorders assessed in the Composite International Diagnostic Interview included mood disorders, anxiety disorders, eating disorders, behavior disorders, and substance use disorders. Severity of disorders based on the presence of subjective distress and impairment was also assessed. A parent completed a developmental and health history that included numerous medical conditions, developmental disorders, and learning disabilities, as well as the criteria for ADHD and behavior disorders. A hierarchical classification of disorders was also established to characterize those youth with multiple disorders.<sup>42</sup> Adolescents with multiple disorders were assigned to the highest-ordered diagnostic category (ie, primary disorder). Adolescents were also asked about their parents' symptoms and treatment for mental disorders in a separate section of the interview. Diagnostic procedures are described in more detail in previous publications.<sup>38,39</sup>

### Mental Health Service Use

A separate interview module was administered to both the adolescents and parents that collected information on service use for emotional behavior disorders during the past 12 months. Specific sectors included mental health specialty outpatient (community mental health center, partial hospitalization or day treatment program, or drug or alcohol clinic) with a mental health professional (psychiatrist, psychologist, social worker, or family counselor) or inpatient care visits (overnight hospitalization or emergency department visits), general medical visits (pediatrician or family physician), and services from other sectors (human services, school services, complementary and alternative medicine, and juvenile justice).

### Psychotropic Medication Use

Respondents' past-year psychotropic medication use for behavioral or emotional problems was assessed at the direct interview through a list of 215 generic and proprietary names of commonly used psychotropic medications. The specific names of medications were checked from the actual prescription bottles by the interviewer, when available. Psychotropic medications were divided into broad classes (antidepressants, stimulants, anxiolytics, mood stabilizers, and antipsychotics). Use of these medications for nonpsychiatric indications was not included in these analyses.

**Table 1. Prevalence of Psychotropic Medication by Medication Class Among Those With 12-Month *DSM-IV* Disorder**

12-mo Conditions <sup>a</sup> : <i>DSM-IV</i> Disorders	Sample Size	Use of Psychotropic Medication						Received Specialty Mental Health Treatment <sup>c</sup>
		Antidepressants	Stimulants	Antipsychotics	Mood Stabilizers	Anxiolytics	Any Medication <sup>b</sup>	
Any anxiety disorder	1950	7.1 (5.5-9.1)	2.9 (1.8-4.7)	1.0 (0.5-1.8)	0.7 (0.4-1.0)	1.9 (1.1-3.3)	11.6 (9.2-14.4)	21.2 (16.8-26.3)
Agoraphobia	192	4.5 (1.8-10.9)	3.0 (0.9-9.5)	0.7 (0.2-2.1)	0.6 (0.1-2.8)	1.4 (0.4-4.9)	9.5 (6.0-14.7)	28.8 (17.5-43.6)
Generalized anxiety disorder	63	16.3 (7.9-30.6)	0.6 (0.1-4.8)	2.8 (0.4-15.8)	0.3 (0.0-2.2)	1.4 (0.3-7.3)	20.2 (10.9-34.4)	35.7 (17.1-60.1)
Social phobia	516	7.1 (4.3-11.5)	1.9 (0.8-4.3)	2.0 (0.8-5.0)	0.8 (0.3-1.9)	1.9 (0.5-7.1)	10.5 (7.0-15.3)	29.9 (19.2-43.2)
Specific phobia	1244	5.5 (3.9-7.8)	3.4 (1.9-6.0)	0.9 (0.4-1.7)	0.4 (0.2-1.1)	1.9 (1.0-3.8)	10.5 (7.8-13.9)	15.2 (11.6-19.7)
Panic disorder	191	17.5 (10.8-27.0)	1.7 (0.6-5.2)	0.9 (0.3-2.6)	1.7 (0.5-5.3)	3.7 (1.5-8.7)	22.6 (15.3-32.0)	26.5 (16.9-38.9)
Posttraumatic stress disorder	292	16.9 (10.5-26.2)	3.6 (1.7-7.7)	2.1 (0.9-5.0)	1.4 (0.6-3.2)	3.1 (1.6-6.2)	20.9 (14.1-29.9)	41.3 (31.5-51.8)
Separation anxiety disorder	143	11.4 (4.2-27.6)	0.1 (0.0-1.1)	0.2 (0.0-1.3)	1.0 (0.2-4.5)	0.8 (0.2-3.6)	15.0 (6.8-29.9)	25.7 (11.6-47.8)
ADHD	437	14.0 (9.7-19.8)	20.4 (13.8-29.3)	1.5 (0.7-3.4)	1.7 (0.6-5.2)	2.3 (0.6-8.0)	31.0 (22.1-41.6)	35.7 (29.0-42.9)
Any behavior disorder	725	9.3 (7.1-12.1)	9.5 (6.5-13.6)	2.1 (1.1-3.9)	1.7 (0.8-3.7)	2.1 (0.9-5.1)	19.3 (15.7-23.5)	39.5 (34.2-45.0)
Conduct disorder	514	8.4 (5.9-12.0)	10.0 (6.2-15.7)	1.9 (1.0-3.6)	1.9 (0.9-4.1)	2.8 (1.1-6.9)	20.1 (15.4-25.6)	42.3 (35.7-49.1)
Oppositional defiant disorder	348	11.2 (7.8-16.0)	13.2 (8.5-19.9)	2.6 (0.9-6.7)	1.8 (0.6-5.3)	2.7 (0.7-10.1)	23.5 (18.7-29.1)	43.1 (36.5-50.0)
Any eating disorder	161	13.1 (6.4-25.0)	8.4 (3.0-21.2)	0.8 (0.3-2.3)	0.1 (0.0-0.8)	1.3 (0.5-3.7)	19.3 (10.8-32.0)	55.0 (35.8-72.9)
Any mood disorder	1021	14.1 (10.6-18.4)	5.4 (3.3-8.8)	1.2 (0.6-2.4)	0.8 (0.4-1.6)	2.9 (1.6-5.3)	19.7 (15.5-24.7)	35.0 (28.3-42.4)
Bipolar	246	14.2 (9.4-20.9)	5.8 (2.4-13.1)	2.6 (0.9-7.5)	1.4 (0.4-4.8)	2.1 (0.6-7.2)	18.0 (12.9-24.6)	33.8 (23.1-46.4)
Depression	788	14.1 (10.4-18.8)	5.4 (3.0-9.5)	0.7 (0.3-1.7)	0.6 (0.2-1.3)	3.1 (1.6-6.1)	20.2 (15.5-25.8)	35.3 (27.9-43.5)
Any substance use disorder <sup>d</sup>	854	9.2 (6.7-12.6)	4.1 (2.5-6.7)	1.1 (0.5-2.3)	1.0 (0.5-2.0)	2.7 (1.3-5.3)	14.4 (11.2-18.3)	35.9 (27.0-45.9)
Any class of disorder <sup>e</sup>	2350	7.8 (6.5-9.3)	6.6 (5.0-8.5)	1.0 (0.6-1.6)	0.7 (0.4-1.2)	1.3 (0.7-2.2)	14.2 (12.2-16.5)	24.9 (21.7-28.4)
0 class	4133	1.3 (0.9-1.9)	0.8 (0.5-1.3)	0.2 (0.1-0.7)	0.0 (0.0-0.2)	0.2 (0.1-0.4)	2.5 (1.8-3.4)	6.6 (5.5-8.0)
1 class	1469	4.7 (3.3-6.7)	5.0 (3.2-7.7)	0.8 (0.3-2.1)	0.3 (0.1-0.8)	0.7 (0.3-1.5)	9.5 (7.0-12.7)	16.0 (12.9-19.6)
2 classes	596	10.9 (7.8-14.9)	9.0 (5.0-15.6)	0.4 (0.2-0.9)	1.7 (0.7-4.1)	1.5 (0.8-3.0)	19.4 (14.1-26.0)	32.9 (27.1-39.4)
≥3 classes	285	16.1 (10.8-23.3)	9.6 (5.3-16.8)	2.5 (1.2-5.1)	1.0 (0.4-2.9)	3.4 (1.0-10.8)	26.0 (18.6-35.2)	50.9 (37.8-63.9)
Suicidality	515	18.5 (13.8-24.3)	6.2 (2.9-12.9)	2.3 (1.1-4.8)	2.1 (1.2-3.4)	4.3 (2.2-8.4)	27.1 (21.4-33.6)	45.3 (37.7-53.1)
Neurodevelopmental disorder <sup>f</sup>	1675	6.1 (4.6-8.2)	7.6 (5.5-10.4)	1.1 (0.5-2.1)	0.8 (0.4-1.6)	0.9 (0.5-1.5)	13.8 (11.6-16.4)	22.1 (18.7-26.0)
Developmental disorders	31	19.3 (6.4-45.6)	19.6 (5.6-50.2)	7.6 (2.3-21.9)	11.8 (3.4-33.9)	3.9 (0.9-15.7)	42.0 (20.1-67.6)	50.6 (25.2-75.7)
Epilepsy	32	3.5 (0.9-12.9)	0.2 (0.0-1.3)	3.7 (0.7-16.5)	2.4 (0.5-10.7)	2.9 (0.4-18.2)	11.6 (3.9-29.9)	20.8 (9.2-40.4)
Headache <sup>g</sup>	1219	5.5 (4.0-7.5)	4.2 (2.3-7.5)	0.6 (0.3-1.4)	0.4 (0.2-0.9)	0.8 (0.5-1.4)	9.7 (7.2-13.0)	19.9 (15.6-25.0)
Learning disability	562	8.0 (4.8-12.9)	15.3 (10.5-21.8)	2.1 (0.8-5.3)	1.7 (0.7-4.1)	1.0 (0.3-2.9)	23.7 (18.3-30.1)	30.9 (25.6-36.8)

Abbreviations: ADHD, attention-deficit/hyperactivity disorder; *DSM-IV*, *Diagnostic and Statistical Manual of Mental Disorders* (Fourth Edition).

<sup>a</sup>Twelve-month conditions assessed in full adolescent Composite International Diagnostic Interview sample (n = 10 123) for anxiety disorder, mood disorder, substance use disorder, eating disorder, and suicidality; 12-month conditions assessed in child-parent paired sample (n = 6483) for ADHD, behavior, class of disorders, and neurological/neuropsychiatric disorder.

<sup>b</sup>Included antidepressants, stimulants, mood stabilizers, anxiolytics, antipsychotics, and miscellaneous medications.

<sup>c</sup>Received treatment from mental health specialty including inpatient, outpatient, and emergency treatment for emotional and behavioral problem based on child and parent reports.

<sup>d</sup>Substance use disorder including abuse of or dependence on alcohol or illicit drug.

<sup>e</sup>Included classes of anxiety, mood, ADHD, behavior, eating, and substance use.

<sup>f</sup>Based on parent reports to questions phrased as "has he or she had this problem in the past 12 months?"

<sup>g</sup>Based on both adolescent and parent reports.

## ANALYSIS PROCEDURES

The data were weighted to adjust for the differential probability of selection of respondents within the school and household samples, differential nonresponse, and residual differences between the sample and the US population and the full NCS-A sample on the cross-classification of sociodemographic variables.<sup>40,41</sup> Cross-tabulations were used to calculate the prevalence of each of the major classes of psychotropic medications among adolescents with 12-month mental disorders, classes of mental disorder, the number of classes of disorder, suicidality, and a series of neurological or neurodevelopmental disorders. Logistic regression analyses were used to examine sociodemographic and clinical correlates of use of common classes of psychotropic drug within each disorder and disorder class. Models

simultaneously adjusted for adolescent demographics and parent characteristics. Results were adjusted for design effects using the Taylor series method in SUDAAN version 10 (RTI International). Statistical significance was based on 2-sided design-based tests evaluated at a .05 level of significance.

## RESULTS

### PSYCHOTROPIC USE AMONG YOUTH WITH MENTAL DISORDERS

**Table 1** presents the prevalence of psychotropic medication use among youth with each of the *DSM* disorder

**Table 2. Prevalence Rates of Specific Classes of Medication Among Participants With 12-Month Diagnostic Groups**

Primary Diagnosis	% (SE)
<b>Antidepressants</b>	
Depression	11.8 (2.1)
Bipolar disorder	16.0 (4.9)
Anxiety disorder	4.5 (0.9)
Other 12-mo disorder	7.6 (1.4)
None of above	1.3 (0.2)
<b>Stimulants</b>	
ADHD	20.4 (3.8)
Conduct or ODD	6.6 (2.1)
Other 12-mo disorder	2.0 (0.5)
None of above	0.8 (0.2)
<b>Antipsychotics</b>	
Neurodevelopmental disorders <sup>a</sup>	2.0 (1.0)
Bipolar disorder	1.7 (1.1)
ADHD/conduct/ODD	1.8 (0.7)
Depression	0.6 (0.3)
Anxiety	0.1 (0.1)
Other 12-mo disorder	0.5 (0.5)
None of above	0.1 (0.0)

Abbreviations: ADHD, attention-deficit/hyperactivity disorder; ODD, oppositional defiant disorder.

<sup>a</sup>Developmental disorder (such as autism spectrum disorder) and learning disability.

ders, suicidality, and neurodevelopmental disorders assessed in this study. The last column shows the proportion who had received specialty mental health treatment. A total of 24.9% of youth had received mental health services during the past 12 months, with significant variability by *DSM* disorders.<sup>9</sup>

Among those with any *DSM-IV* mental disorder, 14.2% reported that they had been treated with a psychotropic medication. Adolescents with ADHD had the highest prevalence of medication use (31.0%) followed by those with mood disorders (19.7%), eating disorders (19.3%), behavior disorders (19.3%), substance use disorders (14.4%), and anxiety disorders (11.6%). Prevalence rates of use of antipsychotic medications (1.0%), mood stabilizers (0.7%), and anxiolytics (1.3%) among those with a mental disorder were very low. The highest rates of psychotropic medication use were observed among those with a developmental disorder/autism (42.0%) or self-reported suicidality (27.1%). There was a direct increase in the proportions of youth with medication use by the number of classes of disorders, with rates of 9.5%, 19.4%, and 26.0% for those with 1, 2, and 3 or more disorders, respectively. Only 2.5% of adolescents without a 12-month *DSM-IV* disorder had been prescribed psychotropic medications. Of these, 78% had evidence of psychological distress or impairment reflected in a lifetime history of mental disorders, subthreshold conditions, or developmental disorders (data not shown). Not shown here, 26.9% (SE = 0.8) of youth had also taken nonpsychotropic prescribed medications during the past 7 days.

**Table 2** presents the prevalence rates of past-year use of the 3 major classes of psychotropic medications among participants with primary diagnoses classified hierarchically to control for comorbidity among the past-year disorders reported in Table 1. Antidepressants were most

frequently used among those with a primary mood disorder (depression, 11.8%; bipolar disorder, 16.0%) followed by those with a primary anxiety disorder (4.5%). Only 1.3% of those with no 12-month *DSM-IV* disorder reported antidepressant use during the past year.

Stimulant use was most common among those with ADHD (20.4%). A small proportion of youth with a behavior disorder without ADHD had received stimulants (6.6%), and only 0.8% of those without a *DSM-IV* disorder reported stimulant use. Very small proportions of those with *DSM-IV* disorders or other neuropsychiatric disorders reported antipsychotic prescription use. Two percent of those with a developmental disorder or learning disability, 1.7% of those with bipolar disorder, and 1.8% of those with a behavior disorder reported antipsychotic use during the past 12 months. Only 0.1% of those without a disorder reported antipsychotic prescriptions.

### CORRELATES OF PSYCHOTROPIC MEDICATION USE

Sociodemographic and clinical correlates of the major classes of psychotropic medication use among youth with the primary target disorders are presented in **Table 3**. When simultaneously controlling for adolescent and parent demographic characteristics and number of classes of disorder, the rates of psychotropic medication use decreased with age among those with all 3 sets of indicated disorders, particularly for stimulants among those with ADHD. Both groups of older adolescents had significantly lower rates of stimulant use than those in the early adolescent age group (ages 13-14 years). There were significantly lower prevalence rates of psychotropic medication use among ethnic minority youth than among white youth with any of the 3 disorders and primary medication classes. Similarly, ethnic minority youth with ADHD tended to use fewer stimulants than white youth with ADHD. Antidepressant use among those with depression was more common among females than males, whereas males with ADHD were more likely to receive stimulants than females. Family income was inversely associated with antidepressant use. Adolescents whose parents had not completed high school reported more stimulant use than those with higher parental education levels.

Severity and suicidality were significantly associated with greater rates of antidepressant medication use, and those with more severe bipolar disorder or neurodevelopmental disorders had greater rates of antipsychotic use. The association between specific disorders and indicated classes of medication was significantly lower for the general medical or other treatment sectors than the mental health specialty sector for all 3 classes of medications. Approximately 25% of antidepressant prescriptions among youth with a major mood disorder occurred in the mental health sector compared with 11.5% in general medicine and 0.3% in other sectors. Stimulants among those with ADHD were prescribed significantly more often by a mental health specialist (32.7%) than by a clinician in the general medical sector (21.1%) or other treatment sectors (3.8%). Similarly, 4.5% of antipsychotic medications were prescribed to those with indicated conditions by a mental health specialist com-

**Table 3. Demographic Correlates of Major Classes of Medication Use Among Adolescents With a *DSM-IV* Depression, ADHD, and CD/ODD Diagnosis in the Past 12 Months**

Correlates	Antidepressant Use Among Depression Cases (n = 503)		Stimulant Use Among ADHD Cases (n = 437)		Antipsychotic Use Among Behavior or Neurodevelopmental Disorder Cases (n = 1297)	
	% (SE)	AOR (95% CI) <sup>a</sup>	% (SE)	AOR (95% CI) <sup>a</sup>	% (SE)	AOR (95% CI) <sup>a</sup>
<b>Child Demographic Characteristics</b>						
Age, y						
13-14	10.7 (4.3)	1 [Reference]	29.2 (6.9)	1 [Reference]	3.0 (1.3)	1 [Reference]
15-16	12.1 (3.9)	0.9 (0.3-2.4)	16.0 (4.2)	0.3 (0.1-0.8)	2.1 (0.9)	0.7 (0.2-1.9)
17-18	12.3 (3.3)	1.2 (0.4-3.4)	12.9 (3.5)	0.3 (0.1-0.6)	0.2 (0.2)	0.1 (0.0-0.6)
Wald $\chi^2$ (P value)		0.2 (.80)		5.8 (.006)		3.2 (.05)
Sex						
F	14.7 (3.0)	1 [Reference]	7.1 (2.4)	1 [Reference]	1.5 (0.6)	1 [Reference]
M	5.4 (1.2)	0.3 (0.1-0.6)	24.9 (4.7)	4.1 (1.8-9.3)	2.2 (0.9)	1.5 (0.6-3.5)
Wald $\chi^2$ (P value)		11.1 (<.001)		11.6 (.002)		1.0 (.33)
Race/ethnicity						
Hispanic	2.4 (1.6)	0.1 (0.0-0.6)	18.8 (9.2)	0.7 (0.2-3.2)	0.1 (0.1)	0.0 (0.0-0.2)
Non-Hispanic black	1.8 (1.1)	0.1 (0.0-0.3)	5.8 (2.3)	0.1 (0.0-0.5)	1.4 (0.7)	0.5 (0.1-2.9)
Other	18.6 (9.0)	1.0 (0.3-2.8)	16.6 (12.2)	0.4 (0.1-1.7)	2.3 (1.3)	0.9 (0.2-3.9)
Non-Hispanic white	16.9 (2.8)	1 [Reference]	23.3 (4.2)	1 [Reference]	2.6 (0.9)	1 [Reference]
Wald $\chi^2$ (P value)		7.4 (<.001)		4.3 (.01)		5.1 (.004)
Region						
Northeast	10.2 (3.8)	1.2 (0.4-3.6)	18.8 (3.7)	1.4 (0.4-4.9)	0.9 (0.6)	0.6 (0.1-6.1)
Midwest	15.9 (3.2)	0.6 (0.2-2.1)	18.3 (2.0)	1.1 (0.5-2.8)	3.0 (1.2)	2.6 (0.5-13.3)
South	8.8 (3.1)	0.5 (0.1-1.9)	24.9 (9.1)	2.2 (0.6-7.5)	2.2 (1.3)	2.5 (0.3-17.9)
West	13.0 (6.4)	1 [Reference]	17.5 (8.2)	1 [Reference]	1.3 (0.8)	1 [Reference]
Wald $\chi^2$ (P value)		0.8 (.51)		0.7 (.55)		1.4 (.27)
Residence						
Metropolitan	8.0 (2.5)	0.3 (0.1-0.8)	23.6 (5.0)	2.2 (0.7-6.5)	2.0 (0.8)	1.1 (0.3-4.7)
Urban	10.8 (3.5)	0.4 (0.2-1.0)	18.5 (7.2)	1.1 (0.4-3.4)	1.6 (0.9)	0.6 (0.1-3.4)
Rural	29.0 (6.8)	1 [Reference]	16.2 (7.0)	1 [Reference]	2.9 (1.7)	1 [Reference]
Wald $\chi^2$ (P value)		3.1 (.06)		1.9 (.16)		0.5 (.61)
<b>Parental Characteristics</b>						
Income						
PIR $\leq$ 1.5	15.8 (6.7)	8.1 (3.2-20.4)	10.8 (4.7)	0.8 (0.2-2.8)	1.1 (0.6)	0.8 (0.1-5.2)
PIR $\leq$ 3.0	16.5 (4.5)	5.1 (2.0-13.1)	21.4 (7.1)	1.1 (0.4-2.9)	3.1 (1.8)	2.1 (0.5-8.6)
PIR $\leq$ 6.0	14.4 (4.1)	3.2 (1.6-6.4)	19.9 (6.4)	1.3 (0.6-2.6)	2.1 (1.1)	1.2 (0.3-5.7)
PIR > 6.0	4.6 (1.1)	1 [Reference]	24.5 (6.9)	1 [Reference]	1.6 (0.7)	1 [Reference]
Wald $\chi^2$ (P value)		8.8 (<.001)		0.2 (.89)		0.4 (.75)
Education						
<High school	13.5 (5.8)	0.5 (0.2-1.6)	9.6 (3.5)	0.2 (0.1-0.6)	0.8 (0.5)	0.4 (0.1-2.1)
High school	10.6 (4.4)	0.6 (0.3-1.5)	10.9 (4.7)	0.4 (0.1-1.0)	1.6 (0.7)	0.6 (0.1-2.5)
Some college	9.5 (2.8)	0.6 (0.3-1.5)	23.9 (5.5)	0.9 (0.3-2.4)	2.7 (1.6)	0.9 (0.2-5.0)
College graduate	14.1 (4.2)	1 [Reference]	29.9 (7.3)	1 [Reference]	2.4 (1.2)	1 [Reference]
Wald $\chi^2$ (P value)		0.7 (.53)		4.5 (.008)		0.5 (.69)
Mental disorder <sup>b</sup>						
No	12.0 (2.3)	1 [Reference]	22.1 (4.8)	1 [Reference]	1.6 (0.6)	1 [Reference]
Yes	11.1 (4.1)	0.6 (0.3-1.4)	10.9 (4.5)	0.5 (0.1-1.6)	3.9 (1.6)	2.9 (0.9-9.8)
Wald $\chi^2$ (P value)		1.2 (.28)		1.0 (.21)		4.8 (.03)

(continued)

pared with 0.5% in the general medical and 1.0% in other sectors.

### COMMENT

This study provides the first evaluation, to our knowledge, of the prevalence, sociodemographic and clinical correlates, and appropriate use of psychotropic medications with specific mental disorders in a nationally representative sample of adolescents with comprehensive evaluations of psychiatric disorders. The results challenge recent concerns over widespread overmedication

and misuse of prescribed psychotropic medications in US adolescents.<sup>2-4</sup> There was no compelling evidence for either misuse or overuse of psychotropic medications. Only 14.2% of youth with a mental disorder during the past year reported psychotropic use, and the majority who had been prescribed medications, particularly those who received treatment in specialty mental health settings, had a mental disorder with severe consequences and impairment, functional impairment, suicidality, or associated behavioral and developmental difficulties. When neurodevelopmental disorders, lifetime history, and sub-threshold conditions are considered, there are few youths

**Table 3. Demographic Correlates of Major Classes of Medication Use Among Adolescents With a DSM-IV Depression, ADHD, and CD/ODD Diagnosis in the Past 12 Months (continued)**

Correlates	Antidepressant Use Among Depression Cases (n = 503)		Stimulant Use Among ADHD Cases (n = 437)		Antipsychotic Use Among Behavior or Neurodevelopmental Disorder Cases (n = 1297)	
	% (SE)	AOR (95% CI) <sup>a</sup>	% (SE)	AOR (95% CI) <sup>a</sup>	% (SE)	AOR (95% CI) <sup>a</sup>
<b>Clinical Characteristics</b>						
No. of classes <sup>c</sup>						
No other class	10.1 (3.6)	1 [Reference]	24.8 (9.0)	1 [Reference]	2.4 (0.9)	1 [Reference]
Exactly 1 other class	12.8 (3.5)	1.1 (0.4-2.8)	21.4 (5.0)	1.0 (0.4-2.5)	1.1 (0.6)	0.3 (0.1-1.0)
≥2 Other classes	12.5 (2.8)	1.3 (0.7-2.7)	14.6 (5.6)	0.9 (0.4-2.4)	2.0 (1.0)	0.9 (0.3-3.0)
Wald $\chi^2$ (P value)		0.5 (.59)		0.01 (.99)		2.1 (.13)
Suicidality						
No	9.6 (1.8)	1 [Reference]	20.2 (4.3)	1 [Reference]	2.0 (0.6)	1 [Reference]
Yes	17.1 (6.0)	3.2 (1.5-6.7)	21.7 (10.7)	2.1 (0.5-8.6)	2.0 (1.1)	1.3 (0.4-4.2)
Wald $\chi^2$ (P value)		9.8 (.003)		1.1 (.30)		0.2 (.64)
Severe disorder						
No	8.0 (2.2)	1 [Reference]	19.0 (4.3)	1 [Reference]	1.4 (0.5)	1 [Reference]
Yes	20.8 (5.6)	5.3 (2.0-14.1)	26.6 (6.9)	2.4 (0.8-7.5)	3.8 (1.6)	4.1 (1.1-15.1)
Wald $\chi^2$ (P value)		11.8 (.001)		2.4 (.13)		4.9 (.03)
Age at onset, y	11.8 (0.3) <sup>d</sup>	1.0 (0.9-1.1)	4.8 (0.2) <sup>d</sup>	1.4 (0.9-2.4)	4.9 (0.3) <sup>d</sup>	0.8 (0.6-1.0)
Wald $F_1$ (P value)		0.02 (.90)		2.0 (.16)		2.9 (.10)
Treatment sector						
Mental health specialty	24.8 (5.5)	1 [Reference]	32.7 (4.9)	1 [Reference]	4.5 (1.3)	1 [Reference]
General medical	11.5 (4.2)	0.3 (0.1-0.6)	21.1 (6.2)	0.3 (0.2-0.8)	0.5 (0.5)	0.1 (0.0-0.7)
Other sector	0.3 (0.3)	0.0 (0.0-0.1)	3.8 (2.1)	0.0 (0.0-0.2)	1.0 (1.0)	0.2 (0.0-1.1)
Wald $\chi^2$ (P value)		12.9 (<.001)		13.5 (<.001)		4.1 (.02)

Abbreviations: ADHD, attention-deficit/hyperactivity disorder; AOR, adjusted odds ratio; CD, conduct disorder; DSM-IV, Diagnostic and Statistical Manual of Mental Disorders (Fourth Edition); ODD, oppositional defiant disorder; PIR, poverty index ratio.

<sup>a</sup>Adjusted for adolescent demographics (age, sex, race/ethnicity, region, and urbanicity), parent characteristics (income, education, and mental disorder), and number of classes of disorder.

<sup>b</sup>Adolescent reports on the parent's depression, anxiety, and panic disorders.

<sup>c</sup>Number of classes of disorder minus the class presently analyzed.

<sup>d</sup>Presented as mean (SE).

treated with psychotropic medications who did not have a serious behavioral, cognitive, or emotional disturbance. The match between specific disorders and indicated medications should also diminish criticism of medication misuse.

We also found little evidence to support claims of practitioner overuse of medications in US adolescents. The majority of the pharmacologically treated youth without a recent disorder had evidence of psychological distress or impairment reflected in a previous mental disorder, sub-threshold condition, or neurodevelopmental disorder. If diagnostic information were available regarding schizophrenia and related psychotic disorders and obsessive-compulsive disorder, it is likely that an even smaller percentage of adolescents would be found to have no objective mental health need for psychotropic treatment.

The efficacy of antidepressants for adolescent major depressive disorder is supported by both clinical trials and meta-analyses.<sup>43</sup> Depressed adolescents are more likely to respond to an antidepressant medication than to cognitive behavioral therapy,<sup>44</sup> the psychotherapy with the strongest empirical evidence.<sup>45</sup> Consistent with epidemiological studies of major depressive disorder in adults,<sup>20</sup> however, only a small minority of adolescents with a depressive disorder were treated with antidepressants. Treatment with antidepressants was strongly related to the presence of serious signs of depression, such as suicidality, and severe impairment or distress. This suggests that an-

tidpressant use tends to be concentrated among those young people with the greatest clinical need.

Across all of the disorders, ADHD was the condition most likely to be treated with psychotropic medication, especially stimulants. However, despite unequivocal experimental evidence of efficacy,<sup>23</sup> a substantial majority of adolescents with ADHD did not receive stimulants in the past year. Even among those who were treated in the specialty mental health sector, only about one-third of adolescents with ADHD received stimulants. Similar results have been reported from research with youth under treatment<sup>46</sup> and in community samples.<sup>16,18</sup>

School-based services play a large role in the delivery of mental health care to young people with ADHD.<sup>9,47</sup> Because symptoms of ADHD are often contextually driven and become particularly evident in high-demand settings, such as the classroom, teachers are well positioned to assess treatment response.<sup>15</sup> In the present study, however, adolescents with ADHD who received mental health care in schools or other settings outside of the specialty and general medical sectors were significantly less likely to receive stimulant medications. Inadequate mental health assessments, concerns over parental responses to a referral for medication evaluation, and philosophical differences concerning the appropriate roles of psychosocial and pharmacological treatments may contribute to the low rate of stimulant use outside of the specialty mental health and general medical sectors.

Antipsychotic use was uncommon among all of the assessed disorders. Youth with neurodevelopmental disorders and bipolar disorder had the highest rates of antipsychotic use, followed by a very small proportion of adolescents with ADHD or disruptive behavior disorders. Clinical trials support a role for second-generation antipsychotics in the treatment of bipolar disorder in youths and irritability, including aggressive and self-injurious behavior, associated with autistic disorder.<sup>28,48</sup> Without information concerning schizophrenia and related psychotic disorders and symptoms or the clinical intent of the psychotropic prescribing, however, it is difficult to evaluate the appropriateness of these prescribing practices. Nevertheless, increasing rates of antipsychotic treatment of young people<sup>49</sup> and common adverse metabolic effects<sup>50</sup> contribute to concerns over antipsychotic prescribing patterns to young people.<sup>42,49,51</sup>

This study advances knowledge on the patterns of psychotropic medication use in a nationally representative sample of adolescents with well-characterized DSM-IV mental disorders and clinical correlates. Previous estimates of psychotropic medication use from pharmacy and insurance statistics are not based on representative samples of the population nor do they include comprehensive assessment of current mental disorders. Limitations of the present study include the lack of information on health insurance that may influence treatment options and the timing of the data collection that was completed in 2004 that may not represent current prescribing practices. However, this concern is offset by the close approximation of the rates of antidepressant treatment<sup>52</sup> and medication use among those in treatment for ADHD<sup>16</sup> in our study with those in a more recent national survey and the finding from pharmacologic and services databases that the use of most psychotropic medications peaked around the study period.<sup>53-55</sup> Finally, because our study was restricted to adolescents, we cannot address recent concerns of psychotropic medication use among children under age 12 years.

A substantial proportion of youth with mental disorders receive services, although relatively few are treated in the specialty mental health service sector.<sup>9</sup> The significant difference in appropriate medication use between the mental health specialty and other treatment sectors suggests that mental disorders are underrecognized in the general medical sector and that appropriate psychotropic medications are underprescribed. Problems with access to the specialty mental health sector pose an enduring challenge to program planners and policy makers. Mental health care of young people within schools, juvenile justice, and primary care settings is often inaccessible, fragmented, and of uneven quality.<sup>56,57</sup> Many regions of the country have only limited access to child and adolescent psychiatrists<sup>58,59</sup> and few non-specialists have sufficient knowledge and experience in the full range of effective treatments. Progress in delivering evidence-based treatments to a larger share of adolescents with common mental disorders will likely require coordinated interventions at the patient, parent, clinician, and health care system levels.

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## REFERENCES

1. Three out of four readers using alternative therapies. consumerreports.org. Accessed July 21, 2011.
2. Angell M. The illusions of psychiatry. New York Review of Books website. <http://www.nybooks.com/articles/archives/2011/jul/14/illusions-of-psychiatry/>. Accessed September 19, 2012.
3. Angell M. The epidemic of mental illness: why? New York Review of Books website. <http://www.nybooks.com/articles/archives/2011/jun/23/epidemic-mental-illness-why/>. Accessed September 19, 2012.
4. Morris J, Stone G. Children and psychotropic medication: a cautionary note. *J Maternal Fam Ther.* 2011;37(3):299-306.
5. Zito JM, Safer DJ, DosReis S, et al. Rising prevalence of antidepressants among US youths. *Pediatrics.* 2002;109(5):721-727.
6. Olfson M, Marcus SC. National patterns in antidepressant medication treatment. *Arch Gen Psychiatry.* 2009;66(8):848-856.
7. Olfson M, Marcus SC, Weissman MM, Jensen PS. National trends in the use of psychotropic medications by children. *J Am Acad Child Adolesc Psychiatry.* 2002;41(5):514-521.
8. Patel NC, Crismon ML, Hoagwood K, et al. Trends in the use of typical and atypical antipsychotics in children and adolescents. *J Am Acad Child Adolesc Psychiatry.* 2005;44(6):548-556.
9. 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(1):32-45.
10. Olfson M, Gameroff MJ, Marcus SC, Waslick BD. Outpatient treatment of child and adolescent depression in the United States. *Arch Gen Psychiatry.* 2003;60(12):1236-1242.
11. Zuvekas SH, Vitiello B, Norquist GS. Recent trends in stimulant medication use among U.S. children. *Am J Psychiatry.* 2006;163(4):579-585.
12. Angold A, Erkanli A, Egger HL, Costello EJ. Stimulant treatment for children: a community perspective. *J Am Acad Child Adolesc Psychiatry.* 2000;39(8):975-984, discussion 984-994.
13. Bauermeister JJ, Canino G, Bravo M, et al. Stimulant and psychosocial treatment of ADHD in Latino/Hispanic children. *J Am Acad Child Adolesc Psychiatry.* 2003;42(7):851-855.

14. Bird HR, Shrout PE, Duarte CS, Shen S, Bauermeister JJ, Canino G. Longitudinal mental health service and medication use for ADHD among Puerto Rican youth in two contexts. *J Am Acad Child Adolesc Psychiatry*. 2008;47(8):879-889.
15. 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.
16. Froehlich TE, Lanphear BP, Epstein JN, Barbaresi WJ, Katusic SK, Kahn RS. Prevalence, recognition, and treatment of attention-deficit/hyperactivity disorder in a national sample of US children. *Arch Pediatr Adolesc Med*. 2007;161(9):857-864.
17. Jensen PS, Bhatara VS, Vitiello B, Hoagwood K, Feil M, Burke LB. Psychoactive medication prescribing practices for U.S. children: gaps between research and clinical practice. *J Am Acad Child Adolesc Psychiatry*. 1999;38(5):557-565.
18. Jensen PS, Kettle L, Roper MT, et al. Are stimulants overprescribed? treatment of ADHD in four U.S. communities. *J Am Acad Child Adolesc Psychiatry*. 1999;38(7):797-804.
19. Wu P, Hoven CW, Cohen P, et al. Factors associated with use of mental health services for depression by children and adolescents. *Psychiatr Serv*. 2001;52(2):189-195.
20. González-Tejera G, Canino G, Ramírez R, et al. Examining minor and major depression in adolescents. *J Child Psychol Psychiatry*. 2005;46(8):888-899.
21. Szatmari P, March JS. Clinical practice guidelines. *J Am Acad Child Adolesc Psychiatry*. 2007;46(8):939-940, discussion 940-942.
22. Abikoff H, McGough J, Vitiello B, et al; RUPP ADHD/Anxiety Study Group. Sequential pharmacotherapy for children with comorbid attention-deficit/hyperactivity and anxiety disorders. *J Am Acad Child Adolesc Psychiatry*. 2005;44(5):418-427.
23. Kaplan G, Newcorn JH. Pharmacotherapy for child and adolescent attention-deficit hyperactivity disorder. *Pediatr Clin North Am*. 2011;58(1):99-120, xi.
24. Pliszka SR, Crismon ML, Hughes CW, et al; Texas Consensus Conference Panel on Pharmacotherapy of Childhood Attention Deficit Hyperactivity Disorder. 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.
25. Wood JG, Crager JL, Delap CM, Heiskell KD. Beyond methylphenidate: non-stimulant medications for youth with ADHD. *J Atten Disord*. 2007;11(3):341-350.
26. Jerrell JM. Pharmacotherapy in the community-based treatment of children with bipolar I disorder. *Hum Psychopharmacol*. 2008;23(1):53-59.
27. Carlson GA, Findling RL, Post RM, et al. AACAP 2006 Research Forum: advancing research in early-onset bipolar disorder: barriers and suggestions. *J Child Adolesc Psychopharmacol*. 2009;19(1):3-12.
28. Liu HY, Potter MP, Woodworth KY, et al. Pharmacologic treatments for pediatric bipolar disorder: a review and meta-analysis. *J Am Acad Child Adolesc Psychiatry*. 2011;50(8):749-762, e39.
29. Birmaher B, Ollendick TH. Childhood-onset panic disorder. In: Ollendick TH, March JS, eds. *Phobic and Anxiety Disorders in Children and Adolescents: A Clinician's Guide to Effective Psychosocial and Pharmacological Interventions*. Oxford, England: Oxford University Press; 2004:306-333.
30. Cheng-Shannon J, McGough JJ, Pataki C, McCracken JT. Second-generation antipsychotic medications in children and adolescents. *J Child Adolesc Psychopharmacol*. 2004;14(3):372-394.
31. Cheung A, Kusumakar V, Kutcher S, et al. Maintenance study for adolescent depression. *J Child Adolesc Psychopharmacol*. 2008;18(4):389-394.
32. Emslie GJ, Mayes TL. Mood disorders in children and adolescents: psychopharmacological treatment. *Biol Psychiatry*. 2001;49(12):1082-1090.
33. Walkup JT, Akincigil A, Chakravarty S, et al. Bipolar medication use and adherence to antiretroviral therapy among patients with HIV-AIDS and bipolar disorder. *Psychiatr Serv*. 2011;62(3):313-316.
34. Turgay A. Psychopharmacological treatment of oppositional defiant disorder. *CNS Drugs*. 2009;23(1):1-17.
35. Turgay A, Binder C, Snyder R, Fisman S. Long-term safety and efficacy of risperidone for the treatment of disruptive behavior disorders in children with sub-average IQs. *Pediatrics*. 2002;110(3):e34.
36. Franklin ME, Sapyta J, Freeman JB, et al. Cognitive behavior therapy augmentation of pharmacotherapy in pediatric obsessive-compulsive disorder: the Pediatric OCD Treatment Study II (POTS II) randomized controlled trial. *JAMA*. 2011;306(11):1224-1232.
37. Vitiello B, Correll C, van Zwieten-Boot B, Zuddas A, Parellada M, Arango C. Antipsychotics in children and adolescents: increasing use, evidence for efficacy and safety concerns. *Eur Neuropsychopharmacol*. 2009;19(9):629-635.
38. Merikangas K, Avenevoli S, Costello J, Koretz D, Kessler RC. National Comorbidity Survey Replication Adolescent Supplement (NCS-A), I: background and measures. *J Am Acad Child Adolesc Psychiatry*. 2009;48(4):367-369.
39. 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.
40. Kessler RC, Avenevoli S, Costello EJ, et al. National Comorbidity Survey Replication Adolescent Supplement (NCS-A), II: overview and design. *J Am Acad Child Adolesc Psychiatry*. 2009;48(4):380-385.
41. Kessler RC, Avenevoli S, Costello EJ, et al. Design and field procedures in the US National Comorbidity Survey Replication Adolescent Supplement (NCS-A). *Int J Methods Psychiatr Res*. 2009;18(2):69-83.
42. 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):w770-w781.
43. 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.
44. March J, Silva S, Petrycki S, et al; Treatment for Adolescents With Depression Study (TADS) Team. Fluoxetine, cognitive-behavioral therapy, and their combination for adolescents with depression: Treatment for Adolescents With Depression Study (TADS) randomized controlled trial. *JAMA*. 2004;292(7):807-820.
45. David-Ferdon C, Kaslow NJ. Evidence-based psychosocial treatments for child and adolescent depression. *J Clin Child Adolesc Psychol*. 2008;37(1):62-104.
46. Zima BT, Bussing R, Tang L, et al. Quality of care for childhood attention-deficit/hyperactivity disorder in a managed care Medicaid program. *J Am Acad Child Adolesc Psychiatry*. 2010;49(12):1225-1237, 1237, e1-e11.
47. Leslie LK, Wolraich ML. ADHD service use patterns in youth. *J Pediatr Psychol*. 2007;32(6):695-710.
48. McDougle CJ, Stigler KA, Erickson CA, Posey DJ. Atypical antipsychotics in children and adolescents with autistic and other pervasive developmental disorders. *J Clin Psychiatry*. 2008;69(suppl 4):15-20.
49. Domino ME, Swartz MS. Who are the new users of antipsychotic medications? *Psychiatr Serv*. 2008;59(5):507-514.
50. Correll CU, Manu P, Olshansky V, Napolitano B, Kane JM, Malhotra AK. Cardiometabolic risk of second-generation antipsychotic medications during first-time use in children and adolescents. *JAMA*. 2009;302(16):1765-1773.
51. Comer JS, Mojtabei R, Olfson M. National trends in the antipsychotic treatment of psychiatric outpatients with anxiety disorders. *Am J Psychiatry*. 2011;168(10):1057-1065.
52. Pratt LA, Brody DJ, Gu Q. Antidepressant use in persons aged 12 and over: US, 2005-2008. NCHS data brief. <http://www.cdc.gov/nchs/data/databriefs/db76.htm>. Published October 2011. Accessed September 19, 2012.
53. 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.
54. Zito JM, Safer DJ, DosReis S, et al. Psychotropic practice patterns for youth: a 10-year perspective. *Arch Pediatr Adolesc Med*. 2003;157(1):17-25.
55. Zuvekas SH. Prescription drugs and the changing patterns of treatment for mental disorders, 1996-2001. *Health Aff (Millwood)*. 2005;24(1):195-205.
56. Frank RG, Glied S. Changes in mental health financing since 1971: implications for policymakers and patients. *Health Aff (Millwood)*. 2006;25(3):601-613.
57. Kelleher K. Organizational capacity to deliver effective treatments for children and adolescents. *Adm Policy Ment Health*. 2010;37(1-2):89-94.
58. Thomas CP, Conrad P, Casler R, Goodman E. Trends in the use of psychotropic medications among adolescents, 1994 to 2001. *Psychiatr Serv*. 2006;57(1):63-69.
59. Sarvet B, Gold J, Bostic JQ, et al. Improving access to mental health care for children: the Massachusetts Child Psychiatry Access Project. *Pediatrics*. 2010;126(6):1191-1200.