

# Adolescent Substance Use Disorder Prevention and Treatment

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## Introduction

Substance abuse problems represent a significant public mental health issue for adolescents in the United States, with 23% of youth having developed a substance use disorder by the age of 18.<sup>1</sup> Childhood mental health problems increase the overall risk for developing adolescent-onset substance use disorders. Conversely, adolescent substance misuse increases the risk of developing co-occurring mental health problems, and the co-occurrence mental health and substance use problems complicates clinical management and treatment. Fortunately, there are a number of practical and effective approaches to the prevention and treatment of adolescent substance abuse problems and their co-occurrence with mental health problems that could—and should—be included in the deployment of comprehensive child and adolescent behavioral health services.

## Epidemiology

There is rich literature regarding the epidemiology of substance use problems among adolescents. One of the most recent rigorous efforts is the *National Comorbidity Replication–Adolescent Supplement* (NCS-A), which examined the prevalence of behavioral health problems and related service utilization among a nationally representative sample of adolescents ages 13-18 years.<sup>1,2-4</sup> Consistent with other studies in this area, the vast majority of adolescents report that they had consumed alcohol by age 18 (78.2%), with about a quarter having used drugs by age 18 (24.4%). Alcohol and drug use was rarely initiated prior to age 13, but accelerated rapidly throughout adolescence. Substance use disorders showed a similar, but slightly lagged pattern with

acceleration in diagnostic rates starting after age 14. The lifetime prevalence of alcohol use and drug use disorders by age 18 was 6.4% and 8.9%, respectively. Alcohol and drug use disorders were somewhat more common in males than females (7.0% vs. 5.8% and 9.8% vs. 8.0%, respectively).

Equally striking are the high rates of comorbidity among substance use disorders with other psychiatric diagnoses. In the NCS-A, 60% of youth with an alcohol use disorder had a comorbid drug use disorder, and 44% of those with a drug use disorder had an alcohol use disorder. Thirty-two percent of adolescents with a substance use disorder met criteria for a non-substance use psychiatric disorder. Particularly concerning is the relationship of substance use disorders with suicidal behaviors, with 24% and 35% of adolescents who attempted suicide meeting criteria for an alcohol or a drug use disorder, respectively. Armstrong and Costello<sup>5</sup> examined the rates of comorbidity between substance use disorders and other mental disorders reported in 15 epidemiological studies. Compared to adolescents without substance use problems, only 2 classes of disorders were clearly more common among adolescents with substance use problems: Disruptive Behavior Disorders (mainly Conduct Disorder with rates of 25.0% to 50.0%) followed by Major Depressive Disorder (with rates of 20.0% to 30.0%). Rates of other mental disorders that were prevalent among adolescents with substance use disorders included Anxiety Disorders (7% to 44%), Attention Deficit Hyperactivity Disorder (12%), Post-traumatic Stress Disorder (11%), and Eating Disorders (5%).

The rates of comorbidity are higher in treatment settings. For example, Aarons et al.<sup>6</sup> found that 40.8%

of youth receiving treatment in public mental health settings met criteria for a substance use disorder.<sup>6</sup>

There is rich literature on the risk and protective factors for substance use disorders. Genetic factors are estimated to account for 40%-70% of risk for developing substance use problems (the magnitude of this association varies across substances).<sup>7</sup> Key psychological and social risk factors include sensation seeking, antisocial behavior, peer and parental substance use (and attitudes towards substance use), as well as community norms regarding substance use (eg, rates of adult alcohol use and adult drunk driving are associated with adolescent substance use).<sup>8</sup> Mental disorders, particularly Conduct Disorder, increased the risk of substance use disorders.<sup>5</sup> Protective factors include social skills, engagement in recreational activities, having a non-parental adult role model, and religious involvement.<sup>8</sup> It is also notable that substance use disorders, especially during adolescence, are associated with a greater risk of developing mental health problems.<sup>9,10</sup> For example, cannabis use increases odds of psychosis by 1.41; frequent cannabis use by 2.09.<sup>10</sup>

Disparities in the rates of substance use disorders are also well documented. In the NCS-A, non-Hispanic blacks had lower rates of substance use disorders than whites and Hispanics.<sup>1</sup> Studies of American Indian adolescents suggest that they have higher rates of substance use problems than non-native youth.<sup>11</sup>

In Colorado, the growth of the medical marijuana industry and the legalization of recreational marijuana for adults over 21 is already having impacts on adolescent substance use. There is strong evidence for the diversion of medical marijuana to adolescents.<sup>12,13</sup> There are also concerns that the shift in attitudes towards marijuana use indicative of its medicalization and legalization will result in greater adolescent misuse and related problems, though a recent survey suggests that while a majority of parents of adolescents in Colorado are supportive of the decriminalization of marijuana use for adults, they want strict controls of its distribution and use because of concerns regarding its health impacts on youth.<sup>14</sup>

Finally, despite the long-standing recognition of adolescent substance use as a significant public health problem, access to care remains severely limited. In the NCS-A, only 15.4% of adolescents with substance use disorders received substance abuse services.<sup>2</sup>

## Prevention

There are 3 types of prevention programs cited in the literature related to substance misuse among adolescents. *Universal prevention* refers to intervention aimed at targeting the entire population, *selective prevention* targets subgroups within the population who are considered high risk (eg, individuals with a genetic predisposition), and *indicated prevention* describes interventions that are geared toward those who are already exhibiting early signs of substance use problems, engaging in substance misuse, or other high risk behaviors.<sup>15</sup>

Cochrane reviews of various types of prevention programs have described the evidence as being relatively weak with heterogeneous and modest initial effect sizes that diminish over time. Universal prevention programs that are designed to target youth who have not yet initiated substance use typically have limited effectiveness.<sup>16,17</sup>

The most effective drug prevention approaches focus on reducing risk factors and increasing protective factors.<sup>15,18</sup> Additionally, multi-modal universal prevention programs that utilize developmentally tailored *booster* sessions tend to show more robust, longer-term effects.<sup>19</sup> For school-based interventions, there is some evidence that prevention programs using non-teacher facilitators (eg, mental health counselors, peer leaders, and health professionals) or a combination of teachers and other facilitators are more effective than teacher-led interventions alone, although these results are somewhat inconsistent.<sup>19</sup>

A recent Cochrane review of universal school-based intervention programs, published in 2011, identified 3 programs deemed to be most effective: (1) the Life Skills Training Program, (2) the Unplugged Program, and (3) the Good Behavior Game.<sup>20</sup>

The Life Skills Training program utilizes a cognitive behavioral skills framework with goals of improving self-esteem, assertiveness, drug resistance, problem solving, communication, emotion regulation, and social skills. The program provides education about negative consequences of drugs and alcohol. This program is intended to be delivered starting in the seventh grade, with booster sessions in subsequent years (10 sessions in eighth grade, and 5 in ninth grade). Findings related to the Life Skills Training program showed lower rates of substance use than controls.<sup>21,15</sup>

The Unplugged Program is based on a social influence model and focuses on teaching life skills, such as assertiveness, problems solving, coping, effective communication, and self-control. It also incorporates education regarding risk and protective factors. It is delivered using 12 sessions.<sup>17,22</sup>

The Good Behavior Game focuses on behavioral management with the intention of promoting an understanding of the child's role within the classroom community. It is delivered to first and second grade children.<sup>23</sup> A study examining the long-term effects of this intervention found that those who received the Good Behavior Game intervention had lower rates of problematic behaviors such as substance use disorders, antisocial behaviors, and suicidal ideation in young adulthood.<sup>23</sup>

A recent, comprehensive, systematic review of selective prevention programs indicates that while there are some programs that show promising results, due to the limited number of studies, current findings are considered preliminary.<sup>24</sup>

Indicated prevention programs that have shown promising efficacy are school-based, and focus on serving youth who have already initiated a mild to moderate level of substance use. Winters<sup>25</sup> and Walker<sup>26</sup> describe very brief interventions consisting of 2 to 3 individual sessions of Motivational Enhancement Therapy (MET)/Motivational Interviewing compared to an Educational Feedback Control (EFC). These very brief interventions show modest short-term reductions in self-reported cannabis use, primarily in adolescents who elected to participate in as many as 4 additional (and optional) Cognitive Behavioral Therapy (CBT) sessions after completing the brief MET intervention. This suggests that longer school-based MET/CBT interventions are needed for the growing number of high school students who regularly use (approximately 25%), or the estimated 10%-15% who meet diagnostic criteria for Substance Use Disorders (SUD). Results from a recently completed pilot study provide empirical support for this conjecture.<sup>27</sup> The study adapted an existing 16-week evidence-based MET/CBT + CM intervention (*Encompass*) as a briefer (8-week) school-based intervention. Fifteen students who committed drug/alcohol related school offences were consecutively referred for clinical evaluation. All met DSM-5 diagnostic criteria for cannabis use disorder, and 13/15 enrolled in the 8-session intervention

after adolescent/parent consent. Nine (69%) completed treatment with 95% compliance (CBT session attendance), and more than half (56%) achieved at least 1 month of sustained abstinence during treatment based on weekly urine drug screens.<sup>27</sup>

## Screening And Assessment

There are 2 types of assessments for substance use and abuse in adolescents that are widely used: brief screening, and comprehensive evaluation. Brief screening is used with the intention of identifying whether there is a cause for concern, and determines if there is a need for further evaluation. Brief screening can be completed in a very short period of time (typically within minutes), and should be a part of any clinical intake process. Comprehensive evaluation tools are utilized when a potential substance use problem has already been identified. These types of evaluations can take up to 2 to 3 hours, depending on the structure of the particular evaluation. The goal of these more comprehensive assessments is to gain a clearer understanding of the nature and severity of the substance problem. They may also gather relevant biopsychosocial information, establishing an appropriate diagnosis, determining the presence of comorbidities, and providing a framework for treatment planning.<sup>18,28,29</sup> There are several commonly-used instruments to accomplish the above tasks,<sup>30,31,28</sup> which are summarized in Table 1. Review articles regarding screening and assessment should be reviewed for more detailed descriptions and evaluations of the instruments, as well as a discussion regarding their utility, reliability, and validity information.<sup>30-32</sup>

Screening & Brief Assessment	Comprehensive Evaluation
<ul style="list-style-type: none"> <li>• CRAFFT—This is a brief 6-item screening tool</li> <li>• Substance Abuse Screening Inventory-Adolescent Version</li> <li>• Personal Experience Screening Questionnaire: PESQ:</li> <li>• Drug Use Screening Inventory (DUSI-A)</li> <li>• Adolescent Drinking Index (ADI)</li> <li>• Adolescent Drug Involvement Scale (ADIS)</li> <li>• Drug Abuse Screening Test-10 (SBIRT)—This is a 10-item instrument that should take less than 8 minutes to complete. It can be used with adults or older youth.</li> </ul>	<ul style="list-style-type: none"> <li>• Adolescent Diagnostic Interview (ADI)</li> <li>• Adolescent Drug Abuse Diagnosis (ADAD)</li> <li>• Adolescent Drug Involvement Scale (ADIS)</li> <li>• Adolescent Alcohol and Drug Involvement Scale (AADIS)</li> <li>• Personal Experience Inventory (PEI)</li> <li>• Kiddie Schedule for Affective Disorders and Schizophrenia (KSADS)-comprehensive semi-structured diagnostic interview</li> </ul>

**Table 1.** Commonly-Used Measures for Screening and Comprehensive Assessment of Substance Use Problems.

## Evidence-Based Interventions For Adolescents With Substance Use Disorders (SUD)

### Evidence-Based Psychosocial/Behavioral Treatments for Substance Abusing Adolescents

According to recent published reviews, the following psychosocial interventions are considered to have “well-established efficacy:” (1) Individual Cognitive Behavioral Therapy (CBT) with or without a component of Motivational Enhancement Therapy (MET), (2) Multidimensional Family therapy (MDFT), (3) Functional Family Therapy (FFT), and (4) Cognitive Behavioral Therapy-Group (CBT-G).<sup>33,34</sup> Interventions deemed to be “probably efficacious” include: (1) Brief Strategic Family Therapy (BSFT), (2) Behavioral Family Therapy (BFT), and (3) Multi-Systemic Therapy (MST).<sup>34</sup> Taken together, these interventions have comparable and moderate acute treatment effect sizes on reductions in substance, and more modest effects on sustained abstinence.<sup>33-35</sup> Of those listed above, interventions that utilize individual MET/CBT have consistently shown greater sustained or emerging post-treatment effect size compared to family-based interventions.<sup>33-35</sup> Other studies have shown that contingency management (CM) using motivational incentives (ie, voucher payments or prize drawings)

significantly increase rates of sustained abstinence, when added to individual MET/CBT compared to MET/CBT alone.<sup>36,37</sup> In a randomized controlled trial of CM in 69 adolescents (ages 14-18) with cannabis use disorders, 50% of the participants who receive CM+MET/CBT achieved at least 10 weeks of abstinence compared to 18% who received MET/CBT alone. In this study, between group differences were maintained at 6 months, but not the 9-month post-treatment follow up.<sup>38</sup>

### Medication-Assisted Treatment for Adolescents with SUD

Numerous studies in adults have shown that medications can be useful when used in conjunction with psychosocial or behavioral interventions for addiction to alleviate symptoms of withdrawal, reduce craving and use, prevent relapse, or to treat common co-occurring psychiatric conditions such as depression or anxiety disorders.<sup>39</sup> Unfortunately, relatively few randomized controlled medication trials have been conducted in adolescents or young adults compared to adults with substance use disorders. Medications that are efficacious or probably efficacious, and which have relatively good safety profiles in adolescents with SUD are shown in Table 2.

Medication	Targeted SUD or Psychiatric Comorbidity	Reduce Craving	Agonist Replacement Therapy	Psychiatric Comorbidity
N-Acetylcysteine (NAC)	Cannabis Use Disorder	X		
Buprenorphine	Opiate Dependence		X	
Nicotine Replacement Therapy	Nicotine Dependence	X	X	
Bupropion	Nicotine Dependence	X		X* *(ADHD, MDD)
Fluoxetine	Major Depressive Disorder (MDD)			X
Osmotic-Release Methylphenidate (OROS-MPH)	ADHD			X
Atomoxetine	ADHD			X

**Table 2.** Medications for Adolescents with Substance Use Disorders.

*Medications for Cannabis Use Disorders.* N-acetylcysteine (NAC) is widely available as an over-the-counter antioxidant supplement or *nutriceutical*. An 8-week, randomized, double-blinded, placebo-controlled trial evaluated the impact of N-acetylcysteine (NAC) (1200 mg twice daily) compared to matching placebo on cannabis use and craving in 116 cannabis-dependent adolescents/young adults (ages 15-21) in the context of brief weekly cessation counseling and contingency management. Participants who received NAC were 2.4 times more likely to have a negative urine cannabinoid test (THC) at post-treatment follow-up visit, and had significantly more negative urine drug tests during treatment compared to those who received placebo (19% vs 10%, respectively).<sup>40</sup>

*Medications for Opiate Use Disorders.* In opiate-dependent adolescents (ages 15-21), longer term (12-week) treatment with buprenorphine-naloxone has been shown to be more effective than brief 14-day buprenorphine-naloxone taper (detoxification) with regard to: (1) treatment compliance, (2) fewer opiate positive urine drug screens, (3) less self-reported opiate use.<sup>41</sup>

*Medications for Smoking Cessation.* Although findings are somewhat mixed, and effect sizes and cessation rates tend to be somewhat lower than that reported in adult studies, both Nicotine Replacement Therapy (NRT) and Bupropion-SR have been shown to be relatively safe and more effective than smoking cessa-

tion counseling alone in nicotine-dependent adolescents.<sup>42,43-45</sup>

*Medications for Co-occurring Psychiatric Disorders*

*Major Depressive Disorder.* Fluoxetine has been shown to be more effective than placebo for co-occurring depression in adolescents concurrently participating in outpatient substance treatment with individual MET/CBT.<sup>39</sup> Despite non-abstinence in most participants, fluoxetine was also well-tolerated, and demonstrated a good safety profile.

*Attention-Deficit Hyperactivity Disorder*

Both Osmotic-Release Methylphenidate<sup>46</sup> and atomoxetine<sup>47</sup> have been shown to be relatively safe and probably efficacious for co-occurring ADHD in adolescents concurrently receiving outpatient substance treatment with individual MET/CBT.

**Summary And Recommendations For Clinical Practice**

Research in the past decade has increased our understanding of biological and developmental processes, as well as environmental risk factors that contribute to adolescent-onset substance use disorders (SUD). There has also been significant progress in the development, implementation, and dissemination of psychosocial interventions that have been deemed to be efficacious or probably efficacious for adolescent SUD.

A handful of medications have also been shown to be useful for reducing withdrawal symptoms, drug craving, and co-occurring psychiatric disorders. Despite significant progress, existing behavioral interventions for adolescent SUD show relatively modest reductions in drug use that attenuate over time, low rates of abstinence, and high relapse rates. Although additional research is needed to improve existing interventions or develop more effective interventions, many treatment programs could currently improve abstinence rates by incorporating CM/motivational incentives into existing treatment. Unfortunately few community-based treatment programs currently utilize CM/incentives. Treatment could also be improved by implementing standardized clinical assessments and repeated measures to enable treatment programs to more rigorously evaluate clinical outcomes and inform practice improvement. De-identified data from clinical assessments could also be used to develop competitive grant proposals to further advance research and clinical practice.

The most significant limitation of the treatment system are the considerable barriers to treatment access, including the limited availability of adolescent-focused substance abuse services. To our knowledge, there is no other area of medicine for which the gap between treatment need and availability is as great as it is for adolescents with substance use disorders (SUD). Existing community-based adolescent substance treatment programs predominantly serve youth who are referred by the juvenile justice system, in part, because the juvenile justice system is the largest third-party payer for adolescent drug treatment, nationwide. Such youth represent less than 10% of those who could benefit from substance treatment. Very few treatment options exist for the estimated 11% of adolescents in the U.S., the majority of whom are high school students, who meet criteria for substance use disorders, but who are not (yet) involved with the juvenile justice system. The vast majority of existing school-based drug prevention programs are designed for youth who have not yet initiated substance use. School-based interventions for youth who have progressed to problematic use, abuse, and/or dependence are very brief, utilizing 1-3 session motivational enhancement interventions that have shown modest to weak short-term reductions in substance use that attenuate over time.

It is possible that the effectiveness of evidence-based substance psychosocial treatment interventions located in community-based treatment settings could be improved if adapted as school-based interventions for non-juvenile-justice-involved high school students who may have somewhat less serious substance involvement. This would be aligned with The American Academy of Pediatrics and the President's New Freedom Commission on Mental Health (NFC) recommendations that mental health and substance treatment services be extended to non-traditional treatment settings, especially schools, to address critical gaps in access and availability of high quality behavioral health treatment for youth and families. This would also help address existing disparities in access for socioeconomically disadvantaged and racial/ethnic minorities, and facilitate greater continuity and coordination with primary medical care in many existing school-based health clinics.

Efforts to significantly increase access and the availability of substance or integrated behavioral health treatment will also require significant expansion of the workforce. Clinical training programs will need to be significantly enhanced and transformed to address the critical shortage of clinicians with dual training in mental health and addiction prevention and treatment, as identified by the Institute of Medicine. University-based research and clinical training programs may be in the best position to take the lead in developing enhanced clinical training programs, and establishing clinical competency and credentialing criteria. Mental health clinician training should include (1) training in systematic assessment of biological/developmental processes, environmental risk, and protective factors associated with adolescent-onset substance abuse; (2) training in evidence-based prevention and treatment interventions that have been shown to reduce risk and enhance resilience or protective factors (eg, Parent Management Training for children with ODD/CD); (3) training in evidence-based approaches to integrated or coordinated treatment (eg, co-located mental health/addiction treatment services); and (4) training in continuing care (eg, relapse prevention, recovery support services) and coordinated care models for youth with co-occurring substance abuse and mental health problems.

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