



Treatment Options for Opioid Abuse in Adolescents

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Abstract

The opioid and substance epidemic is a significant public health concern in the United States. Among the many population groups that are affected, adolescents are especially vulnerable due to their biological underdevelopment, susceptibility to their environment, and vulnerability to comorbid psychiatric symptoms. This review examines contributors to adolescent opioid misuse and explores the treatment options for patients, including medication-based treatments such as methadone and buprenorphine. Factors that often lead adolescents to SUD lie in multiple causes, such as their social environment, psychiatric conditions, and circumstances, such as an injury. Through research, this review shows that although prevention programs and psychosocial interventions are effective, access to evidence-based treatment (particularly medication for opioid use disorder) remains inaccessible or limited to adolescents. Overall, the findings show the need for adolescent-tailored prevention strategies and expanded access to medication-based treatment that are proven to be effective for both adults and adolescents alike.



Introduction and Background

Opioid misuse is defined by the use of prescription drugs without a prescription, or differently than prescribed (Centers for Disease Control and Prevention [CDC], 2025), which often leads to substance use disorder (SUD) alongside physical or psychological dependence, which may contribute to various mental health conditions and physical illnesses, causing nearly 600,000 hospitalizations in 2021 with nonfatal poisoning or overdoses (National Center for Drug Abuse Statistics [NCDAS], 2025). Americans comprise a relatively small proportion of the world's population, yet they consume roughly 80% of the world's opioid supply, which led to an official decree that opioid addiction was a public health emergency in 2017 (Watson, 2024). This is because opioid addiction is extremely costly, prolific, and deadly, as one out of every 22 deaths of persons in the US age 15-74 was attributable to unintentional opioid overdose in 2021. In 2022, according to provisional data, approximately 110,000 people died of a drug overdose (Centers for Disease Control and Prevention, 2024), while in 2024, the federal budget for drug control was about 45 billion dollars (NCDAS, 2025). Through these data, it is apparent that the opioid/substance epidemic is extremely damaging to individuals and communities.

Opioid addiction and the first encounter that leads to such addiction in adolescents are associated with a variety of factors. Developmental vulnerabilities and comorbid psychiatric disorders increase risk for all SUDs. Some environmental and genetic factors are shared by all SUDs and increase risk for all substances, not just for opioid use. Both co-occurring psychiatric disorders and deviation from the normal developmental trajectory seem to worsen with increased severity and repetition of overall SUD, and these progressions may lead to opioid addiction (Sharma et al, 2017). The majority of adolescents with SUD have been found to have other co-occurring mental illnesses. In fact, evidence shows that 37% to 80% of adolescents with SUDs have at least one other mental disorder (Simon et al, 2024).

Psychiatric conditions such as ADHD may increase adolescent substance use risk. This is shown as those with ADHD are significantly more likely to try substances during their lifetime than those without ADHD. Co-occurrence of SUD and other psychiatric disorders may also result in lower treatment retention, increased chance of relapse, and higher likelihood of persistence of SUD (Simon et al, 2024). Furthermore, studies have shown that compared to adolescents without a depressive episode, adolescents with experience of major depressive disorder had a 1.5 times increased risk for prescription opioid misuse, and a 2.2 times increased risk for an opioid use disorder (OUD) when prescribed opioids for other clinical maladies (Yule et al, 2019). Additionally, another study found adolescents who misused prescription opioids to “get high” had increased symptoms of attention-deficit disorder and anxiety, somatic, attention, and conduction disorders compared to their peers without opioid use (Yule et al, 2019).

A history of childhood abuse is also associated with prescription opioid misuse in early adulthood. This is supported by Dr. Stein and colleagues, who found that higher scores on the Adverse Childhood Experience (ACE) questionnaire were correlated with a younger age of first opioid misuse among adults entering an inpatient opioid detoxification unit (Yule, 2019). Additionally, research suggests that internalizing symptoms (e.g., depression, anxiety, traumatic distress) and externalizing symptoms (e.g., aggression, delinquency, hyperactivity) may play a critical role in this association, as both symptom domains have been independently linked to ACE exposure and prescription opioid misuse. This study examined the relationship between ACE and opioids by analyzing statistics from Wave 3 of the National Epidemiological Survey on Alcohol and Related Conditions (NESARC-III), collected in 2012–2013 by the NIAAA. Through this analysis, they have found that People with higher ACE scores were more likely to misuse

prescription opioids, start misusing them at a younger age, have opioid use disorder at some point in their lives, and misuse opioids more frequently (Tang et al, 2020).

Furthermore, although ACEs weren't directly related to OUD, ACEs increase internalizing and externalizing symptoms, which increase the likelihood of prescription opioid misuse and OUD (Tang et al, 2020). A more scientific approach to examining the relationship between adolescent SUD and abuse can be seen through the correlation of addiction and cortisol levels. Cortisol is a hormone that regulates the body's stress response, metabolism, blood sugar, inflammation, and sleep-wake cycle. This is shown in a study that compared adolescents' cortisol reactivity through salivary cortisol samples and emotional regulation difficulties (a factor often showing the likelihood of adolescent substance use) through self-reports and examination. Low levels of cortisol reactivity, often caused by a prolonged stressful environment such as an abusive household, were often found to have led to externalizing symptoms when coupled with emotion regulation difficulties. As predicted, adolescents with low cortisol reactivity and high emotion regulation difficulties had the highest reported symptoms of OUD. Their research shows that adolescents with such conditions are the most vulnerable to engaging in addictive, impulsive behaviors such as abusing substances. Furthermore, because the adolescent brain undergoes significant changes in the emotional system and in behaviors related to emotional regulation, adolescents are more prone to rapid changes in emotional regulation and high rates of comorbid psychological problems, making it a key period for links between emotional processes and outcomes such as SUD and other mental health issues (Poon et al, 2015). This shows how the environment adolescents are in, such as experiences of household abuse, can impact their likelihood of developing SUD.

Another factor for an early exposure to substances, which increases the chance of developing SUD, is peer/parental influence. Peer and parental disapproval of substance use decreases the odds of substance use. Furthermore, any confidant disapproval decreased the odds of substance use (Marziali et al, 2022). This shows that with a more protective community, adolescents are less likely to try substances, therefore lowering the risk of SUD. However, this would also mean that adolescents without community disapproval are at a greater risk of trying substances and developing SUD. Parental influence takes this even further, as an experiment involving 9400 mother-child and 5800 father-child pairs showed that parents' medical prescription stimulant use was associated with their children's medical prescription opioid use, suggesting that parental leftover substance may be a gateway to some adolescent SUDs (Griesler et al, 2021).

The last factor that will be discussed is the physiological stress and its cause of early substance exposure. One example of a group that can be studied for this factor is the youth athletes, as they are more vulnerable to the risk of pain and injury compared to their peers. In fact, the Centers for Disease Control and Prevention (CDC) estimates 2.6 million adolescents suffer a sport-related injury annually, and approximately 7% of these injuries require surgical treatment (Benjamin et al, 2024). Adolescent athletes report greater pain levels and higher psychological stress than their nonathlete peers, which may increase their demand for opioid painkillers. Similar to injuries, physiological stress response systems have been identified as key factors in eliciting neurobiological alterations that increase substance use vulnerability through many studies, deteriorating the body's innate regulatory mechanisms. Perceived environmental threats activate the autonomic nervous system (ANS), and once the danger passes, the parasympathetic branch of the ANS takes over, facilitating the body's restoration. The regulation of the ANS can become weaker if constantly exposed to chronic stress, causing neurobiological

alterations that may increase the risk of SUD (Cavanagh et al, 2021). The weakened regulation in ANS can cause emotion-regulating difficulties, such as hormonal control to destabilize the reactive amygdala (a part of the brain that processes emotion and fear). As one may observe, there are multiple, complex causes of opioid first use and addiction, which make it difficult to prevent and root out opioid use in adolescent Americans.

Treatment Options

Despite such hardships in combating the widespread epidemic, efforts are being made to prevent and treat patients affected by the opioid epidemic. A study in 2025 showed that hosting classroom interventions in 7th grade with sessions on SUD prevention that involved parents significantly reduced prescription opioid misuse, with effects lasting until 12th grade. When educated in a school environment, four studies showed improved knowledge on opioid use, while two showed understanding of opioid withdrawal as well as overdose management (Hua-Nguyen et al, 2025).

On top of such prevention efforts, there are non-medication treatments for opioid addiction for both adults and adolescents alike. The ones discussed in this review paper are extinction training, psychosocial interventions, and mutual-help organizations. In extinction training, a cue that was once correlated with a fear, such as an electric shock to a mouse, is repeatedly presented without anything harmful occurring. As this goes on, the fear associated with that cue gradually decreases. Just as extinction training can help overcome fear, the same concept can be applied to SUD treatment. Actions that trigger what once was a psychological cue for a drug can be presented without it, breaking this cue that may increase the impulse for substance use. An example of this would be presenting a pill container without the substance repeatedly. Exposure therapy operates under the same premise. When someone repeatedly encounters an object, situation, or even a memory that induces an emotion such as drug craving, they'll eventually learn that the action that once cued the positive feelings of substance use is no longer present. Over time, the experience of nothing pleasurable happening again and again helps to ratchet down the emotion (Carpenter et al, 2019). Studies on fear extinction have deepened our understanding of how the brain responds to fear and how those reactions can be unlearned. They've also highlighted several techniques that may strengthen such therapies and make them work better, such as extinction of attention and preventing escape (not allowing patients to avoid tasks).

Other than such mechanical approaches, psychosocial interventions are also important parts of addiction treatment because they address social, environmental, and psychological factors that medication alone cannot fix. These treatments are varied and can be delivered individually, in groups, or through self-administered programs. These treatments can be provided by professionals from psychiatry, psychology, social work, or nursing. Common approaches include motivational interviewing, mutual help groups, family-based therapy, cognitive-behavioral therapy, supportive psychotherapy, psychodynamic psychotherapy, and contingency management (Yue et al., 2022). Unlike psychosocial interventions, mutual-help organizations facilitate social and interactive communication among recovering individuals about their experiences. There, individuals participate in activities aimed at supporting and educating patients recovering from SUD alongside others facing similar challenges. Mutual help groups include Alcoholics Anonymous (AA), Narcotics Anonymous (NA), SMART Recovery, All Recovery groups, and online forums (Recovery Research Institute [RRI], 2026). 12-step organizations, such as AA and NA, are the largest and most widely accessible. Non-12-step

groups are often called “secular” because they focus on non-spiritual aspects of addiction recovery. Even more spiritual than conventional 12-step organizations are religiously affiliated organizations, such as Celebrate Recovery, a Christian-based recovery support organization with 17,000 groups worldwide. A notable trait for these groups would be that their meetings are closely monitored by the national organizations. There are other religious recovery support organizations for other religions, such as Judaism (e.g., Jewish Alcoholics) or Islam (Millati Islami) (RRI, 2026).

Though the methods above are helpful, the most effective, evidence-based treatment is the medications for opioid use disorder (MOUD). Two of the most widely used and longest-established MOUDs worldwide are methadone and buprenorphine. Methadone was originally developed to do three things: stop opioid withdrawal, reduce cravings, and stabilize the body’s normal functions. At the right dose (usually 80–120 mg/day), it also creates a strong “blockade” effect, meaning that if someone uses heroin or another opioid on top of methadone, they don’t feel the high. This tolerance-building effect also offers protection against overdose. Early research showed that methadone didn’t just help with withdrawal, but also reduced criminal activity, cut down the spread of infections like HIV, supported abstinence, and lowered overdose deaths. Buprenorphine is another pharmacological option for treatment, but it works differently, although it serves the same purpose as a maintenance medication. It lasts a long time, as it only partially activates the mu-opioid receptor and binds to it very tightly. Because of this, it prevents overdose from both buprenorphine itself and from other opioids taken on top of it. These properties make it a strong option for long-term treatment. Even though methadone and buprenorphine were documented to be safe and effective by numerous studies, access to them remains limited. This is partly because methadone can be misused to raise the risk of overdose, so in the USA, the prescription is limited by federal law to specially licensed, regulated clinics that follow strict guidelines. Such barriers limit its acceptability to patients, as individuals without convenient access are less likely to enroll in treatment. Buprenorphine, in contrast to methadone, has less strict restrictions in the US, allowing it to be prescribed by any licensed physician who has undergone training and received a waiver. Furthermore, compared to other medications such as XR-naltrexone (which requires patients to be fully withdrawn before initiation), buprenorphine only requires patients to manifest mild withdrawal symptoms (Shulman et al, 2019). However, despite its accessibility and great potential, there is still a shortage of buprenorphine providers, as even in the US, many providers either don’t or minimally prescribe this medication.

When it comes to MOUD, there is a significant underserved population of patients with SUD, especially among adolescents. According to studies, only 27.8% of all people who need opioid use disorder (OUD) treatment received medications for opioid use disorder, MOUD. This seems to be even worse for adolescents, as no adolescents (aged 12-17) were reported for past-year medications for MOUD use. To sum up, this cross-sectional study shows that MOUD uptake was low among those who could have benefited from it. Buprenorphine is the only approved MOUD for adolescents by the US Food and Drug Administration for people 16 years and older. One of the many barriers to adolescent access to MOUD is the hesitancy of physicians about off-label prescribing for ages 12-15, which may be contributing to the underuse of medication in this population.

Furthermore, gaps in access could increase, with specialty facilities that offer adolescent treatment programs less likely to provide MOUD than facilities serving adults (Mauro et al., 2019). Without strategies and medications tailored for youths, the study’s findings support that it

may be difficult to address the underuse of MOUD among adolescents, and maybe the adolescent opioid epidemic as a whole. Even worse, through the years 2015-2020, the rate of buprenorphine dispensed to adolescents decreased 25%, from 0.84 to 0.63 prescriptions per 1000 youth per year (Teranella et al, 2024). Not only that, but the proportion of youth dispensed buprenorphine also decreased 45%, from 7.6 to 4.2 persons per 100,000 per year, while the proportions of adults dispensed buprenorphine increased 47% (Teranella et al, 2024). This shows the diminishing prescription for adolescent patients despite the surging increase in the youth population who have SUD.

In contrast to current trends, clinical trials and strong observational research support the efficacy of MOUDs. Medicines like buprenorphine, methadone, and naltrexone help reduce cravings, withdrawal, and relapse. They also improve recovery and keep people engaged in treatment, all the while lowering the risk of death. MOUD is usually paired with behavioral therapy, though adolescents who refuse therapy should not be denied the medication. Starting MOUD early in the course is proven effective as it can prevent the worsening severity of OUD. And since OUD has such a high risk of mortality, treatment should not be delayed to “see” if non-medication approaches work first. Even though these medications aren’t officially approved for adolescents in all countries, clinical guidelines still recommend them for any patients who meet the criteria for OUD. In fact, when the barriers listed above are removed, the treatment rate increases while the overdose death rate decreases. One example is in France: In 1995, they allowed regular physicians to prescribe buprenorphine with no special training. Within four years, the number of people getting the medication tripled, and overdose deaths dropped by almost 80% (Hadland et al, 2022). To study the barriers between adolescents and MOUD use, 126 clinicians were surveyed. Among those who responded, 61 (48.4%) had received an X-waiver; of these clinicians, 22 were prescribing buprenorphine, and 39 were not. According to these clinicians, the complexity of the X-waiver process, perceived lack of professional support, and the difficulty of initiation were significantly different barriers among waived and nonwaived clinicians. Because the qualification to receive X-waivers was perceived as difficult by multiple healthcare experts, simplifying or improving the X-waiver training and creating support networks that connect new or inexperienced prescribers with clinicians who already have experience were deemed necessary to increase the prescription rate for MOUDs to adolescents (Wagner et al, 2025).

Discussion

This review examines the various ways adolescent opioid misuse may arise, while showing its complexity in developmental, psychological, environmental, and neurobiological factors. Additionally, findings link adverse childhood experiences, emotional regulation difficulties, and altered cortisol reactivity to the likelihood of adolescent substance misuse. Adolescence is a uniquely vulnerable developmental stage, characterized by heightened emotional reactivity, ongoing brain maturation, and increased exposure to social and environmental stressors. When these vulnerabilities intersect, the risk for early substance use and opioid addiction increases substantially.

A consistent finding across research and studies is the high rate of comorbid mental illnesses among adolescents who also have SUD. These conditions may amplify substance use risk by impairing judgment, increasing impulsivity, and intensifying rewards after substance use, making opioids more recreationally effective and addictive (Sharma et al, 2017). Rather than existing independently, substance use disorder and other psychiatric problems often reinforce

each other, contributing to more severe and persistent patterns of opioid addiction (Simon et al, 2024). Environmental and social influences further shape adolescent SUD risk and recovery. More specifically, peers and parental attitudes toward substance use play a significant role in determining whether adolescents initiate use or not. Studies suggest that strong parental disapproval of substance use is protective, whereas increased exposure to substances in an adolescent's environment increases the likelihood of substance misuse (Marziali et al, 2022). These findings emphasize the importance of family and community-level interventions in reducing early exposure to opioids and other substances.

Although psychological and environmental factors account for adolescent substance use, biological processes related to stress and emotional regulation may contribute to an individual's vulnerability as well. Research examining stress responses, such as cortisol reactivity, suggests that adolescents with difficulty in regulating emotional impulses may be more drawn to substance use (Poon et al, 2015). Importantly, these psychological and biological factors appear to interact with one's environmental risks, highlighting the need for integrative models considering multiple levels of influence. This review also reveals the gap in treatment access for adolescents with opioid use disorder. Despite strong evidence supporting the use of medications for opioid use disorder, adolescents are significantly less likely than their adult counterparts to receive medical treatment. Regulatory barriers, provider hesitancy, and limited availability of adolescent-specific treatment programs contribute to this disparity (Mauro et al, 2019). Given the high mortality rate and devastating consequences of opioid addiction, the underserved status of adolescents is a critical health concern.

Several limitations within the existing research should be acknowledged, as many studies rely on cross-sectional designs, while adolescents were frequently underrepresented in clinical data evaluating tangible results of SUD and treatment effectiveness. Other limitations were parental involvement (as adolescent subjects need parental permission to be studied), fear of admitting SUD, which led to difficulty with diverse samples and participant recruitment.

To sum up, adolescent opioid misuse is caused by the interaction of biological developmental vulnerability, psychiatric disorders, social context, and unavoidable incidents such as an injury. Effective prevention and treatment efforts must be adopted to comprehensively treat adolescents, and the healthcare community must provide equitable access to evidence-based care.

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