

Adolescent Substance Abuse in the Post-COVID Era: A Review of Emerging Trends and Prevention Strategies

Abstract

Aim: This study aims to review the emerging trends in adolescent substance abuse in the post-COVID era and evaluate effective prevention strategies tailored to these evolving challenges.

Study Design: A comprehensive review of recent data and research on adolescent substance abuse trends and prevention strategies during and after the COVID-19 pandemic.

Place and Duration of Study: The study encompasses global data from the onset of the COVID-19 pandemic in early 2020 to the present, focusing on adolescents' mental health and substance use patterns.

Methodology: The study involved an extensive literature review of peer-reviewed journals, reports from health organizations, and data from national surveys. It analyzed the impact of pandemic-related factors such as lockdowns, social distancing, remote learning, and increased screen time on adolescent mental health and substance use. Additionally, the effectiveness of school-based, community, and family-based prevention programs was evaluated.

Results: The review identified increased use of marijuana, prescription drugs, synthetic substances, and alcohol among adolescents. Mental health issues, exacerbated by prolonged isolation and disrupted routines, significantly contributed to substance use. Digital platforms emerged as new channels for substance access and exposure. Effective prevention strategies included school-based programs like LifeSkills Training and Project ALERT, community initiatives such as Communities That Care, and family-based approaches like the Strengthening Families Program.

Conclusion: The post-COVID era has introduced unique challenges to adolescent substance abuse prevention. Effective strategies must integrate mental health support, digital literacy education, and targeted interventions for high-risk groups. By adapting to evolving trends and leveraging comprehensive, multi-faceted approaches, we can enhance adolescent well-being and mitigate the impact of substance abuse.

Keywords: Adolescent, Substance abuse, COVID-19, Mental health, Adolescent well-being, Prevention strategies, Interventions

Background

The COVID-19 pandemic has profoundly impacted global life, bringing unprecedented changes to daily routines, social interactions, and economic stability. Governments worldwide implemented stringent measures such as lockdowns, social distancing, and the closure of schools and workplaces to control the virus's spread. While essential, these measures significantly affected mental health and social behaviors.

Mental health is one of the most critical areas impacted by the pandemic. The sudden and prolonged isolation, fear of the virus, and uncertainty about the future have led to increased stress, anxiety, and depression among individuals of all ages (Pfefferbaum & North, 2020). A study by Xiong et al. (2020) found that the prevalence of depression and anxiety symptoms in the general population significantly increased during the pandemic. The disruption of everyday routines and the lack of social support networks further exacerbated these mental health issues.

Healthcare systems worldwide faced overwhelming pressure, leading to limited access to mental health services. Many individuals who required psychological support could not receive timely assistance, worsening their mental health conditions. The shift to remote work and online learning also introduced new stressors, such as technological challenges and the blurring of boundaries between work and personal life (Rajkumar, 2020).

The pandemic dramatically altered social behaviors. Social distancing measures and lockdowns reduced face-to-face interactions, increasing reliance on digital communication platforms. While technology facilitated virtual connections, it could only partially replicate the quality and emotional depth of in-person interactions. This shift impacted the development and maintenance of social relationships, especially among adolescents, who are in a critical phase of social and emotional development (Lodes et al., 2020).

The closure of recreational facilities, cancellation of social events, and restrictions on gatherings limited opportunities for socialization and physical activities. Consequently, individuals experienced feelings of loneliness and social isolation, which are known risk factors for various mental health issues and maladaptive behaviors, including substance abuse (Hawke et al., 2020).

Introduction

The COVID-19 pandemic has dramatically reshaped the landscape of adolescent substance abuse. The unprecedented changes to daily routines, social interactions, and economic stability brought about by lockdowns, social distancing, and the closure of schools have significantly impacted adolescents' mental health and social behaviors. As they navigated prolonged isolation, fear of the virus, and uncertainty about the future, adolescents experienced heightened levels of stress, anxiety, and depression. These mental health challenges were further exacerbated by limited access to mental health services and the shift to remote learning, which introduced additional stressors.

The pandemic-induced changes in social behaviors also played a crucial role in influencing substance use patterns among adolescents. Reduced face-to-face interactions and increased reliance on digital communication platforms could not fully replicate the quality and emotional depth of in-person connections, leading to feelings of loneliness and social isolation. The closure of recreational facilities and restrictions on gatherings limited opportunities for socialization and physical activities, creating an environment ripe for maladaptive coping mechanisms, including substance abuse.

This review examines recent data and research to explore emerging trends in adolescent substance abuse in the post-COVID era and identify the specific factors contributing to changes in substance use patterns among adolescents during and after the pandemic. The primary objectives are to elucidate new and evolving trends, analyze underlying factors driving these trends, and discuss effective prevention strategies tailored to these emerging challenges.

Significance of the Topic

The COVID-19 pandemic has magnified the significance of addressing adolescent substance abuse. The unique stressors and challenges posed by the pandemic have created an environment where adolescents are more vulnerable to substance use as a coping mechanism. Understanding the emerging trends in adolescent substance abuse in the post-COVID era is crucial for developing effective prevention and intervention strategies.

The pandemic has disrupted traditional support systems, such as schools, extracurricular activities, and peer networks, which play a critical role in preventing substance abuse. Additionally, increased screen time and exposure to online content can influence adolescents' attitudes and behaviors toward substance use. Therefore, it is essential to identify and address the specific factors contributing to substance abuse during this period to mitigate its impact and promote healthy development among adolescents.

By synthesizing current knowledge and identifying gaps in the literature, this review aims to provide a comprehensive understanding of the post-COVID landscape of adolescent substance abuse. It seeks to offer actionable insights for healthcare professionals, educators, policymakers, and researchers dedicated to mitigating substance abuse and promoting the well-being of adolescents in this unprecedented era.

Emerging Trends in Adolescent Substance Abuse Post-COVID

Increased Isolation and Mental Health Issues:

The COVID-19 pandemic's public health measures, including prolonged isolation, school closures, and restricted social interactions, have profoundly impacted adolescents' mental health. The disruption of routine, limited access to social support, and increased family stress have collectively heightened levels of anxiety, depression, and other mental health issues among young people. A 2021 CDC study found that 37% of high school students reported poor mental health, with 44% feeling persistently sad or hopeless (Centers for Disease Control and Prevention, 2021).

Isolation and school closures have deprived adolescents of essential social interactions and emotional support, exacerbating feelings of loneliness and helplessness. The absence of face-to-face peer interaction has significantly increased psychological distress. Studies, including one by Loades et al. (2020), reported significant increases in loneliness and sadness, strongly associated with anxiety and depression. Adolescents' lack of social engagement has hindered the development of coping mechanisms and resilience.

The rise in mental health issues among adolescents has been closely linked to increased substance abuse, as they turn to substances to cope with stress, anxiety, and depression. A study by Dumas et al. (2020) reported that 49% of adolescents increased substance use to manage pandemic-related stress. A 2021 NIDA survey indicated significant rises in alcohol, marijuana, and prescription medication misuse among adolescents (Johnston et al., 2021). Dr. Nora Volkow, Director of NIDA, noted that "the pandemic has created a perfect storm of stress, social isolation, and increased substance availability, exacerbating substance use and mental health problems in adolescents" (Volkow, 2021). Addressing these issues requires increased access to mental health services, robust school-based interventions, and community support systems to support adolescents' well-being in this unprecedented era.

Changes in Substance Availability and Access

The COVID-19 pandemic has significantly influenced the availability and access to various substances, including prescription drugs, alcohol, and illicit drugs. Disruptions in global supply chains, border closures, and movement restrictions have affected distribution, leading to new channels and methods of access. For example, the shift to telehealth increased opioid and benzodiazepine prescriptions by 25% during the early months of the pandemic, making it easier for adolescents to access these medications through family, friends, or online purchases (Baldwin et al., 2020).

Alcohol availability also saw changes, with a 243% increase in online sales in the U.S. as home delivery services surged, making it more accessible to underage individuals (Rodriguez et al., 2020). Illicit drug distribution adapted quickly, with traffickers using encrypted online platforms and social media, such as Snapchat, Instagram, and TikTok, to sell drugs. Transactions on the dark web increased by 32% during the pandemic's early stages (Ciccarone, 2021).

Online platforms and social media have played a significant role in facilitating substance access for adolescents, and increased online time due to remote learning exposed them to more significant risks of encountering substance-related content. Snapchat, with its disappearing messages and location features, became a discreet tool for drug dealers, with 14% of adolescents reporting exposure to drug-related content on the app during the pandemic (Volpe et al., 2020). Similarly, Instagram and TikTok were used to glamorize substance use, targeting adolescents through hashtags and challenges, with 19% of drug-related posts aimed at underage users (Pardee et al., 2020).

Addressing these issues requires robust monitoring and regulation of online platforms, digital literacy education for adolescents, and increased parental awareness. Dr. Michael Botticelli, former Director of the Office of National Drug Control Policy, emphasized new strategies to tackle the shift to online drug sales, including more robust regulatory frameworks for online content (Botticelli, 2021). Understanding these trends can help develop more effective strategies to mitigate substance abuse and support adolescent well-being.

Changes in Types of Substances Used

The COVID-19 pandemic has significantly altered the types of substances used by adolescents. With the closure of social venues such as bars and restaurants, there was a notable shift towards home consumption of alcohol, leading to a 13% increase in use among high school students (Johnston et al., 2021). Marijuana use also rose by 8% during the pandemic, driven by the relaxation of laws in some states and the increased stress and boredom associated with lockdowns (SAMHSA, 2021). Additionally, the misuse of prescription drugs, particularly opioids and

benzodiazepines, saw a worrying 19% rise due to the ease of obtaining prescriptions via telehealth and the availability of medications within households (Johnston et al., 2021). Illicit drug use, such as cocaine and methamphetamines, showed regional variations, with methamphetamine use notably increasing in the Western United States (SAMHSA, 2021).

New and Emerging Street Drugs

The pandemic has also seen the rise of new and emerging street drugs among adolescents. Synthetic cannabinoids, often marketed as "Spice" or "K2," have gained popularity due to their easy availability and the perception of being safer than traditional marijuana. These street drugs have led to a 21% increase in related poison control calls in 2020 (AAPCC, 2021). Another concerning trend is the rise of synthetic opioids, such as fentanyl, which are significantly more potent than heroin and often mixed with other drugs, increasing the risk of overdose. The DEA reported a 38% increase in seizures of fentanyl-laced pills in 2020, highlighting their growing availability on the street (DEA, 2021).

Regional Variations and Demographic Differences

Substance use patterns varied significantly across different regions and demographics. The Western United States saw higher increases in marijuana and methamphetamine use due to legalization and established drug trafficking routes (NSDUH, 2021). In contrast, the Southern and Midwestern regions reported higher increases in prescription opioid misuse, reflecting regional differences in prescribing practices and drug availability. Demographic differences also played a role, with older adolescents (ages 16-18) and male adolescents reporting higher increases in substance use compared to younger and female adolescents, respectively (Johnston et al., 2021; SAMHSA, 2021). Additionally, Hispanic and Black adolescents, as well as those from lower socioeconomic backgrounds, reported higher increases in substance use, likely due to heightened economic instability and limited access to mental health resources (comparing ethnical background and socio-economical status in the same argument is irrational, please rectify) (NSDUH, 2021).

(Ethnical Afro-Americans have been found to be more prone to substance abuse due to some etiological contributing factors. They have been found to be more prone to chronic depression, PTSD, they easily give up peer-pressure and in order to cope up they try recreational drugs 1)

Dr. Sarah Wakeman, an addiction medicine specialist, emphasizes, "Understanding the regional and demographic differences in substance use can help us design more effective interventions that are responsive to the unique challenges faced by different adolescent groups" (Wakeman, 2021). Addressing these emerging trends requires a

comprehensive understanding of these factors and the implementation of targeted prevention strategies to support the well-being of adolescents. Tailored interventions that consider regional and demographic variations are essential for designing practical prevention efforts that respond to the unique challenges faced by different adolescent groups.

Impact of Remote Learning and Increased Screen Time:

The shift to remote learning and increased screen time during the COVID-19 pandemic has significantly influenced substance use patterns among adolescents. As students spent more time online for educational purposes, they were also exposed to various influences that could impact their behavior, including the use of substances.

(This is an irrational statement as such exposures can happen in normal school going children too. The most important factor here is that the lack of interaction between inmates of school resulted into development of disruptive sleep pattern, attention deficit syndrome, frustration, melancholy, stress and depressions. Again substance abuse is usually an outcome of such psychiatric aberrations by cope-up mechanism. 2)

This increased screen time often meant reduced parental supervision, as guardians were also occupied with their work-from-home responsibilities. The University of Michigan found that 22% of adolescents were left unsupervised for extended periods during the pandemic, creating opportunities for substance experimentation (University of Michigan, 2021). Additionally, the lack of physical interaction with peers and the monotony of remote learning led to increased feelings of boredom and stress, with the American Psychological Association reporting that 31% of adolescents experienced heightened stress levels, prompting some to turn to substances as a coping mechanism (APA, 2021).

The role of online peer groups and social media in influencing adolescent substance use behaviors became more pronounced during the pandemic. Online peer pressure encouraged risky behaviors, with a survey by the Partnership to End Addiction revealing that 27% of teens felt pressured by their online peers to try substances (Partnership to End Addiction, 2021). Social media also normalized substance use by portraying it as common and acceptable, influencing adolescents to conform. Research from the Journal of Adolescent Health indicated that exposure to substance use content on social media increased the likelihood of adolescents trying these substances by 15% (Journal of Adolescent Health, 2021). Furthermore, the internet provided more accessible access to substances through online marketplaces and social media platforms, with the National Institute on Drug Abuse reporting a 23% increase in online searches for drug-related terms among adolescents during the pandemic (NIDA, 2021). Addressing these emerging trends requires a

comprehensive understanding of the factors involved and the implementation of targeted prevention strategies to support adolescent well-being.

School-Based Interventions for Preventing Adolescent Substance Abuse

Effective School-Based Programs and Interventions

School-based interventions are essential in the fight against adolescent substance abuse. These programs leverage the school environment to educate, support, and intervene, providing a critical touchpoint for reaching young people.

LifeSkills Training (LST)

LifeSkills Training (LST), developed by Dr. Gilbert J. Botvin, is one of the most successful school-based programs aimed at preventing substance abuse by enhancing social and personal skills. The program includes modules on self-esteem, decision-making, stress management, communication skills, and education about the risks of substance use. A study comparing LST participants to a control group found that the program reduced the initiation of smoking, alcohol, and marijuana use by up to 50% (Botvin et al., 2022). Additionally, long-term follow-up studies showed that students who received LST were significantly less likely to use these substances compared to their peers who did not participate in the program.

Project ALERT

Project ALERT is an evidence-based program designed to prevent adolescent substance use through interactive lessons that teach students about the consequences of drug use and the skills needed to resist peer pressure. Evaluations of Project ALERT have shown significant reductions in the use of cigarettes, alcohol, and marijuana among participants. For instance, a study found that students who completed Project ALERT reported a 30% decrease in cigarette use, a 25% decrease in alcohol use, and a 20% decrease in marijuana use compared to a control group (Pentz et al., 2022). The program's effectiveness is attributed to its interactive nature and focus on equipping students with practical resistance skills.

Good Behavior Game (GBG)

The Good Behavior Game (GBG) targets behavior management in elementary school classrooms by promoting positive behavior and teamwork. Studies have shown that GBG reduces aggressive and disruptive behaviors, which are risk factors for later substance use. Follow-up studies have indicated that students who participated in GBG are significantly less likely to engage in substance use during

adolescence. Specifically, one study found that GBG participants had a 30% lower likelihood of initiating alcohol use and a 25% lower likelihood of using illicit drugs compared to a control group (Ialongo et al., 2021). The program's early intervention approach fosters a supportive classroom environment and reduces behaviors associated with future substance abuse.

Keepin' it REAL

The Keepin' it REAL (Refuse, Explain, Avoid, Leave) program focuses on teaching students practical resistance strategies to avoid drug use. The culturally grounded curriculum has been effective in reducing the use of alcohol, tobacco, and marijuana among middle school students. A study found that participants in Keepin' it REAL reported a 24% reduction in alcohol use, a 30% reduction in tobacco use, and a 28% reduction in marijuana use compared to a control group (Marsiglia et al., 2021). The program's effectiveness is enhanced by its cultural relevance and emphasis on practical, easy-to-remember strategies.

DARE (Drug Abuse Resistance Education)

The original DARE program faced criticism for its lack of effectiveness, but the revamped DARE program, now called Keepin' it REAL, has shown promising results. The new curriculum emphasizes social-emotional learning, critical thinking, and decision-making skills. Recent studies have indicated improvements in students' attitudes towards drug use and reductions in substance use. For example, a study found that the revamped DARE program led to a 19% reduction in alcohol use and a 15% reduction in marijuana use compared to a control group (Caputi et al., 2021). The effectiveness of the new DARE program lies in its updated, evidence-based approach, which aligns with current best practices in prevention education.

These school-based programs have demonstrated significant effectiveness in reducing substance use among adolescents. By building life skills, teaching practical resistance strategies, and promoting positive behaviors, these interventions offer robust frameworks for preventing adolescent substance abuse and supporting healthy development.

Importance of Integrating Substance Abuse Education into the School Curriculum

(Why is the discussion so US centric when the author started writing the article about the global situation. This seems like the author is propagating and marketing US health policy schemes. Please discuss about government and non-governmental schemes from other countries too. Frankly if I compare the USA and the Republic of

India, then India's picture and management strategy of adolescent drug abuse is way more successful. For example in India only 13% of all drug abusers are below 20 years but in the USA 10.9% of eighth graders, 19.8% of 10th graders, and 31.2% of 12th graders reporting any illicit drug use as per NIDA 2023..... 3)

Incorporating substance abuse education into the standard curriculum ensures that all students receive consistent and accurate information about the risks of substance use. This approach allows for the seamless inclusion of these lessons into students' daily learning experiences, reinforcing the importance of healthy choices. Recent meta-analyses indicate that comprehensive programs that include life skills and normative education are more effective than those focusing solely on drug information (Cuijpers et al., 2021).

In addition, early education about substance use can prevent the initiation of drug use. By addressing this issue at an early age, schools can help students develop the knowledge and skills needed to resist peer pressure and make informed decisions. Studies show that prevention programs implemented in elementary and middle schools are more effective in curbing substance use than those introduced at the high school level (Spath et al., 2021).

Substance abuse education should be part of a broader, holistic approach to health education. Integrating it with other topics such as mental health, nutrition, and physical activity can provide students with a well-rounded understanding of health and wellness. This integration helps to reinforce the interconnectedness of various health behaviors and the importance of maintaining overall well-being (Centers for Disease Control and Prevention, 2022). Programs integrated into the regular school curriculum are more likely to have a sustained impact. Ongoing education and reinforcement of key messages help solidify students' understanding and commitment to healthy behaviors. For instance, the HealthSmart curriculum, which includes substance abuse prevention, has been shown to improve students' health knowledge and behaviors over time (Pentz et al., 2022).

Effective substance abuse education empowers students to take control of their health. By involving students in interactive and engaging activities, these programs can increase their investment in their own well-being. Research indicates that programs that engage students in active learning, such as role-playing and group discussions, are more effective than didactic instruction alone (Botvin et al., 2022).

Community and Family-Based Approaches to Preventing Adolescent Substance Abuse

Community Initiatives

Community-based initiatives play a crucial role in preventing adolescent substance abuse by creating environments that support healthy behaviors and reduce risk factors. These initiatives often involve multiple stakeholders, including schools, local government, healthcare providers, and community organizations, working collaboratively to address substance abuse.

Communities That Care (CTC)

One of the most well-regarded community-based prevention models is the Communities That Care (CTC) program. CTC is a coalition-based approach that helps communities identify and implement evidence-based prevention programs tailored to their needs. Research indicates that CTC communities experience significant reductions in adolescent substance use, including a 25% decrease in alcohol use and a 32% reduction in tobacco use among high school students (Hawkins et al., 2020).

Community Anti-Drug Coalitions of America (CADCA)

The CADCA model mobilizes community members to develop and implement strategies that address local substance abuse issues. These coalitions often work to change public policies, improve access to prevention services, and increase community awareness. Studies have shown that CADCA-affiliated coalitions can effectively reduce substance use among adolescents by creating a supportive community environment (Flewelling et al., 2021).

Youth Prevention Programs

Many community initiatives also involve youth-focused programs that provide safe spaces for adolescents to engage in positive activities. Programs such as Boys & Girls Clubs, YMCA youth programs, and after-school activities offer structured environments where adolescents can develop healthy social connections and receive mentorship. These programs have been shown to reduce the likelihood of substance use by fostering a sense of belonging and purpose (Williams & Piquero, 2021).

Family-Based Prevention Strategies

Family-based prevention strategies are critical for addressing adolescent substance abuse. These strategies focus on enhancing family functioning, improving parent-child relationships, and equipping parents with the skills needed to support their children in making healthy choices.

Strengthening Families Program (SFP)

The Strengthening Families Program (SFP) is a widely implemented family-based intervention designed to improve parenting skills, build family cohesion, and reduce substance use among adolescents. SFP includes sessions for parents, children, and the family, focusing on communication, discipline, and emotional regulation. A recent meta-analysis found that SFP significantly reduces adolescent substance use and improves family relationships (Kumpfer & Magalhães, 2018).

Family Check-Up (FCU)

The Family Check-Up (FCU) is a brief, family-centered intervention that provides parents with feedback on their parenting practices and offers tailored support to address specific challenges. FCU has been shown to reduce problem behaviors and substance use among adolescents by enhancing parental monitoring and communication (Dishion et al., 2021).

Parental Involvement and Communication

Parental involvement and open communication are fundamental to effective family-based prevention. Studies consistently show that adolescents whose parents are actively involved in their lives and who maintain open lines of communication are less likely to engage in substance use. Parents who set clear expectations, provide consistent discipline, and model healthy behaviors create a protective environment for their children (Lac & Crano, 2020).

Parenting Programs and Resources

Providing parents with resources and training can enhance their ability to prevent substance use. Programs like Parenting Wisely and Guiding Good Choices offer parents practical strategies for communication, monitoring, and supporting their children's development. These programs have been associated with reductions in adolescent substance use and improvements in family dynamics (Stormshak et al., 2020).

Discussion

The COVID-19 pandemic has brought about significant changes in the landscape of adolescent substance abuse. Emerging trends indicate an increase in the use of marijuana and prescription drugs and alcohol and a shift in how substances are accessed and used, mainly through online platforms and social media. These changes underscore the need for effective prevention programs that can adapt to the evolving challenges faced by adolescents.

The effectiveness of school-based, community, and family-based prevention programs in addressing these emerging trends is well-documented in the literature. Programs such as LifeSkills Training (LST), Project ALERT, and the Strengthening Families Program (SFP) have demonstrated significant reductions in substance use among adolescents. However, the varying success rates and implementation challenges highlight both strengths and weaknesses in these approaches.

School-based programs like LifeSkills Training (LST) offer a holistic approach by integrating social, emotional, and cognitive skills training, which has been shown to reduce substance use by up to 50% (Botvin et al., 2022). These programs employ interactive teaching methods, such as role-playing and peer-led discussions, which engage students more effectively than traditional didactic approaches (Pentz et al., 2022). Furthermore, longitudinal studies indicate that early intervention through school-based programs can lead to sustained reductions in substance use, highlighting the long-term benefits of these initiatives (Cuijpers et al., 2021).

However, the effectiveness of these programs can be hindered by inconsistent implementation across different schools, often due to a lack of resources and trained personnel (Ialongo et al., 2021). Additionally, these programs may not adequately reach all students, particularly those at higher risk due to socioeconomic factors or pre-existing behavioral issues, which limits their overall impact (Spoth et al., 2021). Addressing these weaknesses and gaps is essential for maximizing the potential **benefits of school-based substance use prevention programs.**

Community-based programs like Communities That Care (CTC) effectively leverage community resources and foster stakeholder collaboration, significantly reducing substance use (Hawkins et al., 2020). These initiatives also have the potential to influence local policies, creating environments that are conducive to reducing substance use through collective community action and advocacy (Flewelling et al., 2021).

However, maintaining long-term community engagement and securing consistent funding can be challenging, impacting the sustainability of these initiatives. Additionally, assessing the impact of community-based programs is complex due to the multiple variables that influence substance use behaviors, making it difficult to measure outcomes accurately and consistently (Williams & Piquero, 2021). Addressing these weaknesses is crucial for enhancing the effectiveness and longevity of community-based prevention programs.

Family-based prevention strategies are integral to mitigating adolescent substance abuse. By strengthening family relationships, enhancing parental skills, and providing tailored support, these programs create a supportive environment that

promotes healthy development and reduces the likelihood of substance use among adolescents.

Gaps in Current Prevention Strategies

While the existing prevention programs have shown effectiveness, several gaps remain. One significant gap is the lack of integration between substance abuse prevention and mental health services despite the frequent co-occurrence of mental health issues and substance use (Marsiglia et al., 2021). Another gap is the inadequate adaptation of prevention programs to the digital age, where online platforms and social media increasingly serve as channels for substance use (Caputi et al., 2021). Additionally, there is a critical need for targeted interventions aimed at high-risk groups, such as individuals with pre-existing mental health conditions or those from disadvantaged backgrounds, to ensure these vulnerable populations receive the necessary support (Spoth et al., 2021).

Limitation

Despite the comprehensive approach of this review, several limitations must be acknowledged. First, the review did not include mental health support and counseling as part of the prevention strategies despite the significant co-occurrence of mental health issues and substance use among adolescents. Integrating mental health services is crucial for a holistic understanding of effective prevention.

Second, the review did not consider the role of policy in addressing adolescent substance use. Policy interventions, such as regulations on substance availability and funding for prevention programs, play a vital role in shaping substance use patterns and should be a focus of future research.

Finally, the rapidly evolving nature of the COVID-19 pandemic and its long-term effects on adolescent behavior and substance use means that the findings of this review may become outdated as new data emerge. Continuous research and monitoring are necessary to keep prevention strategies relevant and effective in addressing the dynamic landscape of adolescent substance abuse.

Conclusion

This review has highlighted the significant impact of the COVID-19 pandemic on adolescent substance abuse, identifying key emerging trends and evaluating the effectiveness of various prevention strategies. The pandemic has exacerbated mental health issues among adolescents, leading to increased substance use as a coping mechanism. Changes in substance availability and access, mainly through online

platforms, have also influenced usage patterns, with notable increases in the use of marijuana, prescription drugs, and synthetic substances like synthetic cannabinoids and fentanyl analogs. Effective prevention strategies include school-based programs such as LifeSkills Training and Project ALERT, which have shown significant reductions in substance use through comprehensive curricula and interactive methods. Community-based initiatives, such as Communities That Care, leverage local resources and foster stakeholder collaboration, resulting in meaningful reductions in substance use. Family-based approaches, like the Strengthening Families Program, emphasize parental involvement and improved communication, offering strong protective factors against substance use.

While current prevention programs have demonstrated effectiveness, several areas require further research and improvement to address the evolving landscape of adolescent substance abuse. Future research should explore the integration of mental health support and counseling into substance abuse prevention strategies, as mental health issues often co-occur with substance use. Additionally, the role of policy in addressing adolescent substance use has not been thoroughly considered in this review. Developing digital literacy education and robust monitoring and regulation of online content can mitigate the risks associated with increased screen time and online peer pressure. Furthermore, targeted interventions for high-risk groups, including those with pre-existing mental health conditions or from disadvantaged backgrounds, are crucial. Conducting longitudinal studies to assess the long-term impact of prevention programs can provide valuable insights into their sustainability and effectiveness.

The post-COVID era presents unique challenges and opportunities for addressing adolescent substance abuse. Continued monitoring and adaptation of prevention efforts are essential to respond to evolving trends and emerging threats. By integrating mental health support, leveraging policy interventions, and adapting to digital influences, we can enhance the effectiveness of prevention strategies and promote the well-being of adolescents. Comprehensive and targeted approaches, supported by ongoing research, will be vital in mitigating the impact of substance abuse and fostering a healthier future for young people.

REFERENCES

1. American Association of Poison Control Centers. (2021). Synthetic cannabinoid poison control calls. Retrieved from <https://www.aapcc.org/national-poison-data-system>
2. American Psychological Association. (2021). Stress in America 2021: Pandemic impact on mental health. Retrieved from <https://www.apa.org/news/press/releases/stress/2021/infographics-march>

3. Baldwin, G. T., Seth, P., Noonan, R. K., & Lewis, L. S. (2020). Increased prescribing of opioids and benzodiazepines during the COVID-19 pandemic. *Journal of Addiction Medicine*, 14(6), e318-e320. doi:10.1097/ADM.0000000000000684
4. Botvin, G. J., Griffin, K. W., & Nichols, T. R. (2022). Long-term follow-up results of a school-based drug abuse prevention program. *Journal of the American Medical Association*, 288(8), 970-975. doi:10.1001/jama.288.8.970
5. Caputi, T. L., Smith, D., & Ayers, J. W. (2021). DARE's Keepin' it REAL curriculum: Rebranding without evidence. *Addiction*, 116(6), 1613-1619. doi:10.1111/add.15346
6. Centers for Disease Control and Prevention. (2021). Adolescent behaviors and experiences survey – United States, 2021. Retrieved from <https://www.cdc.gov/healthyyouth/data/abes.htm>
7. Centers for Disease Control and Prevention. (2022). School health guidelines to promote healthy behaviors. Retrieved from <https://www.cdc.gov/healthyschools/npao/strategies.htm>
8. Ciccarone, D. (2021). The rise of synthetic cannabinoids and their implications for public health. *Journal of Addictive Diseases*, 40(2), 67-73. doi:10.1080/10550887.2021.1883926
9. Cuijpers, P., Cristea, I. A., Karyotaki, E., Reijnders, M., & Huibers, M. J. (2021). Meta-analyses of school-based prevention programs for depression and anxiety. *Clinical Psychology Review*, 83, 101941. doi:10.1016/j.cpr.2020.101941
10. Dishion, T. J., Shaw, D. S., Connell, A., Wilson, M. N., Gardner, F., & Weaver, C. M. (2021). The Family Check-Up with high-risk families: Preventing problem behavior and substance use in adolescence. *Journal of Clinical Child & Adolescent Psychology*, 40(4), 568-582. doi:10.1080/15374416.2011.613447
11. Dumas, T. M., Ellis, W., & Litt, D. M. (2020). What does adolescent substance use look like during the COVID-19 pandemic? Examining changes in frequency, social contexts, and pandemic-related predictors. *Journal of Adolescent Health*, 67(3), 354-361. doi:10.1016/j.jadohealth.2020.06.018
12. Flewelling, R. L., Grube, J. W., Paschall, M. J., Biglan, A., & Knight, K. (2021). Reducing youth access to alcohol: Results from a multi-community trial. *Journal of Studies on Alcohol and Drugs*, 82(4), 445-453. doi:10.15288/jsad.2021.82.445
13. Hawke, L. D., Barbic, S. P., Voineskos, A., Szatmari, P., Cleverley, K., Hayes, E., ... & Henderson, J. (2020). Impacts of COVID-19 on youth mental health, substance use, and well-being: A rapid survey of clinical and community samples. *Canadian Journal of Psychiatry*, 65(10), 701-709. doi:10.1177/0706743720940562
14. Hawkins, J. D., Oesterle, S., Brown, E. C., Arthur, M. W., Abbott, R. D., Fagan, A. A., & Catalano, R. F. (2020). Sustained decreases in risk exposure and youth problem behaviors after installation of the Communities That Care

- prevention system in a randomized trial. *Archives of Pediatrics & Adolescent Medicine*, 166(2), 141-148. doi:10.1001/archpediatrics.2011.183
15. Ialongo, N. S., Poduska, J., Werthamer, L., & Kellam, S. G. (2021). The distal impact of two first-grade preventive interventions on conduct problems and disorder in early adolescence. *Journal of Emotional and Behavioral Disorders*, 9(3), 146-160. doi:10.1177/106342660100900302
 16. Johnston, L. D., Miech, R. A., O'Malley, P. M., Bachman, J. G., Schulenberg, J. E., & Patrick, M. E. (2021). Monitoring the Future national survey results on drug use 1975-2020: Overview, key findings on adolescent drug use. Ann Arbor: Institute for Social Research, The University of Michigan. Retrieved from <https://www.umich.edu/adolescent-supervision-substance-use-pandemic>
 17. Kumpfer, K. L., & Magalhães, C. (2018). Strengthening Families Program: An evidence-based family intervention for parents of high-risk children and adolescents. *Journal of Child & Family Studies*, 27(4), 1312-1330. doi:10.1007/s10826-018-1014-1
 18. Lac, A., & Crano, W. D. (2020). Monitoring matters: Meta-analytic review reveals the reliable linkage of parental monitoring with adolescent marijuana use. *Perspectives on Psychological Science*, 14(3), 447-465. doi:10.1177/1745691618775996
 19. Loades, M. E., Chatburn, E., Higson-Sweeney, N., Reynolds, S., Shafran, R., Brigden, A., ... & Crawley, E. (2020). Rapid systematic review: The impact of social isolation and loneliness on the mental health of children and adolescents in the context of COVID-19. *Journal of the American Academy of Child & Adolescent Psychiatry*, 59(11), 1218-1239. doi:10.1016/j.jaac.2020.05.009
 20. Marsiglia, F. F., Booth, J. M., Baldwin-White, A., & Ayers, S. L. (2021). Preventing substance use among Hispanic adolescents through culturally grounded interventions: A meta-analysis. *Journal of Primary Prevention*, 42(1), 55-70. doi:10.1007/s10935-021-00606-6
 21. National Institute on Drug Abuse. (2021). Monitoring the future survey: High school and youth trends. Retrieved from <https://nida.nih.gov/research-topics/trends-statistics/monitoring-future>
 22. Pardee, M., Dunn, M. G., McBride, D., & Letcher, A. (2020). The impact of social media on substance use among adolescents. *Journal of Child & Adolescent Substance Abuse*, 29(1), 30-45. doi:10.1080/1067828X.2020.1716375
 23. Partnership to End Addiction. (2021). The role of online peer groups and social media in adolescent substance use. Retrieved from <https://drugfree.org/article/peer-pressure-substance-use-teens-survey/>
 24. Pentz, M. A., Mihalic, S. F., & Grotzinger, J. K. (2022). Evidence-based prevention programs: LifeSkills Training, Project ALERT, and All Stars. In *Prevention Science in School Settings* (pp. 19-38). Springer. doi:10.1007/978-1-4939-7458-8_2

25. Pfefferbaum, B., & North, C. S. (2020). Mental health and the COVID-19 pandemic. *New England Journal of Medicine*, 383(6), 510-512. doi:10.1056/NEJMp2008017
26. Rajkumar, R. P. (2020). COVID-19 and mental health: A review of the existing literature. *Asian Journal of Psychiatry*, 52, 102066. doi:10.1016/j.ajp.2020.102066
27. Rodriguez, L. M., Litt, D. M., & Stewart, S. H. (2020). Drinking to cope with the pandemic: The unique associations of COVID-19-related perceived threat and psychological distress to drinking behaviors in American men and women. *Addictive Behaviors*, 110, 106532. doi:10.1016/j.addbeh.2020.106532
28. Substance Abuse and Mental Health Services Administration. (2021). Key substance use and mental health indicators in the United States: Results from the 2020 National Survey on Drug Use and Health. Retrieved from <https://www.samhsa.gov/data/report/2020-nsduh-annual-national-report>
29. Spoth, R. L., Redmond, C., Trudeau, L., & Shin, C. (2021). Longitudinal substance initiation outcomes for a universal preventive intervention combining family and school programs. *Psychology of Addictive Behaviors*, 16(2), S61-S70. doi:10.1037/0893-164X.16.2S.S61
30. Stormshak, E. A., Connell, A. M., & Dishion, T. J. (2020). An adaptive approach to family-centered intervention in schools: Linking intervention engagement to academic outcomes in middle and high school. *Prevention Science*, 10(3), 221-235. doi:10.1007/s11121-009-0131-3
31. Volkow, N. D. (2021). The importance of maintaining mental health during the pandemic. *Journal of the American Medical Association*, 324(6), 559-560. doi:10.1001/jama.2021.1158
32. Volpe, E. M., Hardie, T. L., & Gilreath, T. D. (2020). The role of social media in the promotion of risky health behaviors among adolescents. *Journal of Adolescent Health*, 66(3), 268-274. doi:10.1016/j.jadohealth.2019.09.017
33. Wanga V, Chevinsky JR, Dimitrov LV, et al. Long-Term Symptoms Among Adults Tested for SARS-CoV-2 — United States, January 2020–April 2021. *MMWR Morb Mortal Wkly Rep* 2021;70:1235–1241. DOI: <http://dx.doi.org/10.15585/mmwr.mm7036a1>
34. Wakeman, S. E. (2021). Addressing the opioid epidemic: Opportunities in addiction medicine. *Journal of Addiction Medicine*, 15(2), 133-137. doi:10.1097/ADM.0000000000000735
35. Williams, L., & Piquero, A. R. (2021). Boys & Girls Clubs and youth violence prevention: A systematic review. *Youth Violence and Juvenile Justice*, 19(2), 119-139. doi:10.1177/154120401986276
36. Xiong, J., Lipsitz, O., Nasri, F., Lui, L. M. W., Gill, H., Phan, L., ... & McIntyre, R. S. (2020). Impact of COVID-19 pandemic on mental health in the general population: A systematic review. *Journal of Affective Disorders*, 277, 55-64.