

1 **The Impact of the SARS-CoV-2 Pandemic on Substance Use in the US**

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1 **Abstract**

2 The SARS-CoV-2 pandemic has been associated with dramatic increases in substance use, as
3 marked by increased alcohol, nicotine and cannabis sales. Lethal opioid overdoses also increased
4 dramatically, especially during the initial phases of the epidemic when lockdowns and social
5 isolation combined with increasing fentanyl contamination of the illicit drug supply resulted in
6 more overdoses and fewer opportunities for rescue. Substance use, and especially inhalational
7 drug use, increases the likelihood of both transmission and severe infection. Youth are especially
8 vulnerable to substance use and have increased risk of long-term problems. These outcomes
9 highlight the need for greater access to substance use treatment. Virtual treatment, which
10 emerged as a promising format during the pandemic, may reduce access barriers. This
11 manuscript reviews trends in substance use during the pandemic, explores root causes of
12 increased use and overdose and examines the potential to increase treatment through virtual care,
13 especially during future periods of disruption.

14
15 **Keywords:** substance use, SARS-CoV-2, COVID-19, youth, virtual care
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1 *Introduction*

2 The SARS-CoV-2 pandemic has exposed and exacerbated the challenges faced by
3 vulnerable populations including individuals with substance use disorders (SUD).^{1,2} Disasters of
4 the past have been linked to increased alcohol, tobacco, and cannabis use, and the SARS-CoV-2
5 pandemic is no exception.^{3,4} Measures to curb the spread of coronavirus have led to unintended
6 negative consequences, including isolation increased stress and anxiety, all of which are factors
7 that can lead to substance use.^{5,6} Additionally, access to medical care and other supports and
8 treatments were also limited during the SARS-CoV-2 pandemic. The increase in substance use
9 and resulting development of SUD during the pandemic, especially among youth, has large
10 implications for public health^{7,8} and also the economy.

11 *Increases in alcohol, nicotine and cannabis use during the SARS-CoV-2 pandemic*

12 Many individuals use psychoactive substances as coping mechanisms, including for
13 mitigation of stress caused by the SARS-CoV-2 pandemic.^{8,9} In June 2020, 13% of adults aged \geq
14 18 years across the United States (US) reported starting or increasing substance use to cope with
15 stress or emotions.¹⁰ Alcohol is the most commonly used depressant psychoactive substance in
16 the US. Stay-at-home orders and lockdowns contributed to increased alcohol consumption.¹¹ In
17 the US, liquor stores were deemed essential businesses and remained open during the pandemic,
18 with alcohol sales increasing substantially.^{12,13} Increased alcohol sales during lockdowns raised
19 concern for increased at-home drinking, as public locations such as bars were closed.¹⁴ This
20 increased consumption has led to increased at-risk drinking, sometimes referred to as “gray area
21 drinking”, in which a person does not meet criteria for alcohol use disorder but consumes enough
22 alcohol to negatively impact health.¹⁵ Increases in overall alcohol consumption have been
23 particularly notable in women¹⁶ and young adults.¹⁷ Lockdowns have also been associated with

1 increased binge drinking,¹⁸ and more adolescent alcohol use at home, often permitted by parents,
2 and sometimes for children as young as 13 years of age.¹⁹ Initiation of alcohol use in early
3 adolescence has been linked to increased risk of binge drinking and alcohol use disorder later in
4 life. In the US, more than 90,000 deaths annually are attributed to alcohol use, with an average of
5 29 years of life lost per death for a total of 2.7 million years of potential life lost.²⁰ Costs to the
6 economy include those from loss of workplace productivity and healthcare. In 2010, the CDC
7 estimated that the cost of excessive alcohol use is more than \$2 per drink.²¹ Increased alcohol use
8 during the pandemic will have enormous financial costs and act as a substantial hindrance to the
9 economic recovery.

10 Increased stress is also associated with increased tobacco and nicotine use.²² Similarly to
11 alcohol, tobacco sales increased during the pandemic.¹³ The popularity of e-cigarettes has led to
12 nicotine use in many individuals who were previously non-smokers, including among young
13 adults.²³ E-cigarette use had been increasing in popularity prior to the SARS-CoV-2 pandemic,
14 with an estimated 2.3% of all US adults reporting current vaping.²³ In August 2019, the Centers
15 for Disease Control and Prevention (CDC) received report of a case of E-cigarette, or Vaping,
16 product use-Associated Lung Injury, or EVALI. This vaping epidemic overlapped with the
17 beginnings of the SARS-CoV-2 pandemic, and by February 2020 there were 2807 EVALI cases
18 and 68 deaths.²⁴ E-cigarette use continues to be popular, with extension of use into younger
19 populations. Per the National Youth Tobacco Survey in 2021, 11.3% of high school students and
20 2.8% of middle school students currently use e-cigarettes, for a total of more than 2 million
21 youths.²⁵ Tobacco product use is a financial burden, with 5.1 million years of potential life lost
22 and \$96.8 billion in productivity losses annually in the US.²⁶

1 Cannabis has been a substance of particular interest during the pandemic as self-isolation
2 is a risk factor for increased cannabis use.⁵ By 2020, when stay-at-home orders for the pandemic
3 were put in place, 27 states had decriminalized cannabis possession and 11 states had legalized
4 adult recreational cannabis use.²⁷ As the pandemic evolved, more states began to pass laws
5 legalizing cannabis, even while cannabis remained federally illegal.²⁸ As of August 2021, 47
6 states have at least some form of cannabis legalization, with 18 states and the District of
7 Columbia legalizing both medical and adult recreational cannabis use.²⁸ Compared to those who
8 did not isolate, young adults who self-isolated during the pandemic had greater cannabis use.⁵
9 *SUD increases the likelihood of SARS-CoV-2 infection*

10 Regardless of substance, individuals with SUD are a particularly vulnerable population
11 and at increased risk for SARS-CoV-2 infection and worse outcomes,¹ even if they have been
12 fully vaccinated.²⁹ Numerous socioeconomic determinants of health and behavioral factors lead
13 to increased SARS-CoV-2 infection risk for individuals with SUD.² For example, homelessness
14 and incarceration often results in overcrowding, which increases risk for disease transmission
15 and can secondarily lead to a lack of hygiene supplies and disinfecting materials.³⁰ Seeking out
16 substances requires interaction with others and often leads to close proximity, increasing risk of
17 disease transmission. During withdrawal and craving phases, individuals with substance use
18 disorders are at risk of violating lockdown orders in order to acquire substances. Additionally,
19 alcohol and drug use have been linked to a disregard for social distancing.⁸ Behaviors associated
20 with inhalational substance use, such as smoking and vaping, include mask removal, repeated
21 inhalation and forceful exhalation, hand-to-mouth movements and sharing of paraphernalia from
22 mouth to mouth,³¹ all of which increase the risk of viral transmission. Youth who report e-
23 cigarette use are at 5 times greater risk of SARS-CoV-2 infection compared to non-users; dual

1 users (e-cigarettes and tobacco) are 7 times more likely to have an infection compared with non-
2 users.³² Previously healthy adolescents and young adults who report vaping are now a population
3 considered high risk for SARS-CoV-2 infection.^{24,33}

4 *Individuals with SUD have worse outcomes with SARS-CoV-2 infection*

5 Further complicating the relationship between SUD and SARS-CoV-2 infection,
6 individuals with SUD have higher prevalence of co-occurring medical disorders, including
7 cardiovascular, endocrine, metabolic, pulmonary, and renal disorders,^{1,7} all of which increase the
8 likelihood of a severe outcome with SARS-CoV-2 infection². Substance use can compromise the
9 immune system,^{7,34} increasing the likelihood of becoming infected, worsening the severity of
10 infectious diseases and potentially decreasing the effectiveness of vaccines.

11 Inhalational substance use in particular damages the lungs, leading to an increased risk of
12 respiratory tract infections. Smoking has been associated with severe illness and worse outcomes
13 for individuals with SARS-CoV-2 infections.³⁴ At a state level, vaping prevalence was found to
14 be positively associated with COVID-19 cases and deaths.³⁵ The vaping epidemic has led to an
15 increased prevalence of lung damage, EVALI, and associated respiratory disorders in young
16 populations.^{24,33}

17 *Relationship between pandemic and overdose deaths*

18 The syndemic of drug related overdose deaths and the SARS-CoV-2 pandemic continues
19 to be troubling and relentless. An estimated 81,230 deaths occurred secondary to drug overdoses
20 from June 2019 through May of 2020, which constituted an 18% increase from the year before,
21 with a steep increase specifically in April and May of 2020.³⁶ In total, the public health crisis
22 triggered by coronavirus has exacerbated the already resource-challenged behavioral health

1 system resulting in over 100,000 drug related overdose deaths during the 12 month period ending
2 April 2021.³⁷

3 A study conducted by the Addiction Policy Forum, which surveyed individuals with SUD
4 and other impacted individuals, found that 20% of the respondents reported an increase in
5 substance use since the SARS-CoV-2 pandemic began. In addition, 4% of the respondents
6 reported that they or their family member experienced an overdose and 1% reported being
7 impacted by a fatal overdose of a family member.³⁸ Seventy two percent of individuals who
8 overdosed reported opioid use.³⁹

9 Possible contributors to overdose deaths include public health practices implemented in an
10 effort to control the spread of coronavirus resulting in changes and/or disruption to behavioral
11 health treatment. For instance, the Addiction Policy Forum survey indicated that of those who
12 reported an overdose, many were unable to access naloxone, needle exchange services, or
13 general needed services.³⁸ While some individuals indicated increased access to take-home doses
14 and curbside medication pickup,³⁹ access to other treatment components such as medical
15 appointments and counseling were curtailed, and the decreased support may have put one of the
16 most vulnerable populations at increased risk.

17 Recent data from the Rhode Island Data Ecosystem (RIDE) found that 53% of
18 individuals who died from overdose were in their personal residence, suggesting that social
19 isolation, reduced social support, and increased use of substances while alone all likely
20 exacerbated the risk of overdose.⁴⁰ The data also indicate a reduction in deaths associated with
21 drug overdose at hospitals, perhaps due to the overall decrease in hospital admissions not
22 associated with SARS-CoV-2 infections or a reluctance to use emergency medical services
23 during the pandemic.⁴⁰⁻⁴² In addition, the RIDE study, and others,^{43,44} found that individuals with

1 mental health diagnoses who may be in greatest need of social support, behavioral health
2 treatment and other protective resources had the greatest increase in risk of fatal overdose during
3 the SARS-CoV-2 pandemic.^{40,43-46} Moreover, the lethality of the drug supply during the
4 pandemic, especially illicitly manufactured fentanyl, has contributed significantly to the rise in
5 overdose deaths.⁴⁷

6 *Special considerations for youth*

7 Youth have been a particularly vulnerable and unsettled group during the course of the
8 SARS-CoV-2 pandemic with unprecedented upheaval and alterations to their usual course of
9 development socially, academically, and within the family structure. The switch from in-person
10 school to virtual or hybrid learning, halting extracurricular activities, and families uprooting to
11 new communities are just a few examples of the many transitions adolescents were forced to
12 make over the last 18+ months. As adolescence is already a turbulent developmental stage, the
13 structure and predictability of life inside and outside the home is grounding and protective for
14 youth. Under the circumstances, it is then not surprising that young people have been one of the
15 most vulnerable populations during the course of the pandemic.

16 Of particular concern for youth during the SARS-CoV-2 pandemic is the risk of
17 substance use initiation and escalation. Early initiation of substance use is associated with
18 immediate and later life negative outcomes including violence, poor physical health, delinquent
19 behavior, mental health problems and addiction. A Canadian study found that overall the
20 percentage of youth using substances decreased during the pandemic as fewer youth initiated
21 substance use during the initial periods of lockdown and school closures during which peer
22 contact was decreased significantly and access to substances was likely more limited. However,
23 the frequency of cannabis and alcohol use increased among those who were already using these

1 substances. The study also found substantial face-to-face substance use with peers despite stay at
2 home orders particularly for youth who assessed their popularity as “low”. On the contrary,
3 solitary substance use, also a risk factor for substance use disorders, was reported mostly by
4 those with depression, fear of contracting coronavirus, or youth who self-rated their popularity as
5 average to high popularity.⁴⁸ As the pandemic has progressed, substance use has remained
6 relatively stable among youth with those at highest risk being older, out of school, and residing
7 outside of the parental/guardian home.⁴⁹ While most of the data available at this time has
8 provided a snap shot of adolescent substance use early in the pandemic, it is possible that
9 initiation rates may rebound as students return to school while stress remains high due to the
10 ongoing pandemic. Extended longitudinal research could be quite enlightening as adolescents
11 develop into adults and physical and mental health outcomes can be followed. As the SARS-
12 CoV-2 pandemic has already had several surges with restrictions increased and later relaxed
13 along with widespread vaccine distribution, it will be crucial to follow youth and others over the
14 course of this worldwide disease. The ramifications of the SARS-CoV-2 pandemic are
15 widespread and will continue to evolve and emerge for the foreseeable future.

16 *Treatment*

17 Access to medical care overall has been a concern during the pandemic as COVID-19 cases
18 rose, the health care system became overburdened, and our medical teams grew more fatigued.
19 As the treatment of those with COVID-19 disease was prioritized, routine care and treatment of
20 non-SARS-CoV-2 related illnesses were delayed and/or not tended to, especially during the
21 beginning stages of the pandemic or viral surges. SUD treatment faced numerous unique
22 challenges, including increased allowance of take-home doses of methadone for patients in
23 treatment programs.⁵⁰ The shift from in-person appointments to telehealth over the course of the

1 last 18+ months has allowed for access to some medical care that otherwise would not have been
2 possible during the SARS-CoV-2 pandemic. However, resources necessary to access virtual
3 services such as reliable internet, personal electronic devices, and privacy can make telehealth
4 limiting to certain patient populations. Additional limitations also exist in the provision of
5 adequate medical treatment via telehealth, including the inability to measure vital signs, conduct
6 a complete physical examination, administer injections or obtain labs, which makes virtual
7 treatment platforms appropriate for only certain illnesses and appointment types. Despite the
8 limitations of telehealth, virtual mental health services during the pandemic served to improve
9 continuity of care for some patients and families.⁵¹ While the standard of care remains in-person
10 treatment, SUD-focused telehealth can also be delivered in an effective and safe manner.⁵²

11 Youth with SUD can be a particularly challenging group to engage in treatment. Telehealth
12 may help to reduce barriers for treatment entry and continuation.⁵³ More investigation is needed
13 to determine the effectiveness and safety of telehealth in youth with SUD, however, trends seem
14 promising for this service delivery method. Virtual care could increase treatment participation
15 for some populations during time of normal operation and serve as a critical link for those in
16 need of treatment during future periods of disruption.

17 *Conclusions*

18 Substance use increased during the SARS-CoV-2 pandemic, likely in part as a coping
19 mechanism for the associated increased stress. In particular, alcohol, nicotine and cannabis use
20 rose, with reports of both heavier use of previously used substances as well as increased
21 initiation of new substance use. Those individuals who consequently developed substance use
22 disorders are at increased risk of disease transmission and infection due to multiple
23 socioeconomic and behavioral factors. Additionally, this vulnerable population is at higher risk

1 of severe outcomes from SARS-CoV-2 infection due to weakened immune systems and the
2 medical comorbidities associated with substance use. As utilization of healthcare resources
3 shifted away from primary care and lockdowns went into effect, the rate of overdose deaths
4 increased substantially. Individuals with substance use disorders found themselves with
5 decreased access to treatment, social supports, and other resources. The stress of the pandemic
6 extended into the adolescent and young adult populations, leading to concerns of youth substance
7 use initiation and escalation. Virtual treatment platforms may help lower barriers for treatment
8 entry and continuation; more research is needed to evaluate the effectiveness of virtual care. As
9 substance use is associated with millions of years of potential life lost annually, in addition to
10 billions of dollars of productivity losses, recovery from the SARS-CoV-2 pandemic will require
11 addressing these issues.

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17 **Conflict of Interest**

18 *Potential conflicts of interest.* J.R. has no conflict. P.M. has no conflict. S.L. serves as an expert
19 witness in the case against JUUL Labs, Inc.

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1 **References**

- 2 1. Wang QQ, Kaelber DC, Xu R, Volkow ND. COVID-19 risk and outcomes in patients with
3 substance use disorders: analyses from electronic health records in the United States. *Mol*
4 *Psychiatry*. 2021;26(1):30-39. doi:10.1038/s41380-020-00880-7
- 5 2. Jemberie WB, Stewart Williams J, Eriksson M, et al. Substance Use Disorders and COVID-
6 19: Multi-Faceted Problems Which Require Multi-Pronged Solutions. *Front Psychiatry*.
7 2020;11:714. doi:10.3389/fpsy.2020.00714
- 8 3. Alexander AC, Ward KD. Understanding Postdisaster Substance Use and Psychological
9 Distress Using Concepts from the Self-Medication Hypothesis and Social Cognitive Theory.
10 *J Psychoactive Drugs*. 2018;50(2):177-186. doi:10.1080/02791072.2017.1397304
- 11 4. Kmiec J. President's message: The COVID-19 pandemic through the lens of disaster
12 psychiatry. *J Addict Dis*. 2020;39(1):1-2. doi:10.1080/10550887.2020.1857203
- 13 5. Bartel SJ, Sherry SB, Stewart SH. Self-isolation: A significant contributor to cannabis use
14 during the COVID-19 pandemic. *Subst Abuse*. 2020;41(4):409-412.
15 doi:10.1080/08897077.2020.1823550
- 16 6. Sugarman DE, Greenfield SF. Alcohol and COVID-19: How Do We Respond to This
17 Growing Public Health Crisis? *J Gen Intern Med*. 2021;36(1):214-215. doi:10.1007/s11606-
18 020-06321-z
- 19 7. Dubey MJ, Ghosh R, Chatterjee S, Biswas P, Chatterjee S, Dubey S. COVID-19 and
20 addiction. *Diabetes Metab Syndr Clin Res Rev*. 2020;14(5):817-823.
21 doi:10.1016/j.dsx.2020.06.008

- 1 8. Taylor S, Paluszek MM, Rachor GS, McKay D, Asmundson GJG. Substance use and abuse,
2 COVID-19-related distress, and disregard for social distancing: A network analysis. *Addict*
3 *Behav.* 2021;114:106754. doi:10.1016/j.addbeh.2020.106754
- 4 9. MacMillan T, Corrigan MJ, Coffey K, Tronnier CD, Wang D, Krase K. Exploring Factors
5 Associated with Alcohol and/or Substance Use During the COVID-19 Pandemic. *Int J Ment*
6 *Health Addict.* Published online January 26, 2021. doi:10.1007/s11469-020-00482-y
- 7 10. Czeisler MÉ, Lane RI, Petrosky E, et al. Mental Health, Substance Use, and Suicidal
8 Ideation During the COVID-19 Pandemic — United States, June 24–30, 2020. *MMWR Morb*
9 *Mortal Wkly Rep.* 2020;69(32):1049-1057. doi:10.15585/mmwr.mm6932a1
- 10 11. Kim JU, Majid A, Judge R, et al. Effect of COVID-19 lockdown on alcohol consumption in
11 patients with pre-existing alcohol use disorder. *Lancet Gastroenterol Hepatol.*
12 2020;5(10):886-887. doi:10.1016/S2468-1253(20)30251-X
- 13 12. Ramalho R, Adiukwu F, Gashi Bytyçi D, et al. Alcohol and Tobacco Use During the
14 COVID-19 Pandemic. A Call for Local Actions for Global Impact. *Front Psychiatry.*
15 2021;12:634254. doi:10.3389/fpsyt.2021.634254
- 16 13. Lee BP, Dodge JL, Leventhal A, Terrault NA. Retail Alcohol and Tobacco Sales During
17 COVID-19. *Ann Intern Med.* 2021;174(7):1027-1029. doi:10.7326/M20-7271
- 18 14. Castaldelli-Maia JM, Segura LE, Martins SS. The concerning increasing trend of alcohol
19 beverage sales in the U.S. during the COVID-19 pandemic. *Alcohol.* 2021;96:37-42.
20 doi:10.1016/j.alcohol.2021.06.004

- 1 15. Wolters C. “Gray Area Drinking” Is More Common Than You Think - And It’s Treatable.
2 Very Well Health. Published July 13, 2021. Accessed November 28, 2021.
3 <https://www.verywellhealth.com/gray-area-drinking-pandemic-alcohol-5192275>
- 4 16. Rodriguez LM, Litt DM, Stewart SH. Drinking to cope with the pandemic: The unique
5 associations of COVID-19-related perceived threat and psychological distress to drinking
6 behaviors in American men and women. *Addict Behav.* 2020;110:106532.
7 doi:10.1016/j.addbeh.2020.106532
- 8 17. Sharma P, Ebbert JO, Rosedahl JK, Philpot LM. Changes in substance use among young
9 adults during a respiratory disease pandemic. *SAGE Open Med.* 2020;8:205031212096532.
10 doi:10.1177/2050312120965321
- 11 18. Weerakoon SM, Jetelina KK, Knell G. Longer time spent at home during COVID-19
12 pandemic is associated with binge drinking among US adults. *Am J Drug Alcohol Abuse.*
13 2021;47(1):98-106. doi:10.1080/00952990.2020.1832508
- 14 19. Maggs JL, Cassinat JR, Kelly BC, Mustillo SA, Whiteman SD. Parents Who First Allowed
15 Adolescents to Drink Alcohol in a Family Context During Spring 2020 COVID-19
16 Emergency Shutdowns. *J Adolesc Health.* 2021;68(4):816-818.
17 doi:10.1016/j.jadohealth.2021.01.010
- 18 20. Esser MB, Sherk A, Liu Y, et al. Deaths and Years of Potential Life Lost From Excessive
19 Alcohol Use - United States, 2011-2015. *MMWR Morb Mortal Wkly Rep.* 2020;69(30):981-
20 987. doi:10.15585/mmwr.mm6930a1

- 1 21. Centers for Disease Control and Prevention. Excessive Drinking is Draining the U.S.
2 Economy. *Alcohol and Public Health*. Published December 30, 2019. Accessed December
3 13, 2021. <https://www.cdc.gov/alcohol/features/excessive-drinking.html>
- 4 22. Rigotti NA, Chang Y, Regan S, et al. Cigarette Smoking and Risk Perceptions During the
5 COVID-19 Pandemic Reported by Recently Hospitalized Participants in a Smoking
6 Cessation Trial. *J Gen Intern Med*. 2021; 36(12):3786-3793. doi:10.1007/s11606-021-
7 06913-3
- 8 23. Mayer M, Reyes-Guzman C, Grana R, Choi K, Freedman ND. Demographic Characteristics,
9 Cigarette Smoking, and e-Cigarette Use Among US Adults. *JAMA Netw Open*.
10 2020;3(10):e2020694. doi:10.1001/jamanetworkopen.2020.20694
- 11 24. The Lancet Respiratory Medicine. The EVALI outbreak and vaping in the COVID-19 era.
12 *Lancet Respir Med*. 2020;8(9):831. doi:10.1016/S2213-2600(20)30360-X
- 13 25. Park-Lee E, Ren C, Sawdey MD, et al. *Notes from the Field: E-Cigarette Use Among Middle*
14 *and High School Students — National Youth Tobacco Survey, United States, 2021. MMWR*
15 *Morb Mortal Wkly Rep*. 2021;70(39):1387-1389. doi:10.15585/mmwr.mm7039a4
- 16 26. Centers for Disease Control and Prevention (CDC). Smoking-attributable mortality, years of
17 potential life lost, and productivity losses--United States, 2000-2004. *MMWR Morb Mortal*
18 *Wkly Rep*. 2008;57(45):1226-1228.
- 19 27. Smyth BP, Cannon M. Cannabis Legalization and Adolescent Cannabis Use: Explanation of
20 Paradoxical Findings. *J Adolesc Health*. 2021;69(1):14-15.
21 doi:10.1016/j.jadohealth.2021.02.025

- 1 28. Manzanetti Z. Marijuana Legalization Continues to Grow: 2021 Laws Map. *Governing*.
2 Accessed November 28, 2021. [https://www.governing.com/now/marijuana-legalization-](https://www.governing.com/now/marijuana-legalization-continues-to-grow-2021-laws-map)
3 [continues-to-grow-2021-laws-map](https://www.governing.com/now/marijuana-legalization-continues-to-grow-2021-laws-map)
- 4 29. Wang L, Wang Q, Davis PB, Volkow ND, Xu R. Increased risk for COVID -19
5 breakthrough infection in fully vaccinated patients with substance use disorders in the United
6 States between December 2020 and August 2021. *World Psychiatry*. 2022;21(1):124-132.
7 doi:10.1002/wps.20921
- 8 30. Volkow ND. Collision of the COVID-19 and Addiction Epidemics. *Ann Intern Med*.
9 2020;173(1):61-62. doi:10.7326/M20-1212
- 10 31. Majmundar A, Allem JP, Cruz TB, Unger JB. Public Health Concerns and Unsubstantiated
11 Claims at the Intersection of Vaping and COVID-19. *Nicotine Tob Res*. 2020;22(9):1667-
12 1668. doi:10.1093/ntr/ntaa064
- 13 32. Gaiha SM, Cheng J, Halpern-Felsher B. Association Between Youth Smoking, Electronic
14 Cigarette Use, and COVID-19. *J Adolesc Health*. 2020;67(4):519-523.
15 doi:10.1016/j.jadohealth.2020.07.002
- 16 33. The Lancet Respiratory Medicine. Evolution of e-cigarettes: vigilance is needed to protect
17 adolescent health. *Lancet Respir Med*. 2020;8(3):217. doi:10.1016/S2213-2600(20)30075-8
- 18 34. Vardavas C, Nikitara K. COVID-19 and smoking: A systematic review of the evidence. *Tob*
19 *Induc Dis*. 2020;18(March). doi:10.18332/tid/119324

- 1 35. Li D, Croft DP, Ossip DJ, Xie Z. The association between statewide vaping prevalence and
2 COVID-19. *Prev Med Rep.* 2020;20:101254. doi:10.1016/j.pmedr.2020.101254
- 3 36. Ahmad F. Q & A on Latest Monthly Estimates of Drug Overdose Deaths. Published online
4 December 18, 2020. Accessed December 11, 2021.
5 <https://www.cdc.gov/nchs/pressroom/podcasts/2020/20201218/20201218.htm>
- 6 37. CDC National Center for Health Statistics. Drug Overdose Deaths in the U.S. Top 100,000
7 Annually. NCHS Pressroom. Published November 17, 2021. Accessed December 11, 2021.
8 https://www.cdc.gov/nchs/pressroom/nchs_press_releases/2021/20211117.htm
- 9 38. Hulsey J, Mellis A, Kelly B. *COVID-19 Pandemic Impact on Patients, Families &*
10 *Individuals in Recovery from a SUD.* Addiction Policy Forum; 2020.
11 [https://www.addictionpolicy.org/post/covid-19-pandemic-impact-on-patients-families-](https://www.addictionpolicy.org/post/covid-19-pandemic-impact-on-patients-families-individuals-in-recovery-fromsubstance-use-disorder)
12 [individuals-in-recovery-fromsubstance-use-disorder](https://www.addictionpolicy.org/post/covid-19-pandemic-impact-on-patients-families-individuals-in-recovery-fromsubstance-use-disorder)
- 13 39. Mellis AM, Kelly BC, Potenza MN, Hulsey JN. Factors Associated With Drug Overdoses
14 During the COVID-19 Pandemic. *J Addict Med.* 2022;16(1):e67-e69.
15 doi:10.1097/ADM.0000000000000816
- 16 40. Macmadu A, Batthala S, Correia Gabel AM, et al. Comparison of Characteristics of Deaths
17 From Drug Overdose Before vs During the COVID-19 Pandemic in Rhode Island. *JAMA*
18 *Netw Open.* 2021;4(9):e2125538. doi:10.1001/jamanetworkopen.2021.25538
- 19 41. Heist T, Schwartz K, Butler S. Trends in Overall and Non-COVID-19 Hospital Admissions.
20 Kaiser Family Foundation. Published February 18, 2021. Accessed April 2, 2022.

- 1 <https://www.kff.org/health-costs/issue-brief/trends-in-overall-and-non-covid-19-hospital->
2 [admissions/](https://www.kff.org/health-costs/issue-brief/trends-in-overall-and-non-covid-19-hospital-admissions/)
- 3 42. Marijon E, Karam N, Jost D, et al. Out-of-hospital cardiac arrest during the COVID-19
4 pandemic in Paris, France: a population-based, observational study. *Lancet Public Health*.
5 2020;5(8):e437-e443. doi:10.1016/S2468-2667(20)30117-1
- 6 43. Bohnert ASB, Ilgen MA, Ignacio RV, McCarthy JF, Valenstein M, Blow FC. Risk of Death
7 From Accidental Overdose Associated With Psychiatric and Substance Use Disorders. *Am J*
8 *Psychiatry*. 2012;169(1):64-70. doi:10.1176/appi.ajp.2011.10101476
- 9 44. Toblin RL, Paulozzi LJ, Logan JE, Hall AJ, Kaplan JA. Mental Illness and Psychotropic
10 Drug Use Among Prescription Drug Overdose Deaths: A Medical Examiner Chart Review. *J*
11 *Clin Psychiatry*. 2010;71(04):491-496. doi:10.4088/JCP.09m05567blu
- 12 45. Murphy AA, Karyczak S, Dolce JN, et al. Challenges Experienced by Behavioral Health
13 Organizations in New York Resulting from COVID-19: A Qualitative Analysis. *Community*
14 *Ment Health J*. 2021;57(1):111-120. doi:10.1007/s10597-020-00731-3
- 15 46. Schlosser A, Harris S. Care during COVID-19: Drug use, harm reduction, and intimacy
16 during a global pandemic. *Int J Drug Policy*. 2020;83:102896.
17 doi:10.1016/j.drugpo.2020.102896
- 18 47. Centers for Disease Control and Prevention. Overdose Deaths Accelerating During COVID-
19 19. CDC Newsroom. Published December 17, 2020. Accessed December 11, 2021.
20 <https://www.cdc.gov/media/releases/2020/p1218-overdose-deaths-covid-19.html>

- 1 48. Dumas TM, Ellis W, Litt DM. What Does Adolescent Substance Use Look Like During the
2 COVID-19 Pandemic? Examining Changes in Frequency, Social Contexts, and Pandemic-
3 Related Predictors. *J Adolesc Health Off Publ Soc Adolesc Med.* 2020;67(3):354-361.
4 doi:10.1016/j.jadohealth.2020.06.018
- 5 49. Hawke LD, Szatmari P, Cleverley K, et al. Youth in a pandemic: a longitudinal examination
6 of youth mental health and substance use concerns during COVID-19. *BMJ Open.*
7 2021;11(10):e049209. doi:10.1136/bmjopen-2021-049209
- 8 50. Amram O, Amiri S, Thorn EL, Lutz R, Joudrey PJ. Changes in methadone take-home dosing
9 before and after COVID-19. *J Subst Abuse Treat.* 2022;133:108552.
10 doi:10.1016/j.jsat.2021.108552
- 11 51. Reay RE, Looi JC, Keightley P. Telehealth mental health services during COVID-19:
12 summary of evidence and clinical practice. *Australas Psychiatry.* 2020;28(5):514-516.
13 doi:10.1177/1039856220943032
- 14 52. Oesterle TS, Kolla B, Risma CJ, et al. Substance Use Disorders and Telehealth in the
15 COVID-19 Pandemic Era. *Mayo Clin Proc.* 2020;95(12):2709-2718.
16 doi:10.1016/j.mayocp.2020.10.011
- 17 53. Levy S, Deister D, Fantegrossi J, et al. Virtual Care in an Outpatient Subspecialty Substance
18 Use Disorder Treatment Program. *J Addict Med.* 2022;16(2):e112-e117.
19 doi:10.1097/ADM.0000000000000871

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