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PERSPECTIVE

Current US COVID-19 Pandemic Substance Use Research and Ideas for Research That May Help Us Learn More

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Abstract

Background: The COVID-19 pandemic likely had and will continue to have severe implications for those who use addictive substances, have substance use disorders, or use substance use related health care services. Policy and services research, particularly health economics research, can illuminate these effects on individuals, uncover the effects of the rapidly imposed changes in policy on how services were delivered, promote efficient and effective provision of services, and inform responses to future pandemics.
Aims of the Study: To identify potential substance use related effects of COVID-19 and pandemic mitigation policies, highlight themes in current research, and suggest areas for further high-quality policy and services research, with an emphasis on health economics research.
Methods: Review of recent published commentaries, government documents, and initial research findings to describe potential impacts, and review of current COVID-19 related research grants funded by the United States National Institutes of Health to identify themes.
Results: Potential impacts include increased risk for and severity of COVID-19 illness among those who use substances, mitigation measures causing increased substance use and development of use disorders, and fundamental changes in the way treatment is provided. Current research may provide initial findings that may be useful in generating hypotheses for future rigorous research.
Discussion: Research on these and other areas could enhance our fundamental understanding of the needs of individuals who use substances and how to best address those needs in the most efficient, effective way. Though this brief review highlights some areas of potential interest, its focus is mainly on treatment and on the United States context. Research on additional services and contexts likely could inform advances as well.
Implications for Health Care Provision and Use: Health care providers rapidly and under considerable stress made needed changes that likely mitigated SARS-CoV-2 transmission. Rigorous research can help determine what worked best and for whom, what could be kept, and what might better be discarded.
Implications for Health Policies: Research on the effects of mitigation policies may inform the development of policies to reduce negative effects when addressing future pandemics, whether to permanently allow at least some substance use treatment flexibilities, and whether research on other restrictive policies might lead to improvement.
Implications for Further Research: This extraordinary event brought into sharp relief the numerous vulnerabilities of those who use substances and those with substance use disorders while also leading to vast changes in the services that address them. Rigorous research into those effects could result in significant improvements in policy and practice.

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Introduction

The COVID-19 pandemic and related public health mitigation measures may have a profound, lasting effect on individuals who use addictive substances and those with substance use disorders (SUDs). At the same time, flexibilities to the relatively restrictive regulations on SUD treatment in the United States (US) were rapidly implemented to mitigate SARS-CoV-2 transmission. Policy and services research in general, and health economics research in particular, can help us better understand these effects on individuals, and also estimate on the effects of these treatment flexibilities and other mitigation strategies on patient outcomes and the delivery of services and their costs.

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In this Perspective I will first briefly describe some of the potential pandemic impacts. Second, I will introduce some of the research that the United States National Institutes of Health (NIH) has funded, mostly administered by the National Institute on Drug Abuse, on COVID-19 related to substance use and SUD. These mostly preliminary studies are not health economics research, but may generate initial findings, ideas, or hypotheses, that might benefit from further rigorous research. Some also will provide data and other resources that might be useful in health economics research. Third, I will identify ideas for research that, in my personal opinion, may further illuminate both the impacts and, importantly, how our responses to the pandemic may inform improvements in how we address substance use and SUDs as well as prepare for future pandemics. My goal is to provide examples of topics on which high-quality policy and services research, with an emphasis on health economics research, might advance science and improve the health and well-being for those who use substances or have SUDs.

Economics is essentially the science of how best to allocate resources in a manner that maximizes social welfare. We start from the notion of scarcity, that all of society's wants and needs cannot be met by existing resources and that choices must be made. If trained in the neoclassical tradition, we examine how well existing markets, and the behavior of individuals and firms in those markets, lead to the production and consumption of goods and services that affect social welfare and how policies and other interventions may improve the response. We compare actual performance, as best we can measure it, to the performance of a perfectly competitive market, which is a theoretical construct that assumes free market entry and exit for firms, firms without market power, perfect information on the part of buyers and sellers, and consistent individual preferences. In theory, perfectly competitive markets lead to a resource allocation that maximizes social welfare. What makes health-related behaviors and health care, particularly those related to substance use, so fascinating is that these markets often diverge far from the assumptions of a perfectly competitive market. That makes these markets all the more important to carefully analyze with an eye toward improving welfare via policies and other interventions to promote efficient, effective, and equitable resource allocation. Although expending vast resources during a rapidly evolving crisis such as a pandemic is understandable, such spending is not sustainable though the needs may continue to be great.

The economic toolkit contains methods, including the practice of developing testable hypotheses from theoretical models of behavior and careful attention to and remedies for violations of assumptions of standard regression-based estimation techniques, that improve rigor and allow for causal interpretation. These tools can be used to strengthen policy and services research as well as the study of topics that are traditionally the subject of other disciplines. Multidisciplinary research by teams including health economists, researchers trained in other disciplines, and researchers and experts in the clinical area (including individuals with these disorders) can lead to truly powerful insights into what works best for whom and about how resources can be allocated to efficiently improve health and wellbeing to the maximum extent possible.

Potential Pandemic Effects on Those Who Use Substances and/or Have SUDs

There are several ways in which the COVID-19 pandemic and the related public health mitigation measures may affect individuals who use addictive substances and the production of treatment for SUDs. Inhaled substances may compromise the lungs, leading to more severe illness, though current evidence about tobacco is mixed.[1] Individuals with alcohol, opioid, and/or cocaine use disorders may have worse COVID-19 outcomes than individuals who do not have those disorders.[2,3] Treatment for SUDs, which prior to the pandemic was mostly in person and often in group settings, was either disrupted, adjusted to telephone or video telehealth platforms, or required risking exposure to COVID.[4] Likewise, chronic pain patients, including those treated with prescribed opioids, confronted a shut-down of in-person pain services and a move to the virtual realm.[5] For opioid use disorder (OUD) treatment, flexibilities like removing the requirement for in-person assessment for initial buprenorphine prescriptions and permitting more patients to have more methadone take home doses were instituted by policymakers at the beginning of the US phase of the pandemic.[6] While these flexibilities may be of benefit to many patients, they may be less appropriate for others.[7] The isolation and loss of jobs, activity, and human contact may have been especially difficult for those with current or past use disorders.[9] The latest data shows that overdoses in the United States are provisionally estimated to have risen approximately 26% between March 2020 and January 2021, compared with six percent between March 2019 and January 2020.[9]

Current COVID-Related SUD Research Funded by NIH

NIH makes it easy to find the COVID-19 related investigator-initiated research it has funded via grants using its NIH RePORTER tool (https://reporter.nih.gov/). To do so, scroll down to ''Advanced Project Search'', click on ''looking for additional search fields'', scroll down to ''Additional Search Filters COVID-19 Response'', click on the box and select all. A search in NIH RePORTER conducted on April 8, 2021 revealed more than a thousand research project grants related to COVID-19. Approximately 150 of these focus on substance use or SUD.[10] Most, though not all, of these studies were funded or administered by the National Institute on Drug Abuse. Many of these grants were for supplement projects that leveraged existing studies to quickly provide initial insights into COVID-related questions, though larger research project grants studies have

Table 1. Examples of Substance Use and COVID Grants Funded by the National Institutes of Health by Theme.

Pandemic Mitigation Strategies and Their Consequences on Substance Use		
Project Number	Project Title	Public Health Relevance*
3U24DA044554-04S1	Collaborating Consortium of Cohorts Producing NIDA Opportunities (C3PNO)	Our Collaborating Consortium of Cohorts Producing NIDA Opportunities (C3NPO) administrative supplement proposal directly addresses priority areas specified in the Notice of Special Interest (NOSI) regarding the Availability of Administrative Supplements and Urgent Competitive Revisions for Research on the 2019 Novel Coronavirus. The proposed supplement study seeks to examine COVID-19 related changes in substance use, substance use disorder (SUD) treatment, and HIV prevention and care among highly vulnerable populations followed by the C3PNO cohorts in major cities in North America (Baltimore, Miami, Chicago, Los Angeles, and Vancouver). We will leverage the existing consortium infrastructure to access cohort participants to conduct repeated assessments that combined with previous data will assess the impact of COVID-19 and the stay-at-home orders prioritizing those with SUD (those injecting drugs or with heavy stimulant use), as well as people living with or at high-risk for HIV including young men who have sex with men.
3R01AA027496-02S1	COVID-19 Pandemic-Related Impacts on Longitudinal Trajectories of Alcohol, Marijuana, and Simultaneous Use and Mental Health Among Young Adults	The devastating impacts of the novel coronavirus disease (COVID-19) pandemic will likely include negative consequences for young adults' (YAs) mental health and substance use. With a randomized staggered design, we will obtain time-sensitive data, including six assessments every two months beginning in July 2020 through June 2021, that builds upon earlier waves of data collection and allows us to track the complementary and/or substitution effects of alcohol and marijuana use as this dynamic public health crisis continues to evolve. This supplement will examine the downstream young adult health, well-being, and substance use effects resulting from social, behavioral, and economic impacts related to the COVID-19 pandemic, including differences in risk and resiliency based on demographics, and other social determinants of health.
3R01DA042755-04S1	Impact of Marijuana Legalization: Comparison of Two Longitudinal Twin Cohorts	This supplemental grant proposes to add questions to extend the aims of the parent project by collecting additional data related to COVID-19 including financial hardships, social/interpersonal problems, stress, mental health, and substance use changes. Data will also be collected on whether participants are essential workers, were exposed to COVID-19, or have been diagnosed with COVID-19. Its goal is to understand how COVID-19 related stay-at-home orders, unemployment, and other factors affect substance use and mental health.

* As it appears in NIH RePORTER (https://report.nih.gov/) or the NIDA Clinical Trials Network Dissemination Library (http://ctndisseminationlibrary.org/) Web sites, as appropriate.

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COVID-19 Effects on Substance Use Outcomes and Services Utilization

Project Number	Project Title	Public Health Relevance*
3U01DA051126-01S1	National Drug Early Warning System (NDEWS) COVID-19 Supplement	We will collect rapid response data on substance use-related consequences of COVID-19 across the US from novel key informants including funeral directors, emergency medical service personnel, and syringe exchange workers. This study will allow us to rapidly acquire data to assess the impact of COVID-19 on substance use behaviors throughout the US. Results will be rapidly disseminated to the scientific community and the public alike and will provide targets for new research strategies and prevention efforts.
3UG1DA040314-06S3	Health Systems Node of the NIDA Clinical Trials Network	As a result of the COVID-19 pandemic, we are witnessing profound societal and health system \newline developments with significant implications for the treatment of drug use disorders: an increase in drug use, people of color at disproportionate risk for distress and drug use, and a potentially transformational move to virtual treatment modalities. The proposed study examines this major shift to virtual treatment for drug use disorders during the pandemic in a large, diverse health care system, specifically exploring potential disparities in accessing treatment. Virtual treatment is likely to persist as a major delivery model of alcohol treatment and understanding potential inequities in access is critical to improving quality of care and outcomes for underserved populations.
3R01DA046653-03S1	Overdose Risk Management and Compensation in the Era of Naloxone	This time-sensitive supplementary research strengthens the capacity of its parent grant to track the drivers of overdose risk behavior over time. By adding measures related to Covid-19 into the monthly web-based surveys being administered to N=576 people who use illicit opioids, the study team will be in a strong position to generate preliminary findings about the unique vulnerabilities and potential compensatory behaviors of people who use opioids during public health crises. Findings will be disseminated widely to inform policymaking and future interventions to reduce the risks of opioid-related overdose in the contexts of public health crises.
3R01DA047537-03S1	Assessing the Safety and Effectiveness of Opioid Tapering in Large Health Systems	The United States is confronting two concurrent public health emergencies of opioid overdoses and the coronavirus disease 2019 (COVID-19), with potential to reinforce health disparities. Populations with chronic opioid exposure, either prescribed or non-prescribed, are at risk of experiencing disruptions to healthcare as a result of the pandemic. This study will examine changes in health services and opioid overdose before and during the pandemic by race/ethnicity and gender.

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Effects of the Pandemic and Pandemic Mitigation Strategies Treatment Services		
Project Number	Project Title	Public Health Relevance*
3U54MD012388-04S4	Southwest Health Equity Research Collaborative	The proposed project will employ Rapid Assessment, Response and Evaluation (RARE) methods to understand how DEA guideline changes allowing increased access to methadone and buprenorphine and treatment via telemedicine during COVID-19 were implemented and experienced by stakeholders, providers, and patients in treatment for opioid dependence. Data to be collected are crucial to informing a debate at the national level about whether policy guideline changes should become permanent after COVID-19 risk has lessened. Research is needed particularly because the changes are believed to improve access to medication-assisted treatment and reduce travel burden for people in rural areas where lack of transportation or barriers to accessing group support can reduce health equity.
CTN-0117	The Impact of COVID-19 Pandemic on Substance Use Treatment Services	As a result of the COVID-19 pandemic, we are witnessing profound societal and health system developments with significant implications for the treatment of drug use disorders: an increase in drug use, people of color at disproportionate risk for distress and drug use, and a potentially transformational move to virtual treatment modalities. The proposed study examines this major shift to virtual treatment for drug use disorders during the pandemic in a large, diverse health care system, specifically exploring potential disparities in accessing treatment. Virtual treatment is likely to persist as a major delivery model of alcohol treatment, and understanding potential inequities in access is critical to improving quality of care and outcomes for underserved populations.

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Barriers and Facilitators to Testing and Vaccination Acceptance among Individuals Who Use Drugs and Other Vulnerable Populations

Project Number	Project Title	Public Health Relevance*
3U01DA040381-05S1	Exploring Barriers and Facilitators to Women Who Use Drugs (WWUD) Awareness, Acceptance and Uptake of COVID-19 Testing, the CARE Study	The proposed study aims to identify factors associated with COVID-19 testing among women who use drugs (WWUD) through exploring predisposing social factors (e.g., housing), individual-level factors (e.g., mental health), and beliefs (e.g., medical mistrust). The study will be advised by a CAB and include both qualitative and longitudinal quantitative data collection. Ultimately, results will inform the development of COVID-19 testing schemes targeting this high-risk population.
3P30DA011041-23S1	A Nurse-Community Health Worker-Family Partnership Model to Increase COVID-19 Testing in Urban Underserved and Vulnerable Communities	We propose a community-collaborative research study that will implement a 2-arm randomized controlled trial to evaluate the effectiveness of a Nurse-Community Health Worker-Family Partnership intervention in promoting COVID-19 testing uptake, adoption of COVID control measures, and mutual aid capacity at the household level in a high-poverty, underserved and vulnerable community disproportionately affected by COVID-19 – Mott Haven, the South Bronx, New York City. Our Nurse-Community Health Worker-Family Partnership intervention, which includes the offer of in-home COVID-19 testing and influenza vaccination, will be compared to a treatment-as-usual control group that can access testing and flu vaccination nearby. The findings will provide an evidence-base for current and future programming related to COVID-19 mitigation in underserved and socially vulnerable communities.
3UG1DA050072-02S3	COVID-19 Testing and Prevention in Correctional Settings	The proposed work is relevant to public health and to the mission of ''Rapid Acceleration of Diagnostics for Underserved Populations (RADxUP)'' given the disproportionately high rates of COVID-19 infection and mortality in correctional facilities. We will identify ethical and feasible solutions to administer upwards of 40,000 tests in carceral settings in Florida, Rhode Island, Minnesota, and Yakima County, Washington, in order to characterize COVID-19 incidence, disease progression, and outcomes of staff and incarcerated. By building strategic partnerships with individuals with a history of incarceration and community and correctional policymakers, we will identify strategies to scale repeat testing in correctional facilities and lay the foundation for future vaccine delivery.

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Effects of Substance Use on COVID-19 Risk and Prognosis		
Project Number	Project Title	Public Health Relevance*
3R01DA048860-02S1	Impact of Medical and Recreational Marijuana Laws on Cannabis, Opioids and Psychiatric Medications: National Study of VA Patients, 2000-2024	This project will utilize the ''big data'' resources of the Veterans Administration electronic medical record system on 5.7 million patients to help fill a major gap in knowledge about the risks for and poor prognosis of COVID-19 among individuals with substance use/substance use disorder (SU/SUD). Findings can generate hypotheses about biological mechanisms of effect, help educate patients, providers, and service planners for the Veterans Administration and other patient groups with high rates of vulnerability factors, and can help educate the general public, especially those turning to substance use during times of stress and mass disaster. Finally, findings will better prepare scientists and clinicians to address possible multiple waves of COVID-19, and the challenges of additional novel coronaviruses with lethal outcomes that may emerge in the future.
3R01DA043396-04S1	Immune Correlates of Long-Term Success with DAA Therapy in HCV/HIV Infected People Who Inject Drugs	Currently, the risk factors for Coronavirus disease 2019 (COVID-19) progression include older age, male gender, and underlying conditions which may impair immune response to the virus. We propose to investigate if opioid use disorder (OUD) in people living with HIV constitutes risk factor for severe COVID-19 due to possible influence of opioids and HIV on immune response to infection. Our investigation of clinical and immunological features of the disease in OUD will expand on known correlates of progressive COVID-19.
3R01DA047933-02S1	Effectiveness of an Integrated Treatment to Address Smoking Cessation and Anxiety/Depression in People Living with HIV	As of April 2020, the novel coronavirus (COVID-19) has led to over 40,000 deaths in the United States, and smoking likely exacerbates the severity of COVID-19 symptoms. Smoking is common among individuals living with HIV, who may already be at heightened risk for a severe course of COVID-19 due to HIV-related comorbidities, and increases in negative affect resulting from the pandemic may compromise smoking cessation efforts. Understanding the degree to which nicotine dependence and HIV disease stage impact COVID-19 outcomes, as well as the influence of COVID-related negative affect on smoking abstinence, will inform knowledge of COVID-19 risk factors and contribute to targeted interventions.

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Longer-term Consequences of the Pandemic and Mitigation Strategies on Childhood Development and Substance Use		
Project Number	Project Title	Public Health Relevance*
3U24DA041123-06S1	ABCD-USA Consortium: Data Analysis Center	Adolescent Brain Cognitive Development (ABCD), the largest longitudinal study of brain development and child health in the United States, follows over 10 years 11,878 children recruited from 21 U.S. research sites, recruited at ages 9-10 in 2016-18. In March 2020, when our participants were ages 11-13, the world became substantially affected by the COVID-19 pandemic, leading to an upheaval in the economy and the lives of almost every family. This project would query all ABCD participants and their parents about the impact of the pandemic on their lives and, in a subset of participants, examine their physical activity and sleep with Fitbit activity trackers, over the months of school closures, job loss, and disease spread.

Studies Developing Data and Research Resources		
Project Number	Project Title	Public Health Relevance*
3U01DA050442-02S1	Using Implementation Interventions and Peer Recovery Support to Improve Opioid Treatment Outcomes in Community Supervision	The 2019 outbreak of the novel coronavirus COVID-19, also known as SARS-CoV-2, has threatened to exacerbate the ongoing opioid epidemic in the United States, which kills more than 130 people each day according to the Centers for Disease Control and Prevention. States have responded to COVID-19 with an unprecedented amount of legal action, some of which may significantly affect access to treatment for individuals living with opioid use disorder, including those involved in the criminal justice system. This research will produce robust longitudinal legal data capturing these measures across all 50 states and Washington, D.C. enabling the evaluation of emerging laws and policies on health outcomes and access to treatment for opioid use disorder.
3R15AA027655-01S1	Alcohol Consumption and Related Comorbid Conditions: Health State Utilities for Economic Evaluation in the Context of the COVID-19 Pandemic	Alcohol consumption presents serious health and public health risks in the US with about half of Americans age 12 and older reporting drinking. Alcohol consumption during a pandemic can create additional risks if hazardous drinking increases. This study will examine alcohol consumption during COVID-19 and its effects on health-related quality of life to inform current policy as well as future responses to similar situations, such as natural disasters, terrorist attacks, and successive waves of coronavirus outbreaks that are expected following \newline re-opening policies and mass-gatherings.

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begun to be funded. Though none of the studies included in this review could be considered health economics, findings and data from these studies may be useful in informing future health economics research. Some of the major themes, and example projects, for which more information appears in **Table 1**, include the following:

Pandemic Mitigation Strategies and Their Consequences on Substance Use

One study is adding a survey to existing cohort studies to examine the effect of the pandemic on substance use among those living with or at risk for HIV (NIH Project Number 3U24DA044554-04S1). Another examines changes in use among young adults (3R01AA027496-02S1). Another one examines the interplay of recreational marijuana laws and prior use with COVI19 on marijuana use and other outcomes (3R01DA042755-04S1).

COVID-19 Effects on Substance Use Outcomes and Services Utilization

One study, which leverages the NIDA-funded National Drug Use Early Waring Network (www.ndews.org) surveillance system, is conducting key informant interviews with funeral directors, emergency medical service personnel, and harm reduction facilities to detect trends in drug-related mortality, health services utilization, and syringe exchange services (3U01DA051126-01S1). Another, which leverages the NIDA Clinical Trials Network (https://www.drugabuse.gov/about-nida/organization/cctn/clinical-trials-network-ctn) will conduct a pre-post comparison to assess the effects of COVID-19 on drug use disorder (DUD) identification and several DUD treatment measures (initiation, engagement, and retention in specialty addiction treatment; medication for OUD) compared by visit types (virtual/non-virtual, telephone, video) (3UG1DA040314-06S3). Another project is examining whether COVID-19-related effects on services availability affected risky behaviors among individuals who inject opioids (3R01DA046653-03S1). Finally, another is examining COVID-19-related effects on both individuals with and those on long-term opioid therapy for chronic pain (3R01DA047537-03S1).

Effects of the Pandemic and Pandemic Mitigation Strategies on Treatment Services

One example is a study that is identifying barriers and facilitators to successful implementation of telehealth and mHealth for opioid treatment in the context of COVID-19 restrictions, temporary guideline changes, and reopening stages and is also assessing the implementation of medication assisted treatment guideline changes and equity in access to take homes for people in rural and underserved populations in Arizona (3U54MD012388-04S4). Another study within NIDA's Clinical Trials Network is examining similar topics in the context of Native Americans and Alaska Natives (NIDA-CTN-0117).

Barriers and Facilitators to Testing and Vaccination Acceptance among Individuals Who Use Drugs and Other Vulnerable Populations

One example is a community-engaged research study that is evaluating the effectiveness of community engagement and other strategies to increase the uptake of COVID-19 testing in the underserved, hard-to-reach populations communities (3U01DA040381-05S1). Another will examine the effectiveness of a Nurse-Community Health Worker (CHW)-Family Partnership intervention designed to promote COVID-19 testing uptake, adoption of COVID-19 control measures, and mutual aid capacity in a high-poverty, racially- and ethnically-diverse community (3P30DA011041-23S1). Another study, part of the Justice Community Opioid Innovation Network of the NIH HEAL Initiative[SM] (https://heal.nih.gov/research/research-to-practice/jcoin), is studying how to increase high-quality care for people with opioid misuse and OUD in justice settings (3UG1DA050072-02S3).

Effects of Substance Use on COVID-19 Risk and Prognosis

An example of this type of study is one examining the effects of substance use and SUDs on COVID-19 among US veterans (3R01DA048860-02S1). Another is examining if opioid use disorder increases risks of severe COVID-19 among those living with HIV (3R01DA043396-04S1). Another is examining the effects of nicotine dependence severity on risks and outcomes of COVID-19, also among those living with HIV (3R01DA047933-02S1).

Longer-term Consequences of the Pandemic and Mitigation Strategies on Childhood Development and Substance Use

Supplements to studies in the Adolescent Brain Cognitive Development (ABCD) study (https://abcdstudy.org/), including one to the project's coordinating center, will examine pandemic-related perturbations in developmental trajectories of substance use as well as brain functioning, cognition, substance use, academic achievement, social functioning, and physical and mental health (3U24DA041123-06S1). COVID-19 supplements were also awarded to the newer NIH HEAL Initiative[SM] HEALthy Brain and Child Development Study (HBCD) study projects (https://heal.nih.gov/research/infants-and-children/healthy-brain), to examine neurodevelopment in the prenatal period and extending through early childhood.

Many of the funded studies should provide an initial examination of these issues and, importantly, generate findings and data that may be useful to policy, health services, and health economic researchers as they develop hypotheses and consider their own studies. Two other studies are developing tools that might also be useful. One is developing a data set of laws, regulations, executive orders, and Medicaid waivers related to COVID for the justice

population (3U01DA050442-02S1). Another is collecting data to generate health related quality of life measures during COVID and comparing them to those obtained before the pandemic (3R15AA027655-01S1).

What Can Policy, Services, and Health Economics Research Help Us Learn from Pandemic Experiences?

The COVID-19 pandemic and the US response to it is of a magnitude not seen by all but the oldest among us. It has promoted rapid changes in the way we live, work if we are lucky enough to have it, and receive food, medical care, and other essentials. Additional research may help us more fully understand the effects of this unprecedented period on those who use substances or who have SUDs, how changes in how substance use services were delivered and received, suggest improvements we might make as we return to the new normal, and provide insights into how we can better prepare for future pandemics. Here are some of my ideas for research that might have impact:

- How does the economic performance (e.g., the business cycle) affect substance use? This question gets asked every time there is a recession, and the results so far have been mixed. Can the fact that this was not only a recession, but an event that resulted in substantial isolation, loss, and fear for our physical well-being be leveraged to better highlight the effects of the business cycle itself? How might economic and other theories of substance use and addiction be updated?
- What was the effect of stimulus payments on those who use substances or who have a disorder? What can we learn that might inform emergency income distribution in future catastrophes or in universal basic income schemes? Evidence suggests that use and exposure to other harms may increase immediately after payment receipt for some substance users.[11,12] Was that the case in terms of pandemic stimulus payments? If it was, given that this is an efficient way to distribute funds to large populations, what can be done to reduce harms associated with future payments?[13]
- What were the effects on patient outcomes of the flexibilities related to telehealth for the treatment of SUD and medications for OUD? What should be retained, modified, or discontinued? The tension here has long been between improving access and retention in treatment versus concerns about effectiveness, patient safety, and, in the case of opioid agonist treatments, diversion. What rigorous research can be done to inform this debate, and especially about the effects of these flexibilities on marginalized and disadvantaged populations?
- What were the effects of these flexibilities on providers of substances use disorder treatment services and how did they affect costs of service delivery? What were the effects on the substance use treatment workforce? Are there implications for the market structure of the industry? If these flexibilities were to be continued at least for some patients, how might payment rates need to be adjusted, and what types of payment models might promote efficient provision of effective services? For example, how might the US Centers for Medicare and Medicaid Services (CMS) Medicare's Opioid Treatment bundled payment model be modified[14] if flexibilities around inductions and take-home doses become the norm?
- How did the pandemic affect those whose access to prescribed pain medications or high-touch services to relieve chronic pain was curtailed during the pandemic? Did they turn to alternatives such as illicit drugs and if so, what was the effect? Did they return to their usual sources of care and interventions as mitigation measures were relaxed?
- What can we learn from the other rapid changes in the delivery of substance use services due to pandemic mitigation measures? What might be worth keeping?
- What more can we learn about social determinants of health and their effects on patients and on the effectiveness of treatment? What additional needs have emerged?
- How have job prospects changed for those who use substances or have or had SUDs? What will the new normal be for them?
- How has COVID-19 spending affected state and local budgets, and what effect will that have on resources for SUD treatment? Public health spending rapidly increased in almost all countries in response to the pandemic at the same time that the economy shut down, and it isn't clear what will happen going forward.[15] SUD spending is often a target for cutting during recessions, but will that be the case this time? What research could inform the efficient allocation of resources?
- What are the implications of long-term COVID-19 sequelae for those who use substances and/or receive substance use treatment and what are the implications for the treatment system?

These areas that, in my opinion, would benefit from rigorous services and policy research formed by economics. They do not necessarily represent the priorities of NIH or NIDA and should not be taken as such. For information on current NIH priorities go to the NIH Guide to Grants and Contracts (https://grants.nih.gov/funding/searchguide/index.html#/), to search for Notices of Special Interest (NOSIs) and Funding Opportunity Announcements. Also visit Institute and Center Web sites (https://www.nih.gov/institutes-nih/list-nih-institutes-centers-offices) to understand priorities and find program officials with whom to discuss potential applications and relevant funding opportunity announcements. As the crisis evolves and one day abates, other critical research topics may well emerge. Also, the ideas presented here focus on treatment for SUDs when many other services including prevention, harm-reduction and recovery services were affected similarly by the public health mitigation measures. Similar analyses of those services could be informative as well. Finally, the focus here was on the US context, and research on relevant topics in other nations would yield important insights as well.

Conclusion

The COVID-19 pandemic has caused unimaginable losses and grief. The best we can do now is to learn as much as we can about to how to improve and to prepare for the next pandemic. Thoughtful, rigorous multidisciplinary research, particularly that which is informed by the tools and methods of health economics, that helps us understand the acute and continuing needs of those who use substances and that informs improvements in policy and practice is perhaps the faint silver lining on a very dark cloud.

References

1. Samet J. Tobacco products and the risks of SARS-CoV-2 Infection and COVID-19. *Nicotine Tob Res* 2020; **22**: S93-S95.
2. Allen B, El Shahawy O, Rogers, Erin, Hochman S, Kahn M, Krawczyk N. Association of substance use disorders and drug overdose with adverse COVID-19 outcomes in New York City: January–October 2020. *J Public Health* (Oxf). 2021 Sep 22; **43**(3): 462-465.
3. Wang Q, Kaelber D, Xu R, and Volkow, N. COVID-19 risk and outcomes in patients with substance use disorders: analyses from electronic health records in the United States. *Mol Psychiatry*, 2021; **26**: 30-39.
4. Blanco C, Compton W, Volkow N. Opportunities for research on the treatment of substance use disorders in the context of COVID-19. *JAMA Psychiatry* 2021; **78**: 357-358.
5. Puntillo F, Giglio M, Brienza N, Viswanath O, Urits, Kaye A, Pergolizzi J, Paladini A, Varrassi G. Impact of COVID-19 pandemic on chronic pain management: Looking for the best way to deliver care. *Best Pract Res Clin Anaesthesiol*, 2020; **34**: 529-537.
6. Centers for Medicare and Medicaid Services Centers for Medicare & Medicaid Services (CMS) and Substance Abuse and Mental Health Services Administration (SAMHSA): Leveraging Existing Health and Disease Management Programs to Provide Mental Health and Substance Use Disorder Resources During the COVID-19 Public Health Emergency (PHE) 2020, https://www.cms.gov/CCIIO/Programs-and-Initiatives/Health-Insurance-Marketplaces/Downloads/Mental-Health-Substance-Use-Disorder-Resources-COVID-19.pdf, accessed April 15, 2021.
7. Leppla I, Gross M. Optimizing Medication Treatment of Opioid Use Disorder During COVID-19 (SARS-CoV-2). *J Addict Med*; 14: e1-e3.
8. National Institute on Alcohol Abuse and Alcoholism. Surveillance Report Covid-19: Alcohol Sales During the COVID-19 Pandemic. https://pubs.niaaa.nih.gov/publications/surveillance-covid-19/COVSALES.htm accessed on April 15, 2021.
9. Centers for Disease Control and Prevention Provisional Drug Overdose Death Counts, 2021. https://www.cdc.gov/nchs/nvss/vsrr/drug-overdose-data.htm, accessed September 9, 2021.
10. NIH REporter: https://reporter.nih.gov/. Accessed April 8, 2021. Author calculation using the COVID-19 Response filter to select relevant projects, identifying all of grants funded by NIDA, NIAAA, and NCI, and those of other institutes using the keyword ‘‘opioid’’ and downloading titles and abstracts from NIH reporter into an Excel file for further review.
11. Høj S, Jacka B, Minoyan N, Bussière P, Bruneau J. Deconstructing the ‘cheque effect’: short-term changes in injection drug use after receiving income assistance and associated factors. *Addiction* 2020; **116**: 571-582.
12. Richardson L, Dong H, Kerr T, Milloy M-J, Hayashi K. Drug-related harm coinciding with income assistance payments: results from a community-based cohort of people who use drugs. *Addiction* 2020; **116**: 536-545.
13. Macmadu A, Rich J. Commentary on Richardson et al. : Strategies to mitigate payment-coincident drug-related harms are urgently needed. *Addiction* 2020; **116**: 546-547.
14. Centers for Medicare and Medicaid Services, Opioid Treatment Program https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/Opioid-Treatment-Program, Accessed April 16, 2021.
15. Kurowski C, Evans D, Tandon A, Eozenou P, Schmidt M, Irwin A, Cain J, Pambudi E, Postolovska I. *From double shock to double recovery - implications and options for health financing in the time of COVID-19*. Discussion Paper. World Bank Group, March 2021.