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Differential impacts of COVID-19 across racial-ethnic identities in persons with opioid use disorder

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ABSTRACT

Objective: The COVID-19 pandemic has exacerbated health disparities, particularly among at-risk people with opioid use disorder (OUD). We sought to characterize the direct and indirect impacts of COVID-19 on this group to understand how the pandemic has affected this group, this group's public health response to COVID-19, and whether there were differences by race/ethnicity.

Methods: This study recruited its sample from a drug treatment setting in the northeast region of the United States. We surveyed 110 individuals on methadone as treatment for OUD and assessed COVID-19-related impacts on their health behaviors and other indices of social, physical, and mental well-being, including sexual health behaviors, substance use, mental health status, health care access, income, and employment.

Results: Our findings highlight overall increases in depression, anxiety, loneliness, and frustration among the sample of people with OUD; the study also observed decreases in financial stability. Significant differences between groups indicated a greater financial burden among racial-ethnic minorities; this subgroup also reported greater direct adverse effects of COVID-19, including being more concerned about contracting COVID-19, not being able to get a COVID-19 test, and knowing someone who had died from COVID-19. A greater proportion of Whites indicated increases in alcohol consumption and non-prescription drug use than did racial-ethnic minorities.

Conclusions: Treatment providers must be vigilant in managing direct and indirect outcomes of COVID-19 among people with OUD. Findings highlight the need to develop culturally competent, differentiated interventions in partnership with community-based organizations to meet the unique challenges that the COVID-19 pandemic presents for people in treatment for OUD.

1. Introduction

The novel SARS-CoV-2 (COVID-19) virus was first identified in the United States in the early months of 2020, spreading worldwide as a pandemic (Centers for Disease Control and Prevention [CDC], 2020a). Within 6 months, doctors and scientists had identified more than 6.8 million COVID-19 cases across the United States, resulting in nearly

200,000 deaths (CDC, 2020a). A majority of cases occurred in densely populated areas, though some populations with limited access to testing and treatment infrastructure are at particularly elevated risk of becoming infected. Particular subgroups of the population who need to take extra precautions for the prevention of COVID-19 (e.g., older adults, racial-ethnic minorities, homeless; CDC, 2020f) parallel the subgroups of individuals who have disproportionate rates of opioid

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overdose deaths (Wilson et al., 2020). The infrastructure of the health care system in the United States to address the COVID-19 pandemic (O'Reilly-Shah et al., 2020), amid a co-occurring opioid epidemic, places individuals with opioid use disorder (OUD) at increased risk for adverse consequences, such as financial stress, mental illness, and drug- and sex-related risk behaviors (Kar et al., 2020). While evidence-based mitigation and containment strategies have curbed COVID-19 in some areas when fully implemented (CDC, 2020c), they have also exacerbated health disparities for marginalized groups, including people with opioid use disorder (OUD) (O'Reilly-Shah et al., 2020).

People with OUD are uniquely vulnerable to acquiring COVID-19 because of comorbid medical and psychiatric conditions, poorer health literacy, and stigma (Dunlop et al., 2020; National Institute on Drug Abuse, 2018). Comorbid chronic lung disease may put individuals using opioids at elevated risk for severe complications from COVID-19, including hospitalization and death (National Institute on Drug Abuse, 2017). Compared to the general U.S. population, people with OUD have decreased access to health care, increased housing insecurity (Chatterjee et al., 2018), and higher rates of incarceration (U.S. Department of Justice, 2017), which cumulatively increase vulnerability for COVID-19 and pose challenges for accessing testing and care (Kar et al., 2020). Moreover, individuals' social and economic circumstances are likely to impact stigma and access to health care, limiting infectious disease testing (Hoyt et al., 2012) and substance use treatment access and utilization (Stringer & Baker, 2015).

As COVID-19 cases continued to increase across the country, available data indicated racial-ethnic disparities across multiple states (CDC, 2020b). Long-standing systemic health and social inequities have put members of racial-ethnic minority groups, including non-Hispanic Black persons, Hispanics, and Latinx, and American Indians/Alaska Natives, in a position to be more likely to acquire COVID-19 and experience poorer quality of life outcomes, regardless of age (CDC, 2020d). This disproportionate impact from COVID-19 on minorities mirrors disparities that have been well characterized in other disease processes that pre-date the pandemic. Given intersectional risks for COVID-19 and OUD among racial-ethnic minorities (e.g., socioeconomic conditions; CDC, 2020b, 2020e, 2020f; Janevic et al., 2017), existing health disparities are likely to be exacerbated among racial-ethnic minority individuals with OUD.

Characterizing the intersectional impacts of COVID-19 and OUD among racial-ethnic minorities is crucial to understanding the direct (e.g., COVID-19 diagnosis, knowing someone who died from COVID-19) and indirect (e.g., substance use behaviors, mental health issues, financial stress) effects of this pandemic and the COVID-19 responses. Research has documented changes in access to treatment, substance use, mental health, and overdose rates among substance users in recovery (National Institute on Drug Abuse, 2020); however, a gap in published studies focuses on COVID-19 impacts among people in treatment specifically for OUD. Therefore, we sought to fill knowledge gaps on the impacts of COVID-19 by surveying people in treatment for OUD receiving medication for opioid use disorder (MOUD). Findings will help to inform the development of targeted strategies to help people with OUD successfully navigate the COVID-19 pandemic and mitigate the deleterious direct and indirect effects of COVID-19 on their health.

2. Materials and methods

2.1. Participants

The study drew its sample from a parent study that recruited 234 patients from a methadone clinic to assess their preference for various HIV prevention strategies, as described in a previous study (Shrestha et al., 2020). Individuals were eligible for the parent study if they were: a) 18 years or older; b) self-reported HIV-uninfected or had unknown HIV status; c) reported drug- or sex-related HIV risk behaviors in the past 6 months; d) met Diagnostic and Statistical Manual of Mental Disorders (DSM-5) criteria for OUD; e) receiving MOUD (i.e., methadone); and f)

able to understand, speak, and read English.

2.2. Study setting and procedures

The study recruited participants from Connecticut's largest addiction treatment setting (APT Foundation, Inc.), which provides MOUD and behavioral health care for people with a wide range of substance use disorders. The parent study recruited participants using clinic-based advertisements and fliers, word-of-mouth, and direct referral from counselors.

After the onset of the COVID-19 pandemic, trained research assistants contacted participants from the parent study and asked them if they would be willing to participate in the follow-up survey via telephone to examine the impact of the COVID-19 pandemic. For the current study, we contacted all parent study participants from May 7 through September 18, 2020, to offer participation in a brief telephone survey to understand the impact of COVID-19 on their general well-being, sexual health, substance use, mental health, and financial status. The study gave all consenting participants \$10 (via a gift card) for their participation in the survey. The Institutional Review Board at the University of Connecticut and the board at the APT Foundation, Inc. approved the study protocol.

2.3. Measures

This study assessed participants' social, demographic, and health characteristics from the parent study, including age, sex, sexual orientation, ethnicity, marital status, educational status, employment status, annual income, housing status, and current methadone dose.

For the current study, we measured COVID-19-related impacts on health behaviors and other indices of social, physical, and mental well-being, including sexual health behaviors, substance use behaviors, mental health status, health care access, income, and employment. The study measured sexual hygiene by asking if participants "washed up before/after having sex." The study asked participants to indicate whether they experienced changes in these outcomes (indicating "increase," "decrease," or "no change") from the beginning of the COVID-19 pandemic to the present day. Participants also reported on awareness of COVID-19 exposure and any experiences with COVID-19 testing. If applicable, those who had been tested were asked to indicate their test result and level of medical treatment received. Tables 1, 2, 3, and 4 provide an overview of the scope of questions asked in the survey.

2.4. Data analysis

The study calculated COVID-19-related impacts as proportions (n and percentages) for the total sample and stratified by racial-ethnic minority subgroups. Based on our sample characteristics, we condensed the racial-ethnic identities from four endorsed categories (White, African American or Black, Hispanic or Latinx, or other) into two subgroups; nonminority (White) and racial-ethnic minority (African American, Hispanic or Latinx, and other). The study assessed differences in COVID-19 impacts by race/ethnicity (White or racial-ethnic minority group) using Chi-square tests. We reported Chi-square values with associated *p*-values; we set the alpha level for statistical significance at *p* < 0.05. Study staff performed all analyses using IBM SPSS version 25 (IBM Corporation, 2017).

3. Results

3.1. Participant characteristics

Among 234 participants, 96 repeatedly did not answer when called 5 times; 15 did not have a working phone number; 7 participants declined to participate; 3 were no longer in OUD treatment; and 3 participants were either incarcerated, hospitalized, or deceased, resulting in a final

Table 1
COVID-19-related measures (N = 110).

Variables	Total (N = 110)		White (n = 66)		Racial-ethnic minority (n = 44)		χ^2	p-value
	n	%	n	%	n	%		
Heard of COVID-19								
No	2	(1.8)	1	(1.5)	1	(2.3)	0.085	0.771
Yes	108	(98.2)	65	(98.5)	43	(97.7)		
Been in close contact with someone with COVID-19								
No	91	(82.7)	52	(78.8)	39	(88.6)	1.792	0.181
Yes	19	(17.3)	14	(21.2)	5	(11.4)		
COVID-19 symptoms								
No symptoms	12	(10.9)	8	(12.1)	4	(9.1)	0.249	0.617
Some symptoms	98	(89.1)	58	(87.9)	40	(90.9)		
Tested for COVID-19								
No, have not tried to get tested	69	(62.7)	46	(69.7)	23	(53.5)	10.422	0.034*
No, tried to get tested but could not get a test	10	(9.1)	2	(3.0)	8	(18.2)		
Yes, tested and the result was negative	19	(17.3)	9	(13.6)	10	(22.7)		
Yes, tested and the result was positive	5	(4.5)	4	(6.1)	1	(2.3)		
Yes, tested and awaiting result	7	(6.4)	5	(7.6)	2	(4.5)		
Receive any treatment, if tested positive for COVID-19								
No	1	(20.0)	1	(23.0)	0	(0.0)	0.313	0.576
Yes	4	(80.0)	3	(75.0)	1	(100.0)		
Hospitalized, if tested positive for COVID-19								
No	1	(20.0)	1	(23.0)	0	(0.0)	0.313	0.576
Yes	4	(80.0)	3	(75.0)	1	(100.0)		
Know someone who tested positive for COVID-19								
No	53	(48.2)	32	(48.5)	21	(47.7)	0.006	0.938
Yes	57	(51.8)	34	(51.5)	23	(52.3)		
Know someone who died of COVID-19								
No	76	(69.1)	51	(77.3)	25	(56.8)	5.3172	0.023*
Yes	34	(30.9)	15	(22.7)	19	(43.2)		
Concerned about catching COVID-19								
Not concerned at all	10	(9.1)	7	(10.6)	3	(6.8)	11.230	0.024*
A little concerned	19	(17.3)	15	(22.7)	4	(9.1)		
Moderately concerned	32	(29.1)	22	(33.3)	10	(22.7)		
Very concerned	30	(27.3)	16	(24.2)	14	(31.8)		
Extremely concerned	19	(17.3)	6	(9.1)	13	(29.5)		
Day-to-day life impacted by COVID-19								
Not at all	4	(3.6)	2	(3.0)	2	(4.5)	2.629	0.622
A little	23	(20.9)	15	(22.7)	8	(18.2)		
Much	18	(16.4)	12	(18.2)	6	(12.6)		
Very much	36	(32.7)	18	(27.3)	18	(40.9)		
Extremely	29	(26.4)	19	(28.8)	10	(22.7)		
Practicing social distancing to prevent the spread of COVID-19								
All of the time	29	(26.4)	15	(22.7)	14	(31.8)	2.493	0.477
Most of the time	62	(56.4)	37	(56.1)	25	(56.8)		
Some of the time	13	(11.8)	10	(15.2)	3	(6.8)		
None of the time	6	(5.5)	4	(6.1)	2	(4.5)		
Ability to stay at home to prevent the spread of COVID-19								
No	44	(40.0)	31	(47.0)	13	(70.5)	3.340	0.068
Yes	66	(60.0)	35	(53.0)	31	(29.5)		

 χ^2 Pearson Chi Squared.* $p < 0.05$ asymptotic (2-sided) significance.

analytic sample of 110. Participants' mean age was 44.7 years (SD = 10.6), and the mean daily methadone dose was 81.36 mg (SD = 28.1). Most participants were high school graduates (76%), heterosexual (76%), primarily English-speaking (96%), had an annual income of less than \$10,000 (71%), and reported being currently married or living with a partner (74%). Women represented more than half (56%) of the sample; 58% of the sample met criteria for alcohol use disorder (AUD), and 37% reported being homeless. The majority of participants identified as White (60%), with approximately a quarter identifying as Black or African American (24%), 15% identifying as Hispanic/Latinx, and 2% other.

3.2. COVID-19 characteristics

Nearly all participants (98%) reported having heard of COVID-19 (Table 1). Seventeen percent reported being in close contact with someone diagnosed with COVID-19, and 52% reported knowing someone diagnosed with COVID-19. More than half (59%) of the sample indicated COVID-19 impacted their day-to-day life, "very much" to "extremely." A sum of 83% of participants reported social distancing most of the time, if not all of the time, to prevent the spread of COVID-19. Only 60% reported being able to stay home regularly to prevent the spread of COVID-19; others reported being unable to afford to miss work (18%), having to care for family members (9%), not believing staying at home is effective at preventing the spread of COVID-19 (5%), being an

Table 2
Sexual health and substance use behaviors (N = 110).

Variables	Total (N = 110)		White (n = 66)		Racial-ethnic minority (n = 44)		X ²	p-value
	n	%	n	%	n	%		
Number of sexual partners								
Decreased	21	(19.1)	10	(15.2)	11	(25.0)	3.326	0.190
Not changed	88	(80.0)	56	(84.8)	32	(72.7)		
Increased	1	(0.9)	0	(0.0)	1	(2.3)		
Sex without using a condom								
Decreased	14	(12.7)	8	(12.1)	6	(13.6)	2.011	0.366
Not changed	90	(81.8)	56	(84.8)	35	(77.3)		
Increased	6	(5.5)	2	(3.0)	4	(9.1)		
Transactional sex								
Decreased	11	(10.0)	6	(9.1)	5	(11.4)	0.152	0.697
Not changed	99	(90.0)	60	(90.9)	39	(88.6)		
Increased	0	(0.0)	0	(0.0)	0	(0.0)		
Used drugs or alcohol before sex								
Decreased	15	(13.6)	5	(7.6)	10	(22.7)	5.153	0.076
Not changed	92	(83.6)	59	(89.4)	33	(75.0)		
Increased	3	(2.7)	2	(3.0)	1	(2.3)		
Engage in video dates or sexting								
Decreased	8	(7.3)	2	(3.0)	6	(13.6)	5.518	0.063
Not changed	99	(90.0)	63	(95.5)	36	(81.8)		
Increased	3	(2.7)	1	(1.5)	2	(4.5)		
Wash up before and after sex								
Decreased	6	(5.5)	2	(3.0)	4	(9.1)	1.882	0.390
Not changed	86	(78.2)	55	(80.3)	33	(75.0)		
Increased	18	(16.4)	11	(16.7)	7	(15.9)		
Alcohol consumption								
Decreased	11	(10.0)	2	(3.0)	9	(20.5)	9.462	0.009*
Not changed	84	(76.4)	53	(80.3)	31	(70.5)		
Increased	15	(13.6)	11	(16.7)	4	(9.1)		
Use of non-prescription drugs								
Decreased	13	(11.8)	3	(4.5)	10	(22.7)	8.377	0.015*
Not changed	83	(75.5)	54	(81.8)	29	(65.9)		
Increased	14	(12.7)	9	(13.6)	5	(11.4)		
Stock up on non-prescription drugs								
Decreased	12	(10.9)	3	(4.5)	9	(20.5)	9.479	0.009*
Not changed	90	(81.8)	60	(90.9)	30	(68.2)		
Increased	8	(7.3)	3	(4.5)	5	(11.4)		
Stock up on injection equipment supplies								
Decreased	10	(9.1)	4	(6.1)	6	(13.6)	2.004	0.367
Not changed	91	(82.7)	57	(86.4)	34	(77.3)		
Increased	9	(8.2)	5	(7.6)	4	(9.1)		
Prepare my own drugs								
Decreased	8	(7.3)	2	(3.0)	6	(13.6)	10.042	0.007*
Not changed	96	(87.3)	63	(95.5)	33	(75.0)		
Increased	6	(5.5)	1	(1.5)	5	(11.4)		
Sharing of drugs or supplies with others								
Decreased	14	(12.7)	5	(7.6)	9	(20.5)	3.942	0.047*
Not changed	96	(87.3)	61	(92.4)	35	(79.5)		
Increased	0	(0.0)	0	(0.0)	0	(0.0)		
Clean surfaces where prepare drugs (before & after use)								
Decreased	5	(4.5)	1	(1.5)	4	(9.1)	3.983	0.137
Not changed	85	(77.3)	54	(81.8)	31	(70.5)		
Increased	20	(18.2)	11	(16.7)	9	(20.5)		
Wash up before and after drug preparation and use								
Decreased	4	(3.6)	1	(1.5)	3	(6.8)	4.692	0.096
Not changed	88	(80.0)	57	(86.4)	31	(70.5)		
Increased	18	(16.4)	8	(12.1)	10	(22.7)		
Keep supply of Narcan in case of overdose								
Decreased	6	(5.5)	3	(4.5)	3	(6.8)	2.381	0.304
Not changed	90	(81.8)	57	(86.4)	33	(75.0)		
Increased	14	(12.7)	6	(9.1)	8	(18.2)		
Experienced overdose since the start of the pandemic								
No	105	(95.5)	62	(93.9)	43	(97.7)	0.873	0.350
Yes	5	(4.4)	4	(6.1)	1	(2.3)		

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Table 2 (continued)

Variables	Total (N = 110)		White (n = 66)		Racial-ethnic minority (n = 44)		X ²	p-value
	n	%	n	%	n	%		
Had trouble getting to the methadone clinic for methadone dose because of COVID-19								
No	28	(25.5)	15	(22.7)	13	(29.5)	3.706	0.295
Yes	8	(7.3)	7	(10.6)	1	(2.3)		
Take-home bottles	73	(66.4)	43	(65.2)	30	(68.2)		
Not on methadone	1	(0.9)	1	(1.5)	0	(0.0)		

X² Pearson Chi Squared.

* *p* < 0.05 asymptotic (2-sided) significance.

Table 3

Mental health impact (N = 110).

Variables	Total (N = 110)		White (n = 66)		Racial-ethnic minority (n = 44)		X ²	p-value
	n	(%)	n	(%)	n	(%)		
Frustration or boredom								
Decreased	2	(1.8)	1	(1.5)	1	(2.3)	1.641	0.440
Not changed	27	(24.5)	19	(28.8)	8	(18.2)		
Increased	81	(73.6)	46	(69.7)	35	(79.5)		
Anxiety								
Decreased	2	(1.8)	1	(1.5)	1	(2.3)	0.091	0.956
Not changed	23	(20.9)	14	(21.3)	9	(20.5)		
Increased	85	(77.3)	51	(77.3)	34	(77.3)		
Depression								
Decreased	2	(1.8)	1	(1.5)	1	(2.3)	3.345	0.188
Not changed	36	(32.7)	26	(39.4)	10	(22.7)		
Increased	72	(65.5)	39	(59.1)	33	(75.0)		
Quality of sleep								
Decreased	47	(42.7)	26	(39.4)	21	(47.7)	0.914	0.633
Not changed	51	(46.4)	33	(50.0)	18	(40.9)		
Increased	12	(10.9)	7	(10.6)	5	(11.4)		
Loneliness								
Decreased	4	(3.6)	2	(3.0)	2	(4.5)	0.490	0.787
Not changed	54	(49.1)	34	(51.5)	20	(45.5)		
Increased	52	(47.3)	30	(45.5)	22	(50.0)		
Social support from family, friends, partners								
Decreased	30	(27.3)	15	(22.7)	15	(34.1)	6.583	0.037*
Not changed	61	(55.5)	43	(65.2)	18	(40.9)		
Increased	19	(17.3)	8	(12.1)	11	(25.0)		
Physical abuse from partner								
Decreased	6	(5.5)	1	(1.5)	5	(11.4)	5.503	0.063
Not changed	96	(87.3)	61	(92.4)	35	(79.5)		
Increased	8	(7.3)	4	(6.1)	4	(9.1)		
Sexual abuse from partner								
Decreased	4	(3.6)	1	(1.5)	3	(6.8)	3.126	0.209
Not changed	103	(93.6)	64	(97.0)	39	(88.6)		
Increased	3	(2.7)	1	(1.5)	2	(4.5)		
Emotional abuse from partner								
Decreased	7	(6.4)	2	(3.0)	5	(11.4)	3.103	0.212
Not changed	81	(73.6)	50	(75.8)	31	(70.5)		
Increased	22	(20.0)	14	(21.2)	8	(18.2)		
Financial abuse from partner								
Decreased	6	(5.5)	1	(1.5)	5	(11.4)	4.972	0.083
Not changed	93	(84.5)	58	(87.9)	35	(79.5)		
Increased	11	(10.0)	7	(10.6)	4	(9.1)		

X² Pearson Chi Squared.

* *p* < 0.05 asymptotic (2-sided) significance

essential worker (6%), and requiring regular visits to drug treatment centers (2%). Two-thirds of the sample (66%) reported receiving methadone in multi-day take-home bottles because of policies that their clinic had implemented. Eight participants (7%) reported having trouble getting to their MOUD clinic at all, most of whom were White (*n* = 7).

Racial-ethnic minority participants reported greater concerns about COVID-19 (30%) than did White participants (9%, *p* = 0.024). One-third

of the sample (31%) knew someone who had died from COVID-19, with racial-ethnic minority participants being more likely to have known someone who died from COVID-19 (43%) compared to White participants (23%, *p* = 0.023). Racial-ethnic minority participants also reported more difficulty obtaining a COVID-19 test than White participants (18% vs. 3%; *p* = 0.034).

Table 4
Economic impact (N = 110).

Variables	Total (N = 110)		White (n = 66)		Racial-ethnic Minority (n = 44)		χ^2	p-value
	n	(%)	n	(%)	n	(%)		
Change in employment								
Job has not changed/still not working	79	(71.8)	42	(63.6)	37	(84.1)	6.343	0.175
Now working from home	13	(11.8)	9	(13.6)	4	(9.1)		
Have lost my job	1	(0.9)	1	(1.5)	0	(0.0)		
Have added a job	1	(0.9)	1	(1.5)	0	(0.0)		
Other	16	(14.5)	13	(19.7)	3	(6.8)		
Access to resources (e.g., food, money)								
Decreased	62	(56.4)	37	(56.1)	25	(56.8)	0.188	0.943
Not changed	42	(38.2)	25	(37.9)	17	(38.5)		
Increased	6	(5.5)	4	(6.1)	2	(4.5)		
Number of paid work hours								
Decreased	35	(31.8)	23	(34.8)	12	(27.3)	1.467	0.480
Not changed	74	(67.3)	42	(63.6)	22	(72.7)		
Increased	1	(0.9)	1	(1.5)	0	(0.0)		
Income								
Decreased	46	(41.8)	31	(47.0)	15	(34.1)	3.566	0.168
Not changed	62	(56.4)	33	(50.0)	29	(65.9)		
Increased	2	(1.8)	2	(3.0)	0	(0.0)		
Need to financially support others who have lost jobs								
Decreased	7	(6.4)	1	(1.5)	6	(13.6)	13.602	0.001*
Not changed	80	(72.7)	56	(84.8)	24	(54.5)		
Increased	23	(20.9)	9	(13.6)	14	(31.8)		
Difficulty buying food								
Decreased	8	(7.3)	3	(4.5)	5	(11.4)	3.329	0.189
Not changed	55	(50.0)	37	(56.1)	18	(40.9)		
Increased	47	(42.7)	26	(39.4)	21	(47.7)		
Difficulty paying rent								
Decreased	5	(4.5)	2	(3.0)	3	(6.8)	3.990	0.136
Not changed	72	(65.5)	48	(72.7)	24	(54.5)		
Increased	33	(30.0)	16	(24.2)	17	(38.6)		
Access to transportation								
Decreased	21	(19.1)	14	(21.2)	7	(15.9)	0.615	0.735
Not changed	73	(66.4)	42	(63.6)	31	(70.5)		
Increased	16	(14.5)	10	(15.2)	6	(13.6)		
Became homeless/moved in with a friend								
No	99	(90.0)	60	(90.9)	39	(88.6)	0.152	0.697
Yes	11	(10.0)	6	(9.1)	5	(11.4)		
Loss of health insurance								
No	106	(96.4)	64	(97.0)	42	(95.5)	0.173	0.677
Yes	4	(3.6)	2	(3.0)	2	(4.5)		

 χ^2 Pearson Chi Squared.* $p < 0.05$ asymptotic (2-sided) significance.

3.3. COVID-19 impacts on sexual health and substance use behaviors

Most participants reported no change in sexual health behaviors, some reported decreases, and very few reported an increase in sex-related behaviors due to COVID-19 (Table 2). The reported number of sexual partners did not change for 80% of the sample, 82% reported no change in condomless sex, and 90% reported no changes in exchanging sex for money or drugs (transactional sex). Decreases in number of sexual partners were reported by 19% of the sample, 13% reported a decrease in condomless sex, and 10% reported a decrease in transactional sex. Reported drug or alcohol use before sex decreased for 14% of the sample. Sexual hygiene increased for 16% of the sample. The study observed no statistically significant differences in sexual risk behaviors between White and racial-ethnic minorities.

Participants self-reported moderate changes in substance use behaviors during the pandemic. Reported changes in stocking up on injection equipment were moderate (an overall 7% increase and 9% decrease), as 82% reported no changes in this behavior. A small proportion of participants reported an increase in cleaning surfaces where

drugs are prepared (18%) and general hygiene (e.g., washing hands) before and after drug use (16%). Fourteen participants (14%) reported an increase in keeping a supply of naloxone ("Narcan") on hand in case of overdose, and five participants (4%) reported experiencing an overdose since the start of the COVID-19 pandemic. No participants reported an increase in sharing drugs or supplies with others since the onset of COVID-19, as the majority (87%) reported no change in this behavior.

Substance use behaviors differed by race/ethnicity. Racial-ethnic minority participants tended to report greater reductions in substance use behaviors since the onset of the COVID-19 pandemic relative to White participants. The study observed differences in alcohol consumption; 21% of racial-ethnic minorities reported a decrease in alcohol consumption, while 17% of the White subgroup identified increased alcohol consumption ($p = 0.006$). In terms of non-prescription drug use, 23% of the racial-ethnic minority subgroup reported a decrease in the use of non-prescription drugs, while 14% of White participants reported an increase in the use of non-prescription drugs ($p = 0.018$). Racial-ethnic minority participants reported a greater increase in preparing their drugs than White participants (12% vs. 2%, $p = 0.013$) and a

greater decrease in sharing drugs or supplies with others than White participants (21% vs. 8%, $p = 0.047$).

3.4. COVID-19 impacts on mental health

The study observed increased psychological distress due to the COVID-19 pandemic among participants (Table 3). Most participants reported increases in frustration or boredom (74%), anxiety (77%), depression (65%), and loneliness (47%). Forty-three percent of the sample reported decreased sleep quality, and 27% reported a decline in social support from family and/or friends. A higher proportion of racial-ethnic minority participants tended to report experiencing negative mental health effects of COVID-19 across all domains assessed (frustration or boredom, anxiety, depression, loneliness, sleep quality, and social support); however, the differences did not reach statistical significance. Participants also reported an increase in abuse from partners; 20% of participants reported increased emotional abuse, 7% reported increased physical abuse, 3% reported increased sexual abuse, and 10% reported an increase in financial abuse. A reported decrease in these four types of abuse (i.e., physical, sexual, emotional, and financial) tended to be more prevalent in the racial-ethnic minority participants, but did not reach statistical significance.

3.5. COVID-19 impacts on economics

Overall, most (57%) participants reported decreases in access to resources (e.g., food, money) during the pandemic (Table 4). Paid work hours decreased for 32% of the sample, and income decreased for 42%. Participants also reported difficulty buying food (43%) and paying rent (30%). One-fifth (19%) of the sample reported decreased access to transportation during the pandemic. Racial-ethnic minority participants were twice as likely as White participants to report increased need to provide financial support to family members who had lost their job due to COVID-19 (32% vs. 14%; $p = 0.001$).

4. Discussion

High rates of medical and psychiatric comorbidity and intersectional risk factors (e.g., socioeconomic status, low housing security) for COVID-19 place people with OUD at increased vulnerability for experiencing additional adverse effects of COVID-19 (CDC, 2020a; Kar et al., 2020; National Institute on Drug Abuse, 2018; Schimmel & Manini, 2020; Volkow, 2020). Because OUD affects racial-ethnic groups differently, we sought to investigate the economic, mental, and sexual health, and substance use implications of the COVID-19 pandemic for people with OUD in treatment, stratified by racial-ethnic characteristics. To our knowledge, this study is the first to assess the impact of COVID-19 on people in treatment for OUD. We observed a general decrease in the quality of mental health and financial stability and moderate increases in substance use among this sample of people with OUD. A greater proportion of White participants reported increased alcohol consumption and non-prescription drugs than did racial-ethnic minorities, whereas racial-ethnic minority participants bore a greater share of the adverse economic and direct impacts of COVID-19 than did Whites. Racial-ethnic minorities in the sample were more likely to report having taken on the responsibility of financially supporting loved ones during the pandemic, being unable to receive a COVID-19 test, knowing someone who had died of COVID-19, and being concerned about catching COVID-19 than White participants.

We observed a general decrease in social support from family, friends, and peers in our sample. These feelings of isolation and depression may trigger people with OUD to self-medicate with illicit substances to alleviate their negative feelings (Hyman et al., 2007; National Institute on Drug Abuse, 2020), and may be confounded by difficulty accessing methadone clinics, as some participants reported. Higher rates of depression are associated with greater health burdens

among racial-ethnic minorities (Bailey et al., 2019). In a population-based national sample, major depression was more prevalent in minority groups than in non-minority Americans (Dunlop et al., 2003). Amid an ongoing national opioid epidemic, the intersection of multiple stressors (e.g., job loss, financial burden, loss of routine, and disconnection from community resources and support systems) may predict increased mental health issues and substance use disorders among racial-ethnic minorities (Henry et al., 2020). The toll of the COVID-19 pandemic on mental health and financial stability for people with OUD is likely to increase relapse (National Institute on Drug Abuse, 2020; Henry et al., 2020; Alexander et al., 2020). Knowing that induced stress increases the likelihood of relapse for people in OUD treatment (Hyman et al., 2007), and considering the abrupt changes in clinic procedures (reduced counseling/prescription management), treatment providers, peers, and families should be hypervigilant of relapse possibility. While addiction treatment providers are mindful of the chronic risk of relapse, clinicians should consider lower thresholds of treating underlying depression and anxiety, given these circumstances.

Trends of emotional, physical, sexual, and financial abuse from partners remained unchanged for many participants in our sample; increases were observed for all forms of abuse among the racial-ethnic minority subgroup, although the study did see some decreases. The inconsistent trends on reported abuse are a concerning finding, as participants who are quarantining with a partner may be hesitant to report abuse (Felson et al., 2006). These findings may also be explained by a general higher prevalence of abuse among minority populations before the COVID-19 pandemic (CDC, 2011; Dakil et al., 2011) such that no changes in violence victimization may still reflect high rates of abuse. Our participants also noted an increase in a number of factors associated with perpetrating violence, including low self-esteem, depression, low income, unemployment, and heavy alcohol and drug use (CDC, 2020g). Decreased mental health, growing unemployment, increased alcohol use, and financial stress, in response to the COVID-19 pandemic, increases the risk for domestic violence (John Hopkins Medicine, 2020) among the general population. Our findings indicate a presence of these risk factors among people with OUD, pointing toward a need for advocacy and support for an integrated care model in OUD (National Institute of Mental Health, 2017), to reduce domestic violence implications from COVID-19. Addiction treatment settings play an essential role in reducing adverse consequences of increased substance abuse and domestic abuse by screening for mental and financial health issues, reviewing available prevention and referral options, integrating various health care services, and offering ongoing support.

Other novel findings from our study highlighted greater non-prescription drug and alcohol use among White participants than racial-ethnic minorities. The study observed significant differences in other drug-related risk behaviors by subgroup, such as not stocking up on non-prescription drugs, not sharing drugs or drug supplies, and preparing own drugs (as opposed to having someone else prepare drugs); indicating the racial-ethnic minority participants reported greater engagement in these harm reduction behaviors. These results suggest that racial-ethnic minority participants tended to be more aware of the risks of COVID-19 and the need to take greater precautions. While this is an encouraging observation, treatment providers should carefully monitor these behaviors, as the majority of participants reported no changes in their substance use behaviors. The unchanged state of risk behaviors (e.g., condomless sex, transactional sex, sharing injecting equipment) among our sample is concerning, given that participants may have been engaging in these behaviors prior and the continued risk-behaviors exacerbates the risk for COVID-19 and other infections (HIV/Hepatitis C/sexually transmitted infections) during this pandemic.

Before COVID-19, addiction treatment settings presented an important touchpoint and prime intervention opportunity to educate at-risk patients on HIV and relapse prevention measures, given the near-daily contact with treatment providers and counselors (Nyamathi et al., 2011). However, COVID-19 has impacted the way drug treatment

centers and methadone clinics operate by implementing multiday dosing (take-home bottles) to enable social distancing, meaning clinics are interfacing directly with patients less often (Substance Abuse and Mental Health Services Administration [SAMHSA], 2020); one-third of our sample reported transitioning to take-home bottles. This transition limits the ability to reach at-risk subpopulations that would be, under normal circumstances, more frequently engaged in treatment and prevention services (SAMHSA, 2020). An unintended consequence of COVID-19 safety protocols in drug treatment clinics (e.g., take-home medication, limited group therapy) is reduced contact with treatment providers for those who need support to navigate and maintain treatment protocols through the pandemic. This disconnect with treatment providers may decrease mental stability and increase stress among persons with OUD, thus increasing the risk for relapse and overdose among people with OUD, as opioid-related mortality rates during the COVID-19 pandemic have already increased across the United States (American Medical Association, 2020). Individuals need to receive accurate information on how to engage in effective COVID-19 preventive measures (Zhong et al., 2020); we may also need to modify our treatment approach to meet the needs of higher-risk groups—racial-ethnic minority groups—during and following the pandemic.

4.1. Limitations

Despite persistent outreach efforts to contact potential study participants, only 47% of eligible participants from the parent study participated in this study. While most of the characteristics of participants in our sample were well representative of similar research (Larochelle et al., 2018; Ling et al., 2020) (i.e. majority male, majority White, majority high school graduate), other participant characteristics are not entirely representative of the population of persons with OUD as a whole. For example, no participants in our sample were HIV+, while in a large cohort study (Richardson et al., 2021) of 1604 people in treatment for OUD, 43% were HIV+. Our study is limited in generalizability to subpopulations of persons with OUD. Sampling bias may be present, as willingness to engage in the study may indicate a higher level of functioning and willingness to engage in treatment/research among participants in our sample, compared to other patients in OUD treatment and/or people with OUD who are not in treatment. Additionally, the study included participants only if they could communicate sufficiently in English, contributing to additional sampling bias.

Our collapsing the measures may have caused a threat to the internal validity of the study. While necessary for the safe collection of data, the context of a phone-based interview may have resulted in reporting bias. Participants may have completed interviews while being in close physical proximity to family or partners, given 74% reported being married/living with a partner. Some underreporting of socially undesirable behaviors, such as sexual risk behavior and substance use, is likely, and participants may not have felt sufficiently safe to comfortably disclose domestic violence exposure in the presence of an abusive partner. Importantly, our study enrolled participants from May 7 to September 18, 2020, which may have influenced the study outcomes due to the dynamic nature of the COVID-19 surges and stages of quarantine. Nonetheless, efforts to understand these challenges within this highly vulnerable population are critical for addressing health disparities in response to the COVID-19 pandemic.

5. Conclusion

COVID-19 has disproportionately impacted certain racial-ethnic subgroups in the United States (CDC, 2020b). Disparities in access to health care, comorbid diseases, and mental health issues across race and ethnicity are likely to exacerbate the impact of COVID-19 on subpopulations of individuals with OUD, which highlights the need for culturally congruent outreach services. Results from this study indicated racial-ethnic minorities (African American/Black and Hispanic/Latinx)

in treatment for OUD bore greater economic and direct COVID-19 impacts during the pandemic than did White participants. However, greater proportions of White participants reported increases in alcohol and non-prescription drug use. We observed increased feelings of loneliness, depression, and anxiety among our sample; the study also observed decreases in economic/financial factors among the 110 participants. The mental and financial burden of COVID-19, observed among people with OUD, places these individuals at greater risk for relapse and overdose deaths amid an underlying opioid epidemic (American Medical Association, 2020; Henry et al., 2020). Treatment providers, researchers, and policymakers must consider structural (e.g., access/affordability of health care), interpersonal (e.g., stigma, abuse), and intrapersonal factors (e.g., depression, substance use) to prevent the wide-ranging effects of COVID-19 that may be pronounced among racial-ethnic subpopulations with OUD.

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Declaration of competing interest

The authors have no conflicts of interest to declare. Dr. Sheno's spouse worked for Merck pharmaceuticals 1997–2007 and retains company stock in his retirement account. There is no conflict of interest, but it is included for full disclosure.

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