

Published: October 31, 2023

Citation: Shaffer PM, Helm A, et al., 2023. Rapidly Adapting a Multicomponent Treatment for Persons Experiencing Chronic Homelessness with Comorbid Substance Use and Mental Health Disorders During the Coronavirus Disease 2019 Pandemic, *Medical Research Archives*, [online] 11(10). <https://doi.org/10.18103/mra.v11i10.4507>

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DOI

<https://doi.org/10.18103/mra.v11i10.4507>

ISSN: 2375-1924

RESEARCH ARTICLE

Rapidly Adapting a Multicomponent Treatment for Persons Experiencing Chronic Homelessness with Comorbid Substance Use and Mental Health Disorders During the Coronavirus Disease 2019 Pandemic

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ABSTRACT

Background: People with co-occurring substance use and mental health disorders (COD) who experience chronic homelessness often have difficulty engaging in treatment and support services. During the Coronavirus Disease 2019 (COVID-19) pandemic this problem was compounded by community agencies reducing or eliminating in-person care to minimize transmission of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). This study examined the rapid adaptations that were made during COVID-19 to a community-based multicomponent intervention, Maintaining Independence and Sobriety Through Systems Integration, Outreach and Networking (MISSION), and how these changes impacted engagement in treatment and fidelity to the intervention prior to and during the COVID-19 pandemic.

Methods: Guided by the Model for Adaptation Design and Impact (MADI) framework, this mixed-methods study (1) qualitatively examines the nature of the rapid adaptations made to the MISSION model with $n=4$ MISSION clinical program staff and (2) quantitatively examines patterns of engagement and fidelity to the MISSION model prior to and during the pandemic among $n=109$ people with COD who are experiencing chronic homelessness in an urban region of Massachusetts.

Results: In consultation with the MISSION developers, clinical staff made rapid innovative adaptations to MISSION. These changes, identified through the qualitative interviews, included developing safe in-person session procedures (e.g., shortening sessions, adapting group sessions to individual sessions) and strategies to engage incarcerated individuals to provide continuity of care (e.g., mailing letters and coordinating with jail staff). Despite the adaptations, adherence to the MISSION model remained consistent during COVID-19 and compared to pre-COVID-19. However, there was more adherence to the structured components of care compared to the unstructured components of care during the pandemic. Interestingly, linkages to other needed treatments and community supports increased by 522% despite the pandemic closures.

Conclusions: This mixed-methods study demonstrated that a community-based multicomponent intervention for people experiencing chronic homelessness with COD can be adapted rapidly during a pandemic to help maintain COD treatment and with good fidelity, and that the MADI framework can help document those changes. Thus, these findings provide treatment settings with helpful guidance for community-based COD interventions and public health emergency preparedness.

Keywords: COVID-19, mental health, addiction, substance use disorders, co-occurring disorders, homeless, pandemic, pandemic preparedness, public health response, wraparound interventions

Introduction

The Coronavirus Disease 2019 (COVID-19) pandemic disproportionately impacted marginalized groups, including individuals experiencing homelessness who evidence high prevalence of chronic health conditions^{1,2}, such as co-occurring mental health and substance use disorders (COD).³⁻⁷ Rates of COD among individuals experiencing homelessness are as high as 80% and this population requires ongoing support for multiple treatment, housing, and social determinants of health (SDOH) needs.^{7,8} During the COVID-19 pandemic, it was critical to provide continuity of care; treatment closures were occurring, and consistent care was critical to reduce disease incidence, related mortality, and manage chronic diseases among this vulnerable population. However, few studies and guidelines were available to inform potential changes to community-based approaches for hard-to-engage populations,⁹ and most suggestions included a rapid shift to telehealth, which raises equity issues as many individuals experiencing chronic homelessness do not have equal access to communication technology compared to those who are stably housed.¹⁰⁻¹² During the COVID-19 pandemic, there was a need to develop innovative care delivery solutions for individuals experiencing homelessness with COD. COVID-19 presented numerous challenges related to maintaining safe in-person treatment given the absence of public health preparedness and evolving protocols. However, adaptations to clinical interventions needed to be executed with considerable caution to maintain the integrity of the evidence-based practice and fidelity while maintaining treatment efficacy.¹³⁻¹⁵

One type of community-based multicomponent intervention for individuals experiencing homelessness with a COD is Maintaining Independence and Sobriety Through Systems Integration, Outreach and Networking (MISSION). A multidisciplinary team delivers MISSION and offers housing support, group therapy to address COD, peer support, and community outreach to link people to services to address their SDOH needs along with warm handoffs (see details of MISSION in the methods section). Despite MISSION's efficacy outside of a pandemic,¹⁶⁻²⁷ the clinical staff needed to make rapid adaptations at the onset of the pandemic, while balancing the delivery of services to maintain fidelity to the original model as much as possible.

The purpose of this study is to examine how adaptations were made to service delivery as intended during the COVID-19 pandemic. Researchers have developed implementation

science frameworks to systematically examine the nature of adaptations to healthcare interventions and their impacts. Therefore, to fill this gap, we retrospectively examined adaptations made to a community-based COD treatment intervention during the COVID-19 pandemic and assessed the impact of these changes. The specific aims of this study were to: (1) describe MISSION adaptations; (2) compare engagement rates in MISSION prior to and after implementation of adaptations; and (3) examine the fidelity (i.e., adherence) to the MISSION model prior to and after implementation of adaptations. The Model Adaptation Design and Impact (MADI) framework was the conceptual model that guided the aims of this study. The MADI framework refined and synthesized several existing implementation science adaptation and outcome frameworks (e.g., the Framework for Reporting Adaptations and Modifications-Enhanced (FRAME)).^{28,29}

Methods

This study employs mixed methods with a sequential design. First, we used qualitative evidence to better understand the nature of these adaptations via a semi-structured focus group with clinical staff delivering MISSION to individuals who were chronically homeless.³⁰ Second, we used a pre-post single group design to compare engagement in care and fidelity to the MISSION model. This strategy permits a better understanding of the impact of adaptations to the MISSION model. This mixed methods design is advantageous as changes occurred rapidly at the start of the pandemic with little time to deliberate, and both investigative methods are essential to achieve the aims of this study. The study took place in an urban city in western Massachusetts, which is part of a region that is ranked as having one of the largest homeless populations in the United States (U.S.).³¹ While there was a discussion of the study and informed consent with potential clients, we did not obtain written informed consent because the Human Subjects Protection review board of the University of Massachusetts Chan Medical School determined that the project was program evaluation and thus exempt from the requirements of informed consent.

INTERVENTION

MISSION is a 12-month multicomponent wraparound intervention to address the needs of individuals experiencing homelessness with a COD. Regarding program structure and format, a case manager and peer support specialist (i.e., an individual with lived COD recovery experience), deliver MISSION jointly. Each MISSION clinical team carry caseloads of approximately 20 clients. MISSION service intensity includes 4 hours of

individual and/or group sessions per week in the first 4 months (phase 1), that tapers to 2 hours of individual and/or group sessions every other week during months 5 through 8 (phase 2), followed by an individual and/or group session once per month (approximately 1-hour total) during months 9 through 12 (phase 3).

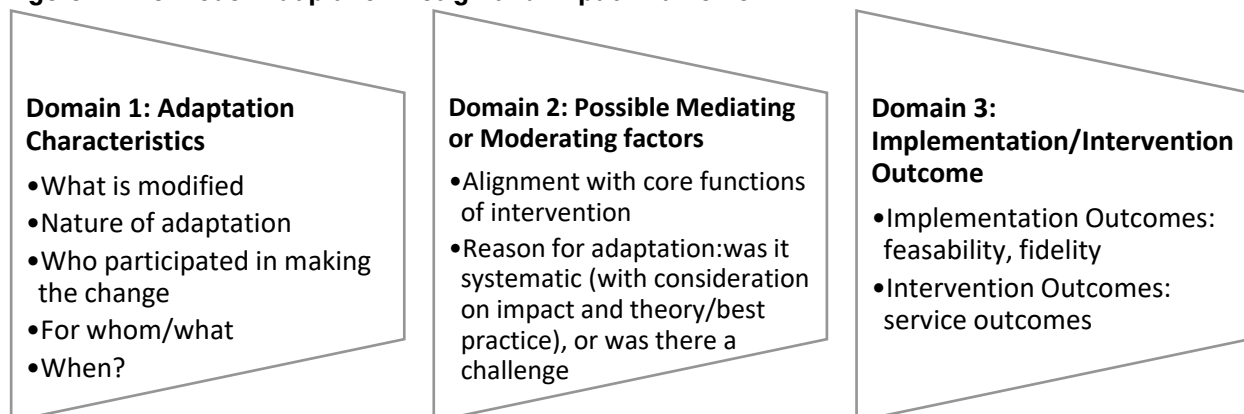
The MISSION curriculum systematically combines five evidence-based intervention components. The first component, Critical Time Intervention (CTI) case management,³² offers intensive community-based services to help the client establish firm linkages to behavioral health and other prosocial supports in the community via assertive outreach, care coordination, and collaborative treatment planning. The second treatment component is Dual Recovery Therapy (DRT),²² which includes 13 structured sessions for clients to develop skills and to simultaneously address mental health and substance use symptoms and related problematic behaviors. The third treatment component is Peer Support,^{33,34} which includes both unstructured community visits as well as 11 structured recovery-based sessions (e.g., a session reinforcing the importance of medication and maintaining a medication schedule in the recovery process) that were designed to complement DRT and to facilitate and support recovery in the community. The fourth component of MISSION is vocational and educational support, which includes assessing clients' needs and assisting them in finding and maintaining employment as well as achieving educational goals. The fifth component of MISSION is trauma-informed care. While MISSION is not a Post-Traumatic Stress Disorder and Addiction Treatment intervention, MISSION teams are trained to understand, recognize, and respond to the effects of trauma, and refer clients to other treatment providers who offer evidence-based trauma treatment. Of note, prior to the COVID-19 pandemic, MISSION teams would routinely meet with clients in-person for structured

group sessions and CTI indoors, in the community in a variety of settings, or in their vehicles as they were transporting the client, and these in-person contacts were intended to build relationships, rapport, and a therapeutic alliance.

THE MODEL ADAPTATION DESIGN AND IMPACT FRAMEWORK

The MADi framework (see Figure 1) guided both the qualitative portion of this study to assess adaptation characteristics and the quantitative pre-post portion of this study to examine the impacts of adaptations. To retrospectively identify and describe MISSION adaptations in response to the COVID-19 pandemic, we gathered qualitative data from all MISSION clinical staff via a single focus group ($n=4$). The complex and multi-faceted nature of adaptations calls for the use of a comprehensive adaptation framework to promote systematic, consistent adaptation descriptions and reporting. Although several adaptation frameworks exist, most frameworks guide plans for adaptations, rather than retrospective assessments of adaptations already made in practice. The MADi framework includes important adaptation constructs (i.e., what was adapted, the nature of adaptations, who was involved in adaptation decision-making, for whom/what the adaptation was made, and when the adaptation occurred) and the impact on fidelity and service use. An important feature of MADi is that it can be used retrospectively to develop research questions and evaluate the impact of adaptations (i.e., pre-post comparisons). When applied retrospectively, MADi can direct discussions of adaptations and evaluate the impact of these adaptations. As such, the current study uses MADi to retrospectively identify and describe characteristics of adaptations to MISSION and its impacts on an extremely hard to engage population of persons experiencing chronic homelessness with a COD.

Figure 1. The Model Adaptation Design and Impact Framework



PARTICIPANTS

MISSION Clinical Staff. Four clinical staff provided MISSION services to the 109 clients enrolled in this study (i.e., two case managers and two peer support specialists). All clinical staff participated in a qualitative semi-structured focus group with MISSION developers and UMass Chan research staff to document and describe the rapid adaptations made at the onset of the COVID-19 pandemic (i.e., within the first month).

Clients Served. The sample inclusion criteria were: (1) individuals experiencing chronic homelessness (based on the Housing and Urban development definition: an individual with a disability who has been continuously homeless for 1 year or more or has experienced at least four episodes of homelessness in the last 3 years where the combined length of time homeless in those occasions is at least 12 months);³⁵ (2) individuals who were 18 years of age or older; (3) individuals who met DSM-5 criteria for one or more substance use disorders; and (4) individuals who met DSM-5 criteria for one or more mental health disorders without the presence of acute psychotic symptoms or instability (i.e., schizophrenia, bipolar I disorder with psychotic features). Eligible individuals were offered twelve months of MISSION treatment and services. The final sample was 109 clients who evidenced chronic homelessness with COD.

Semi-structured Qualitative Guide. The current study uses MADi to retrospectively identify and describe characteristics of adaptations to MISSION. The evaluator for this study and two research assistants led the focus group using a semi-structured interview guide. The guide aimed to determine all adaptations that were made to MISSION at the onset of the COVID-19 pandemic, the nature of the adaptation, the exact timing of the change, who was part of the decision-making process, and any other details related to developing and implementing the change. We used the MADi framework to guide the development and application of an a priori codebook.

MISSION Fidelity Measure, Engagement tracking, and Linkage to Care Tracking. The MISSION Fidelity Measure tracks the core components of the MISSION treatment model, including CTI, DRT, peer support groups, vocational/educational supports, and trauma-informed care. The fidelity index consists of 78 items assessing the presence or absence of certain activities within MISSION. Taking the responses from all non-missing items, we summed sessions per client for each component, and computed a fidelity score (i.e., a measure of adherence) for each client. This provided a ratio of activities received divided by activities expected.

The fidelity measure also tracks engagement in care. To track all linkages made while receiving MISSION treatment, we documented linkages to other healthcare and support services via a healthcare service form.

Baseline Characteristics of Population Served.

Baseline data were collected via self-report instruments required by the project's grant funding from the Substance Abuse and Mental Health Services Administration (SAMHSA). Thus, measures included the SAMHSA Government Performance and Results Act questions (GPRA) (Substance Abuse and Mental Health Services Administration, 2015), which incorporates the Addiction Severity Index (ASI) (McLellan et al., 1997). As a part of the GPRA, housing status and years of homelessness were measured at baseline. Housing status was reported as the main place where the individual lived during the 30 days prior to baseline. We also measured behavioral health symptoms and functioning using the Behavior and Symptom Identification Scale-32 (BASIS-32).³⁶ The BASIS-32 includes 32 items rated on a 5-point scale of 0 to 4, where 4 indicates extreme difficulty and 0 indicates no difficulty. An overall mean score is generated and scores for five subscales: depression and anxiety; psychosis; relation to self and others; impulsive and addictive behavior; and daily living and role functioning.³⁶

Data Analysis

Interview transcripts were analyzed via the framework method.³⁷ The focus group transcript was reviewed, and short phrases were compared with the a priori codebook and new codes were generated using a grounded theory approach.³⁸ After expanding the a priori codebook, two researchers coded the focus group interview together and refined the codebook until all important content areas were captured. A third researcher reviewed the transcript, verified codes, and discussed discrepancies with the two researchers. Once coding was completed, research team members read the representative quotes and grouped similar codes together. These code groups were then reviewed and discussed to identify themes/adaptations of MISSION. The quantitative data were analyzed via SAS 9.2. Data were checked for out-of-range values, missingness, and distributional form. Univariate analyses were conducted to assess baseline population characteristics and bivariate analyses to assess the pre-post engagement and fidelity comparisons. We defined the pre-period as December 26, 2017 (our first client enrollment) to March 1, 2020, and the post-period from March 1, 2020, to January 6, 2023 (the end of the project). The level of

significance was set at .05. Two-sided tests were conducted for all tests of hypotheses.

Using common analytical processes for mixed method research, we analyzed qualitative and quantitative data sets independently and then combined the results of both analyses at the interpretative level.³⁹ We examined the results through the MADF Framework paradigm (see Figure 1).

Results

QUALITATIVE RESULTS

Focus group clinical staff were evenly split between gender (50% male), age 54 years on average ($SD = 10.0$), 50% were Black/African American, predominately non-Hispanic (75%), had an average of eight years of experience working with persons who are homeless ($SD = 8.17$), and an average of four years of experience working in their MISSION role ($SD = 1.63$). Described below are the five adaptations that staff made to continue service delivery during the pandemic. Interested readers can find the quotes for each adaptation in Table 1.

Table 1. MISSION Adaptations and Example Quotes

Adaptation	MISSION Staff Quote
Adaptation 1: Adaptations to Participant Recruitment and Target Population	<p><i>"Because of some of the challenges, because now with COVID-19. The whole objective is to try to implement as much of the MISSION model to the individuals that we encounter. And the way the project was initially set up is we are supposed to be working with individuals once they are housed, unfortunately we are getting individuals long before they are housed. So, we are getting the chronic of the chronic. The challenge is some of these individuals, depending on what their mental health issue, were so compromised that it is hard to get anything done because one we cannot put them in our car, two because of the risk of COVID-19, and three because they are not at the right stage of change, and then four everything is so convoluted now because of COVID-19. So contacts, trying to get people to services, everything is shut down and different right. So now we had to figure out you know trying to get clients that are really wanting, you know, some relief but still meet the criteria for MISSION."</i></p> <p><i>"For a while referrals from COC weren't happening very frequently for a while. So now we had to figure out how to enroll new participants. And so collectively, um, you know we restructured again on how to, because you know we are doing outreach constantly like we are constantly out on the streets so we see all of the individuals that that may be possibly on the city's by name list we are just getting connected to them. So um, as a team we decided that any homeless person that you see in your travels, panhandling or whatever, chat them up find out who they are get as much information as you can. I would compare that information to the cities by name list through the cities warehouse and see if the person is already in there, and if they met our criteria, I would enroll them (into MISSION). If we meet someone that is not in the cities database then I would put them in the city's database if they met the criteria, being chronically homeless, substance abuse and a mental health component. And we would enroll them."</i></p>
Adaptation 2: Adaptations to Structured Dual Recovery Therapy (DRT) Group Sessions	<p><i>"The adjustment was to make sure they got the DRT session as structured as possible, right where they are. If you have been looking for this person and you see them on the drug block you address the issue that is happening for them right there and relate it with the DRT Session. Depending on what it is, if it is motivation and competence and ready to change boom you are right here on the street... we are using our own life experience based on the information in the MISSION model."</i></p> <p><i>"We basically know the information that is in the DRT [participant workbook] and that is in the structured sessions. So, I am rolling up on you and I am hard pressed to find you and you are dealing with you know the challenges of life right, so we have a discussion about this for you know 30 minutes...relapse prevention, we are having a discussion about for 30 minutes, while I am trying to refer you out to something that could possibly help you, you know, get in a better situation. So we are most concerned about addressing the immediate need"</i></p>
Adaptation 3: Adaptations to Support Incarcerated Persons	<p><i>"The entire counseling system for our individuals that are incarcerated is shut down at the jail. When we would go and find out that we have not seen somebody for a minute we would automatically you know check the jail, check the hospital, database see if they are in programming, this that and the other. We find out they are in jail immediately a case manager and a peer support would appear at the jail with our credentials and they [the jail] would give us a private room because we are professionals to meet with our client. No questions asked. That has all shut down, so now it is trying to find someone in the jail that can be a liaison, so that we</i></p>

Adaptation	MISSION Staff Quote
	<p><i>can help coordinate services for individuals while they are incarcerated, so that they can transition or make sure all their documents are, whatever it is. We can't get to anybody."</i></p> <p><i>"The letter writing was to the inmate directly to say go find a counselor and bridge the gap for us so we can help you."</i></p>
<p>Adaptation 4: Adaptations to Service Linkages and Transportation</p>	<p><i>"It was hard you know not having that dedicated time in the car to talk with each other. Transportation although it is viewed as a basic need, often gets overlooked as being a great therapeutic opportunity. Both the time in the car, and attending services together can improve a working relationship."</i></p> <p><i>"It was rough period for my clients, it was harder than usual to get housing, and there were many more basic needs that were needed."</i></p>
<p>Adaptation 5: Adaptations to Parameters for In-person Contact</p>	<p><i>"We were instructed by our organization that once the quarantine was lifted, you know when they started letting people that were essential workers back to work, this team unfortunately couldn't do the work in the same way that we were doing it before. We were instructed that we were not allowed to have clients in our cars anymore and to limit our contact."</i></p> <p><i>"The ones (clients) that were placed in in hotels or the ones that were housed already that were on our caseload we began to continue to see them by asking them to meet us outside of their place or outside in the you know, in the park or wherever or in the front of their house, like that."</i></p>

Adaptation 1: Adaptations to Participant Identification and Target Population Enrollment. Prior to the COVID-19 pandemic, the local public health department and mayor convened local service providers, and together as a group (also known as the COC), discussed the needs of the local homeless population and maintained a list of these individuals. Prior to the pandemic, this list was a main referral source; however, during the pandemic, despite the vulnerability of this population, this group ceased their meetings. Therefore, the MISSION staff pivoted to doing street outreach in encampments, shelters, and identified usual hang out spots to engage with this population and screen potential clients for study enrollment.

Adaptation 2: Adaptations to Parameters for In-person Contact. Adaptations to in-person contact during COVID-19 included being restricted to outdoor settings, maintaining social distance, and wearing masks. For clients who were housed, team members continued to have contact with them and asked clients to meet them outside of their house or in a nearby park to be in well ventilated areas and reduce transmission risk. For those not housed, staff met clients in the community to deliver in-person MISSION sessions (e.g., near a shelter or service agency, streets/parks). Team members also indicated those changes altered the nature of client contacts. During COVID-19, staff used in-person contacts to complete necessary paperwork for service referrals and housing placements and were much more likely to utilize their computers during in-person contacts with clients (including helping with the completion of online applications) relative to

pre-COVID-19. MISSION staff reported that they did not feel it was feasible to eliminate in-person contact given the vulnerabilities of the population they were serving and their limited access to technology. Overall, MISSION clinical staff reported that decisions to make adaptations to in-person contacts were influenced by the MISSION model developers with adherence to fidelity in mind and political leadership/state mandates, but ultimately the MISSION clinical staff decided how they would adapt strategies within the confines of state and organizational guidelines.

Adaptation 3: Adaptations to Dual Recovery Therapy (DRT). Pre-COVID-19, MISSION case managers delivered weekly structured DRT group sessions in-person in an outpatient clinic setting. When closures hit in March of 2020 in Massachusetts, the outpatient clinic location for structured DRT group sessions was no longer available. Additionally, telehealth had limited feasibility for this population as only one client out of 109 had adequate access, and traditional in-person groups were not an option since staff wanted to follow state mandates and minimize the risk of SARS-CoV-2 transmission. Thus, as noted in adaptation two above, DRT sessions took place in-person, albeit in innovative ways to minimize (not eliminate) the risk of transmission. Due to these changes, there was slight drift in the delivery of DRT as it was delivered individually rather than in a group format. Also, clinical staff discussed sometimes shortening or condensing a DRT session to fit the content in (i.e., from 1-hour pre-pandemic to approximately 30 minutes during COVID-19), or sometimes changing the order of the 13 DRT sessions to deliver a topic that was most

relevant to the client at the time they were meeting. Staff also indicated reducing the use of the participant workbook, as that was often too difficult while working together outside in a non-structured environment. Given that the target population was chronically homeless and not all were in stable housing, workbooks could not be distributed to clients with an expectation that clients would be able to retain their copy over time.

Adaptation 4: Adaptations to Support Incarcerated Persons. Pre-COVID-19, MISSION staff would engage and support clients who became incarcerated while in the study via in-person visits to correctional facilities and were provided private rooms. During COVID-19, visits to correctional facilities ceased, as outside visitors were not permitted to enter facilities. To maintain contact and engagement with incarcerated clients during COVID-19, MISSION staff mailed written letters or cards and included money for their commissary. MISSION staff also reached out to correctional facility staff to serve as a liaison. MISSION staff used these mechanisms to encourage recovery by recommending internal counselors and other program specialists during incarceration to help improve continuity of care. Staff felt that their clients were responsive to this approach.

Adaptation 5: Adaptations to Service Linkages and Transportation. MISSION clinical staff described additional changes regarding service linkages and fulfilling transportation needs for clients. Pre-

COVID-19 service referrals and linkages occurred through in-person, supported referral assistance, meaning that MISSION staff collaborated with clients to identify referrals addressing a full range of needs spanning from basic (e.g., food stamps) to medical/behavioral health services. MISSION staff would meet clients in-person, in their house, or often in their car as they provided transportation to needed services or as they were accompanying a client to a service. However, during COVID-19, the referral and linkage process changed, and staff predominantly set up referrals and linkages electronically without in-person supports. In addition, the nature of service referrals being made also changed with a focus on basic needs over behavioral health, which is corroborated by the quantitative data as indicated below. Transportation of clients to services and attendance at services by MISSION staff ceased.

QUANTITATIVE RESULTS

Descriptive statistics for baseline characteristics of the sample are presented in Table 2. The majority of the sample was male (69.7%) and either Black/African American (24.4%) or White (72.3%), 22.0% Hispanic/Latinx, with a mean age of 44.2 ($SD = 13.2$). On average, clients had been homeless 8.3 years in their lifetime ($SD = 6.2$), and on average, first experienced homelessness at age 29.3 ($SD = 12.4$). Regarding behavioral health, clients reported an average of 16.2 years of illicit substance use ($SD = 13.3$), and the average total BASIS-32 scores was 1.50 ($SD = 0.71$).

Table 2. Participant Baseline Characteristics (N=109)

Characteristic	n	%	M(SD)
DEMOGRAPHICS & GENERAL INFORMATION			
Gender			
Female	33	30.27	
Male	76	69.73	
Age (Years)			44.20 (13.20)
Ethnicity			
Hispanic/Latino	24	22.01	
Non-Hispanic/Latino	85	77.99	
Race			
White	68	72.34	
African American	23	24.46	
Two or More Races	3	3.20	
Marital Status			
Never Married	85	78.72	
Divorced	16	14.81	
Separated	3	2.77	
Widowed	2	1.85	
Married	2	1.85	
Highest Level of Education (Lifetime)			
Less than High School Diploma/GED	33	30.27	
High School Diploma/GED	58	53.21	
Post-High School	18	16.52	
Employment			
Employed	4	3.66	

Characteristic	<i>n</i>	%	<i>M</i> (<i>SD</i>)
Unemployed	105	96.34	
Housing			
Stable	2	1.83	
Unstable	107	98.17	
Homelessness			
Number of years homeless in lifetime			8.34 (6.24)
Age when First Homeless			29.39 (12.39)
CRIMINAL JUSTICE HISTORY			
Arrested at least one time	91		85.05
Lifetime arrests			7.12 (11.29)
Lifetime convictions			2.80 (5.79)
Lifetime months incarcerated			22.31 (47.89)
Most Common Types of Criminal Charges			
Drug Charges	47		51.64
Assault	38		41.75
Shoplifting/Vandalism	36		39.56
Disorderly Conduct	34		37.36
Parole/Probation Violation	31		34.06
MENTAL HEALTH & TRAUMA			
Psychological/Emotional Problems (Past Six Months)			
Depression	95		87.15
Anxiety	95		87.15
Hallucinations	4		3.66
Trouble understanding, concentrating, remembering	40		36.69
Trouble controlling violent behavior	22		20.18
Suicidal thoughts	15		13.76
Suicidal attempts	4		3.66
Psychological/Emotional Problems (Lifetime)			
Depression	84		77.06
Anxiety	86		78.89
Hallucinations	4		3.66
Trouble understanding, concentrating, remembering	35		32.11
Trouble controlling violent behavior	23		21.10
Suicidal thoughts	8		7.33
Suicidal attempts	4		3.66
Trauma			
Experienced at least one traumatic event in lifetime	74		67.88
Experienced interpersonal violence	60		81.08
Experienced domestic violence	8		10.81
Experienced community or school violence	1		1.35
Natural Disaster	1		1.35
Other	4		5.41
PCL-5 Score			41.24 (13.95)
BASIS-32			
Relation to self & others			2.04 (0.99)
Depression & anxiety			1.91 (0.93)
Daily living & role functioning			1.55 (0.86)
Impulsive/addictive behaviors			1.15 (0.75)
Psychosis			0.38 (0.54)
Total score			1.50 (0.71)
SUBSTANCE USE HISTORY			
Substance Use History (Past Six Months)			
Alcohol (days)			58.22 (73.05)
Opioids (days)			47.51 (72.52)
Stimulants (days)			41.44 (68.23)
Marijuana (days)			39.44 (64.93)
Any illicit drug (days)			89.49 (79.96)
Substance Use History (Lifetime)			
Age of first use			14.61 (3.81)
Alcohol (years of use)			19.39 (15.78)
Opioids (years of use)			5.39 (7.46)

Characteristic	<i>n</i>	%	<i>M</i> (<i>SD</i>)
Stimulants (years of use)			7.24 (8.63)
Marijuana (years of use)			10.92 (14.38)
Any illicit drug (years of use)			16.21 (13.33)
Most Problematic Substances (Lifetime)			
Alcohol	35		32.71
Opioids	35		32.71
Stimulants	21		19.62
Marijuana	14		13.10
Other	2		1.86
UTILIZATION OF HEALTH & BEHAVIORAL HEALTH SERVICES			
Service Use (Past Six Months)			
Inpatient for physical complaint	12	11.01	
Outpatient for physical complaint	8	7.33	
Emergency room for physical complaint	23	21.10	
Inpatient for psychiatric complaint	23	21.10	
Outpatient for psychiatric complaint	11	10.09	
Emergency room for psychiatric complaint	16	14.67	
Inpatient for substance abuse	24	22.01	
Outpatient for substance use disorder	21	19.26	
Emergency room for substance use disorder	17	15.59	
Service Use (Lifetime)			
Hospitalized for medical problems	60	55.04	
Treated for alcohol use disorder	25	22.93	
Treated for substance use disorder	48	44.03	
Inpatient for psychiatric complaint	56	51.37	
Outpatient for psychiatric complaint	52	47.71	
Emergency room for psychiatric complaint	49	44.95	

*Due to missing data, one client was excluded from the baseline analysis.

Table 3. Engagement and Fidelity

Variable	Pre-COVID-19 Mean (SD)	COVID-19 Mean (SD)	95% CI Difference	Mean <i>t</i>	<i>p</i> -value
Total Sessions	46.13 (42.70)	25.87 (21.65)	(8.36, 32.15)	3.38	<0.001
Total DRT Sessions	10.56 (7.96)	7.84 (6.68)	(0.17, 5.27)	2.1	<0.05
Total CTI Case Management Sessions	15.76 (21.04)	7.74 (8.84)	(2.33, 13.71)	2.8	<0.01
Total Case Management Sessions	26.32 (26.83)	15.57 (13.64)	(3.27, 18.23)	2.85	<0.01
Total Structured Peer Sessions	4.78 (6.22)	4.63 (7.82)	(-2.29, 2.58)	0.12	0.91
Total CTI Peer Sessions	15.03 (17.05)	5.66 (7.33)	(4.75, 13.99)	4.03	<0.001
Total Peer Sessions	19.81 (21.15)	10.29 (11.74)	(3.52, 15.52)	3.15	<0.01
Adherence Overall MISSION Model (%)	0.65 (0.52)	0.57 (0.69)	(-0.13, 0.29)	0.75	0.45
Adherence DRT (%)	0.87 (0.64)	1.12 (1.3)	(-0.60, 0.10)	1.41	0.17
Adherence CTI Case Management (%)	0.67 (0.76)	0.43 (0.52)	(0.01, 0.47)	2.09	0.04
Adherence Total Case Management (%)	0.77 (0.62)	0.76 (0.76)	(-0.23, 0.25)	0.08	0.93
Adherence Structured Peer Support (%)	0.49 (0.63)	0.74 (0.93)	(-0.52, 0.02)	1.81	0.11
Adherence CTI Peer Support (%)	0.68 (0.6)	0.49 (0.89)	(-0.07, 0.45)	1.44	0.17
Adherence Total Peer Support (%)	0.58 (0.53)	0.68 (0.92)	(-0.36, 0.16)	0.76	0.46

Engagement in MISSION was high, with the pre-COVID-19 rate at 85% and during COVID-19 rate at 67% (difference = 18%, $p < 0.05$). Interestingly, the average number of sessions per client decreased during COVID-19 from 46.1 to 25.8 sessions (44% decrease, $p < 0.001$), which is attributed to a decrease in CTI utilization during the pandemic. Specifically, the average number of CTI case management sessions decreased from 15.7 to 7.7 (51% decrease; $p < 0.01$), and the average

number of CTI peer support sessions decreased from 15.0 to 5.6 (63% decrease; $p < 0.01$).

Fidelity to the MISSION model remained relatively stable with 65% adherence pre-COVID-19 and 57% adherence post-COVID-19 ($p = 0.45$). However, fidelity to each component of the model shifted in different ways. Interestingly, fidelity to both structured components of the MISSION model increased during COVID-19 (DRT: 87% to 112%

(25% increase, $p = 0.17$); and Peer-led group (PSS) sessions (PSS: 49% to 74% (25% increase, $p = 0.11$). Conversely, fidelity to CTI (i.e., unstructured sessions) decreased during COVID-19. CTI with case managers decreased from 67% to 43% (24% decrease; $p < 0.05$) and decreased with peer support specialists 68% to 49% (19% decrease; $p > 0.05$).

Despite the decrease in fidelity to CTI there was a 522% increase in the average number of linkages from pre-pandemic to during the COVID-19 pandemic from 4.35 to 26.96 linkages ($p < 0.001$). The average number of linkages for behavioral health treatment and services increased from 1.68 to 11.38 (577% increase; $p < 0.001$). Linkages also increased in a variety of SDOH areas including a 1,362% increase in linkages for basic needs (0.37 to 5.41; $p < 0.001$), a 988% increase in linkages for benefits and entitlements (0.25 to 2.72; $p < 0.001$), and an 844 % increase in linkages for family, legal, medical, or other services (0.38 to 3.59; $p < 0.001$).

Discussion

In this paper, we present findings from a pilot study serving people experiencing chronic homelessness with a COD prior to and during the COVID-19 pandemic. Adaptations were made rapidly to the MISSION model at the onset of the COVID-19 pandemic and both qualitative and quantitative results demonstrate the feasibility of these adaptations. Review of adaptations were uniquely guided by the MADi framework and include: (1) identification of potential participants and target population; (2) parameters for in-person contact; (3) adaptations to DRT sessions; (4) innovative ways to support incarcerated clients; and (5) service linkage and transportation modifications. This study also found high rates of engagement in MISSION both pre-COVID and during COVID suggesting that it is possible to rapidly adapt a multicomponent intervention for chronically homeless individuals and still deliver it with adequate fidelity.

To the best of our knowledge this is the first study to systematically conduct a retrospective review of rapid adaptations made to a community-based intervention implemented during the COVID-19 pandemic for a population experiencing chronic homelessness and COD. The clinical staff in this project felt it was critical to maintain some in person contact despite the social distancing requirements and made several notable modifications. These adaptations are especially noteworthy given that behavioral healthcare often receives less priority during public health pandemic response planning, thus there were no guidelines to inform the MISSION

clinical staff, even though vulnerable populations are impacted by disasters disproportionately.⁴⁰ During the pandemic, access to care was limited given the pressure on the healthcare system including closures, and often reductions in clinic hours. As a response, the Centers for Medicare & Medicaid Services (CMS) encouraged providers to switch to delivering care via telehealth by promulgating mechanisms for reimbursement during the pandemic, yet evidence-based recommendations and guidance for serving patients with COD were scarce.⁴¹⁻⁴⁴ Despite this evidence, many behavioral healthcare providers switched to providing continuity of care via telehealth given the rapid need to find solutions. In this study, given the chronic nature of the homeless population we were serving, telehealth was not a feasible strategy for continuity of care as only one participant in our study had access to technology. Additionally, several studies examining patient experiences in behavioral health residential care in civilian and Veteran populations during the COVID-19 pandemic^{45,46} reported that patients preferred to maintain in-person care even if it was less often or fewer people in structured group, and those that had access to technology noted the need for education on technology usage for telehealth before rapidly implementing.⁴⁵⁻⁴⁷ These patient perspectives are particularly poignant given that they are also consistent with scientific findings which indicate that prosocial supports and connections to the community are well understood to be protective factors that support COD and recovery.⁴⁸⁻⁵¹

Other studies have noted participants reported increases in difficulty meeting basic needs and more difficulty receiving behavioral health services during COVID-19.⁵²⁻⁵⁶ These findings are particularly worrisome given that homeless individuals with COD and other SDOH needs are disproportionately impacted during public health emergencies.^{57,58} This population is more likely to have limited support systems or reduced autonomy,^{59,60} with restricted access and ability to process complex, rapidly changing information. Many people with COD are more vulnerable to being under-informed and misinformed.⁶¹ In addition, the county where services took place is highly diverse (e.g., 20.8% Black/African American, 47.5% Hispanic/Latino, 74.6% and 113.5% percent higher than the state averages respectively).⁶² Residents of this area have disparate SDOH as compared to overall rates for the state,⁶² with 37% receiving food stamps, 26.3% living below the poverty threshold, which is more than double the state average,⁶² twice as likely to not have health insurance as compared to other areas of the state,⁶² and the region ranks the

highest in Massachusetts on the Centers for Disease Control and Prevention social vulnerability index.⁶³ Given the complex vulnerabilities of the population served in this study it is striking that we were able to maintain engagement in MISSION, and provide linkages to needed treatment and services after adaptations were implemented. The adaptations to the MISSION model reported in this study allowed clinical staff to sustain fidelity to the MISSION model during a pandemic (57%), and maintain engagement in MISSION (67%). The rate of engagement in MISSION post implementation of the adaptations are particularly striking given that people experiencing chronic homelessness with a COD are historically difficult to engage in treatment, with low engagement rates.^{63,64} Interestingly, engagement with both components of structured care (i.e., DRT sessions and peer led groups) increased during the pandemic, whereas components of unstructured care (i.e., CTI with case managers and peer specialist) decreased. Despite CTI sessions decreasing, the average number of linkages per client increased dramatically during the pandemic, highlighting both the increase in client's needs for SDOH services but also that MISSION teams were able to coordinate care, successfully link and advocate for participants for a variety of need areas despite many reports of access issues during the pandemic for vulnerable populations.⁶⁵⁻⁶⁷

Our study has several limitations. First, this study only includes a sample from a single intervention and site with a pre-post design with no comparison group. Thus, findings may not be representative and limit generalizability because of the small sample size and limited urban area of a single state (i.e., Massachusetts), which might vary meaningfully from other U.S. states and other countries. Second, adaptations were developed and implemented rapidly rather than after methodical planning was not optimal. Adaptation is a key concept in intervention implementation, and has been defined as a process of thoughtful and deliberate alteration to the design or the delivery of an intervention, with the goal of improving its fit.²⁸ Adaptations are a form of modification, which is broader, and encompasses any changes made to an intervention – whether deliberate, or in reaction to a challenge.²⁸ Despite the fact that this study did not have time for a thoughtful process prior to developing and implementing the adaptations, the lack of time represents a “*real-world reaction to a challenge*” However, it is important to review other pandemic responses to optimize adaptations and improve community-based intervention preparedness for future crises. Although engagement remained high, an evaluation of how

service delivery adaptations impact behavioral health outcomes is warranted. Third, a randomized control trial comparing standard MISSION compared to the adapted version of MISSION is warranted.

Despite these limitations, findings demonstrate our ability to (1) provide uninterrupted care during an unprecedented pandemic, (2) engage chronically homeless individuals with a COD while maintaining fidelity to MISSION both pre and post COVID, and (3) describe MISSION adaptations that offer healthcare administrators, researchers, and clinicians strategies to promote prioritizing the care of an already vulnerable homeless population with COD. Thus, these results provide treatment settings with helpful guidance for community-based COD interventions and public health emergency preparedness.

Declarations of interest: none

Acknowledgements: A Grant from Substance Abuse and Mental Health Services Administration, CSAT (1H79TI080430-01) funded this research. We thank the Behavioral Health Network, Western Massachusetts Regional Network to End Homelessness, Massachusetts Department of Mental Health (DMH), Massachusetts Department of Public Health/ Bureau of Substance Addiction Services (DPH/BSAS) for their collaborations during this project and their endless work serving a vulnerable population of people during a trying time.

Disclosure: The views expressed in this article are those of the authors and do not necessarily reflect the position or policy of the University of Massachusetts Chan Medical School, Harvard Medical School, or the United States Government.

Ethical Approval: The University of Massachusetts Chan Medical School's Institutional Review Board reviewed this open pilot and determined that it was program evaluation and not human subjects research.

Table 4. Linkages

Linkages											
Variable	Pre-COVID-19 Mean (SD)	COVID-19 Mean (SD)	95% Mean Difference	CI	t	p					
Average Linkages	4.35 (7.25)	26.96 (26.86)	(-29.35, 15.87)	-	6.68	<0.001					
Linkage Types											
Variable	Pre-COVID-19 N (%)	COVID-19 N (%)	95% CI Difference	%	z	p	Pre-COVID-19 Mean (SD)	COVID-19 Mean (SD)	95% CI Mean Difference	t	p
Behavioral Health Treatment & Services	106 (38.70)	774 (42.20)	(-2.70, 9.70)	1.10	0.27	0.27	1.68 (2.91)	11.38 (12.54)	(-12.82, -6.58)	6.2	<0.001
Education & Employment	45 (16.42)	72 (3.92)	(8.02, 16.97)	8.40	<0.001	0.71 (2.09)	1.05 (2.05)	(-1.02, 0.41)	0.85	0.39	
Housing	60 (21.89)	190 (10.36)	(6.43, 16.62)	5.51	<0.001	0.95 (1.56)	2.79 (3.61)	(-2.79, -0.89)	3.83	<0.001	
Basic Needs	23 (8.39)	368 (20.07)	(7.91, 15.44)	4.63	<0.001	0.37 (0.92)	5.41 (5.74)	(-6.45, -3.63)	7.14	<0.001	
Benefits/Entitlements	16 (5.83)	185 (10.09)	(1.16, 7.35)	2.23	<0.05	0.25 (0.78)	2.72 (2.82)	(-3.19, -1.76)	6.94	<0.001	
Family, Legal, Medical, and Other Supports	24 (8.70)	244 (13.3)	(0.91, 8.28)	2.13	<0.05	0.38 (1.01)	3.59 (4.74)	(-4.38, -2.04)	5.45	<0.001	

*Linkage Types: Behavioral Health Treatment & Services includes Trauma services, Medication assisted treatment, gambling treatment services, mental health, and substance use treatment, and web-based recovery services; Education & Employment were combined as one category; Family, Legal, Medical, and Other were grouped together due to low percentage of overall linkages.

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