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### Title

Use of technology for delivery of mental health and substance use services to youth living with HIV: a mixed-methods perspective.

### Permalink

<https://escholarship.org/uc/item/4g4144bb>

### Journal

AIDS care, 32(8)

### ISSN

0954-0121

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### Publication Date

2020-08-01

### DOI

10.1080/09540121.2019.1622637

Peer reviewed



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To cite this article: Parya Saberi, Carol Dawson Rose, Angie R. Wootton, Kristin Ming, Dominique Legnitto, Melanie Jeske, Lance M. Pollack, Mallory O. Johnson, Valerie A. Gruber & Torsten B. Neilands (2019): Use of technology for delivery of mental health and substance use services to youth living with HIV: a mixed-methods perspective, AIDS Care, DOI: [10.1080/09540121.2019.1622637](https://doi.org/10.1080/09540121.2019.1622637)

To link to this article: <https://doi.org/10.1080/09540121.2019.1622637>



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## Use of technology for delivery of mental health and substance use services to youth living with HIV: a mixed-methods perspective

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### ABSTRACT

Disparities in HIV treatment outcomes among youth living with HIV (YLWH) present a challenge for ending the HIV epidemic. Antiretroviral therapy (ART) adherence can be impacted by comorbidities such as mental health and substance use. Technology use has shown promise in increasing access to mental health and substance use services. Using a mixed-methods approach, we conducted formative research to describe the relationship between mental health, substance use, and medication adherence in 18–29 year-old YLWH, and explored technology use as an approach to supporting these services. Among 101 YLWH, ART adherence was significantly negatively associated with mental health measures such as depression, trauma, and adverse childhood experiences and marijuana and stimulants use. Depression had the highest level of relative importance in its association with ART adherence. During in-depth interviews with 29 participants, barriers to and facilitators of accessing and maintaining mental health services were identified. Most participants favored technology use for mental health and substance use service delivery, including videoconferencing with a counselor. Provision of ongoing mental health and substance use treatment is an important mechanism to achieving HIV treatment engagement. Technology, particularly videoconferencing, may have the capacity to overcome many barriers to care by increasing accessibility of these services.

**Abbreviations:** ACE: adverse childhood experiences; ART: Antiretroviral therapy; ASSIST: alcohol, smoking, and substance involvement screening test; AUDIT: alcohol use disorders identification test; CI: confidence interval; DAST: drug abuse screening test; IDI: in-depth interview; MH/SU: mental health/substance use; MH: mental health; MI: multiple imputation; OR: odds ratios; PCL-5: post-traumatic stress disorder checklist-5; PHQ-9: patient health questionnaire-9; SU: substance use; YLWH: youth who are living with HIV

### ARTICLE HISTORY

Received 17 September 2018  
Accepted 3 May 2019

### KEYWORDS

Technology; mental health; youth; HIV; telehealth

## Introduction

Worldwide, youth and young adults are particularly vulnerable to HIV (Bekker, Johnson, Wallace, & Hosek, 2015). During 2010–2014 in the US, 75,993 persons aged 18–29 years were diagnosed with HIV, and diagnosis rates ranged from 16.5 to 34.0 per 100,000 population (Ocfemia, Dunville, Zhang, Barrios, & Oster, 2018). Approximately 41–51% of youth who are living with HIV (YLWH) have been diagnosed with HIV (Centers for Disease Control and Prevention, 2017; Chen et al., 2012; Whitmore et al., 2013), 62–68% have been linked to care (Hall et al., 2012; Olatosi, Probst, Stoskopf, Martin, & Duffus, 2009), and 31–59% have achieved viral suppression (Kahana et al., 2016; Lally et al., 2018; Saberi, Mayer, Vittinghoff, Naar-King, & Adolescent Medicine

Trials Network for, 2015). Therefore, only 6% of YLWH are estimated to be virally suppressed (Zanoni & Mayer, 2014).

Substance use and mental health (MH/SU) disorders disrupt the continuum of HIV care at every stage (Holtzman et al., 2015; MacDonell, Naar-King, Huszti, & Belzer, 2013; Tarantino et al., 2018), and if left untreated, are associated with low linkage to and retention in HIV care, delays in ART initiation, poor ART adherence, and increased HIV disease progression and transmission. Moreover, barriers such as shortage of appropriately trained MH/SU counselors (Dotson et al., 2014) and lack of youth-friendly services (Saberi, Ming, & Dawson-Rose, 2018) have resulted in youth's reduced access to these services.

Despite the need for interventions to address barriers to the continuum of HIV care in YLWH, one systematic review found only three studies that met the highest level of strength of evidence (Shaw & Amico, 2016). One study supported a telephone-based counseling intervention with adherence monitors (Belzer et al., 2014), one included weekly in-person or internet-facilitated family and patient counseling (Letourneau et al., 2013), and one used motivational interviewing to reduce risk behaviors in YLWH in Thailand (Rongkavilit et al., 2013). Therefore, rigorous and innovative approaches are needed to address engagement in care among YLWH.

To further understand the impact of MH/SU issues on ART adherence among YLWH and the characteristics of a promising intervention to address MH/SU, we conducted formative research to increase our understanding of the barriers to receiving MH/SU counseling and treatment and how technology could be used for the provision of these services.

## Materials and methods

We conducted a mixed-methods study with 18–29 year-old individuals living with HIV and receiving health care in the San Francisco Bay Area. We received approval from the University of California, San Francisco's Institutional Review Board for the conduct of this study and received electronic informed consent from all participants.

### Quantitative survey

Data collection occurred March through November 2017. Inclusion criteria were having an HIV seropositive status, being 18–29 years old, and speaking English. Eligibility was determined based on the individual's age (using a text-messaged photograph of their date of birth from an official identification card to the encrypted study telephone) and their HIV serostatus (based on a text-messaged photograph of an ART medication bottle bearing their name, a laboratory slip showing their HIV viral load result, or a letter of diagnosis from their health-care provider). Those unable to send a text message were given an option to email these photographs or bring proof of age and HIV serostatus to the study location. Participants were recruited from local Bay Area clinics and organizations serving YLWH using a range of strategies, including flyers, referral request letters to clinicians and clinical staff working with YLWH, referrals from enrolled participants, and online recruitment on Facebook, Grindr, and SCRUFF. All study activities related to the quantitative survey were conducted remotely. Participants were compensated with a US\$40 Amazon gift certificate.

Eligible individuals were emailed or text-messaged a link to a Qualtrics survey (version 2017, Provo, UT, USA), a data collection software program used to conduct online surveys. Participants answered questions pertaining to demographics, use of technology (access to a mobile telephone or computer, frequency of internet access, and breaks in mobile telephone service), and rating of ART adherence in past 30 days (i.e., "Thinking back over the past 30 days, rate your ability to take all your medications as prescribed: excellent, very good, good, fair, poor, or very poor") (Lu et al., 2008). MH was assessed based on the Patient Health Questionnaire-9 (PHQ-9) (Spitzer, Kroenke, & Williams, 1999) with a score of 0–27; the Post-traumatic Stress Disorder Checklist-5 (PCL-5) (Weathers et al., 2013) with a score of 0–80 and a cut-off of  $\geq 33$  being indicative of further evaluation for post-traumatic stress disorder; and Adverse Childhood Experiences (ACE) (Edwards, Anda, Felitti, & Dube, 2004) with a score of 0–10. SU was examined based the Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST) (Humeniuk, Henry-Edwards, Ali, Poznyak, & Monteiro, 2010) which assesses the use of tobacco, marijuana, cocaine, stimulants, sedatives, opioids, inhalants, and hallucinogens and has a score of 0–39 (except tobacco which ranges from 0 to 31); the Drug Abuse Screening Test (DAST) (Skinner, 1982) with a score of 0–10; and the Alcohol Use Disorders Identification Test (AUDIT) (Bohn, Babor, & Kranzler, 1995) with a score of 0–40. Given the moderate sample sizes, to maximize use of information and statistical power, variables in inferential analyses were treated as continuous with the following exceptions: ART adherence was dichotomized as 1 = "very good" or "excellent" and 0 = "good", "fair", "poor", or "very poor"; and ACEs was dichotomized ( $0 \leq 4$  and  $1 \geq 4$ ) to compare individuals with multiple ACEs to those with fewer ACEs (Felitti et al., 1998). In descriptive analyses, we report on the corresponding categories for ASSIST, DAST, AUDIT, PHQ-9, and PCL-5 to provide additional information on commonly-used clinical cutoffs for these measures.

Quantitative analysis methods were selected to meet the largely descriptive goals of the study. One-way frequency tables for the categorical variables, and means and standard deviations for the continuous variables summarized the sample characteristics. Bivariate associations of ART adherence with MH/SU variables using logistic regression analyses were then examined using odds ratios (ORs) and 95% confidence intervals (CIs). Finally, we used dominance analysis to rank-order the relative importance of the correlates of ART adherence that had a  $p$ -value  $< 0.05$  in bivariate analyses (Azen & Traxel, 2009). For the dominance analysis, the default

missing data handling method of listwise deletion would result in an unacceptable loss of cases (19%) for this multi-variable analysis. Therefore, multiple imputation (MI) via chained equations was first used to generate 50 imputed datasets to ensure the dominance analysis results were based on the full sample. The covariates age, race/ethnicity, and sex at birth were included in the MI to inform imputations and were also incorporated in the dominance analysis as control variables. Stata (version 15.1) was used to perform quantitative analyses.

### Qualitative interviews

We conducted one-on-one in-depth interviews (IDIs) with a subset of survey respondents that was purposefully sampled to include a range of experiences by ensuring diversity in race/ethnicity, gender, and self-reported ART adherence. The interviews lasted about 60 min and participants were compensated US\$60.

Our interview guide included questions about YLWH personal experience with SU, how that may have impacted getting health care, and use of MH/SU services. We were specifically interested in barriers that participants may have experienced in receiving MH/SU treatment, and their perceptions of using technology (e.g., videoconferencing) for treatment.

All IDIs were audio-recorded and transcribed verbatim. We used a grounded theory methods (Charmaz, 2014) to thematically code and analyze these data. Initially, ten transcripts were open coded by one author. The research team met after the initial ten transcripts were coded to review the generated list of 210 codes and 734 passages to group them into initial categories for a draft codebook. Using this codebook, two authors independently coded 20% of the transcripts to verify the reliability of the coding process and further refined the codes and categories to create a final codebook. Using an iterative process, analytic memos were written during and after coding to capture major themes and relationships between themes from the interviews as well as findings from the survey data.

## Results

### Quantitative results

We collected cross-sectional survey data from 101 YLWH with a mean and median age of 25.0 years (Table 1). Participants were mainly Latino (35.6%), African American (29.7%), male gender (78.2%), and gay-identified (68.3%). Most participants reported that they “can barely get by” when asked to describe their financial situation (55.4%), and 52.5% reported having ever been

**Table 1.** Summary of participant demographics, use of technology, HIV clinical outcomes, and mental and substance use evaluations.

		N = 101*
Age, mean years (SD)		25.0 (2.9)
Race/ethnicity, N (%)	Latino	36 (35.6)
	African American non-Latino	30 (29.7)
	White non-Latino	14 (13.9)
	Other non-Latino	18 (17.8)
Male sex at birth, N (%)		90 (89.1)
Gender identity, N (%)	Male	79 (78.2)
	Female	10 (9.9)
	Other	12 (11.9)
Sexual identity, N (%)	Gay	69 (68.3)
	Bisexual	17 (16.8)
	Heterosexual	12 (11.9)
Perceived financial situation, N (%)	Live comfortably	17 (16.8)
	Can barely get by	56 (55.4)
	Cannot get by	21 (20.8)
Education, N (%)	Less than high school	9 (8.9)
	High school degree or GED	45 (44.6)
	More than high school or any college degree	47 (46.5)
In school, N (%)		29 (28.7)
Working, N (%)		62 (61.4)
Living situation, N (%)	Own or parent's home	50 (49.5)
	Someone else's place	24 (23.8)
	Rooming, boarding, half-way house, group home, or shelter	11 (10.9)
	Drug or other treatment facility	8 (7.9)
	Welfare hotel or month-to-month hotel	4 (4.0)
	Other	4 (4.0)
Ever homeless or lived in a shelter, N (%)		53 (52.5)
Ever jail or prison, N (%)		24 (23.8)
Access to cell phone, N (%)		99 (98.0)
Type of mobile telephone, N (%)	iPhone	56 (55.4)
	Android	39 (38.6)
	Other smartphone	2 (2.0)
	Non-smartphone	2 (2.0)
Total number of mobile telephone numbers in past 6 months, N (%)	One	61 (60.4)
	Two	19 (18.8)
	Three or more	13 (12.9)
Breaks in mobile telephone service in past 6 months, N (%)	Never	60 (59.4)
	Once	15 (14.9)
	Twice or more	21 (20.8)
Mean number of hours per day on internet, hours (SD)		5.3 (4.2)
Currently taking ART, N (%)		100 (99.0)
ART adherence rating, N (%)	Excellent	25 (24.8)
	Very good	33 (32.7)
	Good	21 (20.8)
	Fair	12 (11.9)
	Poor	4 (4.0)
	Very poor	5 (5.0)
Moderate-high risk level for substances (ASSIST), N (%)	Marijuana	59 (58.4)
	Tobacco	50 (49.5)
	Stimulants	31 (30.7)
	Cocaine	27 (26.7)
	Inhalants	24 (23.8)
	Sedatives	19 (18.8)
	Hallucinogens	14 (13.9)

(Continued)

**Table 1.** Continued.

		N = 101*
	Opioids	4 (4.0)
Degree of drug use problem (DAST), mean score (SD)		2.9 (2.9)
Alcohol risk (AUDIT), mean score (SD)		6.1 (6.4)
Depression severity (PHQ-9), mean score (SD)		7.8 (7.5)
ACEs score, N (%)	≤ 4	55 (66.3)
	> 4	28 (33.7)
Mean trauma score (PCL-5), mean (SD)		21.8 (22.1)

Notes: ACEs: Adverse Childhood Experiences; ART: antiretroviral therapy; ASSIST: Alcohol, Smoking, and Substance Involvement Screening Test; AUDIT: Alcohol Use Disorders Identification Test; DAST: The Drug Abuse Screening Test; PHQ-9: Patient Health Questionnaire-9; PCL-5: Post-traumatic Stress Disorder Checklist-5.

\*Numbers do not add up to 100% due to small amounts of missing data, including “do not know” or “decline to answer” responses.

homeless or lived in a shelter. Despite 99.0% reporting ART use, 41.6% reported less than very good ART adherence.

Mobile telephone access was nearly ubiquitous (98.0%), with the vast majority of respondents reporting access to smartphones (96.0%). Approximately 32% of participants reported having more than one telephone number in the past six months, and 36% had breaks in service. Participants reported a mean of 5.3 h of internet use per day.

Marijuana, tobacco, and stimulant use were the most common substances reported at moderate to high risk levels based on ASSIST. Approximately 42.5% of participants had a moderate to severe degree of SU and 57.5% had no to low degree of SU based on the DAST interpretation. Moderate to severe levels of alcohol use that would warrant counseling/monitoring or being considered dependent was relatively low (7.9%) based on AUDIT scores. About one-third of participants (33.7%) had moderate to severe depression and 22.8% had mild depression as assessed by PHQ-9. Participants had a mean of 3.5 ACEs, with 33.7% reporting five or more ACEs. Thirty-four participants (33.7%) had a trauma score  $\geq 33$  based on PCL-5 scores.

In bivariate analyses (Table 2), very good/excellent ART adherence was significantly negatively associated with measures of MH (i.e., PHQ-9, ACEs, and PCL-5). For every one unit increase in depression score (based on PHQ-9), there was an 8% reduction in the odds of reporting a high level of ART adherence ( $p$ -value = 0.004) and for every one unit increase in trauma score (based on PCL-5), there was a 2% decrease in the odds of reporting a high level of ART adherence ( $p$ -value = 0.029). Those with five or more ACEs had a 0.33 odds of high adherence versus those with four or fewer ( $p$ -value = 0.019).

**Table 2.** Bivariate associations between mental health, substance use, and psychosocial variables and very good or excellent self-reported ART adherence.\*

	OR (95% CI)	P-value
DAST	0.89 (0.77–1.02)	0.090
ASSIST		
Tobacco	0.97 (0.93–1.01)	0.091
Marijuana	0.94 (0.90–0.98)	0.006
Cocaine	0.99 (0.94–1.04)	0.685
Stimulants	0.95 (0.92–0.99)	0.013
Sedatives	0.98 (0.91–1.04)	0.463
Opioids	1.01 (0.90–1.12)	0.910
Inhalants	0.92 (0.83–1.03)	0.123
Hallucinogens	1.00 (0.92–1.09)	0.954
AUDIT	0.96 (0.90–1.02)	0.195
PHQ-9	0.92 (0.87–0.98)	0.004
ACEs cutoff ( $\leq 4$ vs $> 4$ )	0.33 (0.13–0.84)	0.019
PCL-5	0.98 (0.96–0.998)	0.029

Notes: ACEs: Adverse Childhood Experiences; ART: antiretroviral therapy; ASSIST: Alcohol, Smoking, and Substance Involvement Screening Test; AUDIT: Alcohol Use Disorders Identification Test; CI: confidence interval; DAST: The Drug Abuse Screening Test; OR: odds ratio; PHQ-9: Patient Health Questionnaire-9; PCL-5: Post-traumatic Stress Disorder Checklist-5

\*N = 100 for all analyses except for AUDIT (N = 95) and ACEs (N = 83).

Among the substances examined on ASSIST, use of marijuana and stimulants were significantly correlated with decreased odds of a high level of ART adherence. Tobacco use approached statistical significance ( $p$ -value = 0.091). However, alcohol and opioid use were not significantly associated with ART adherence.

In dominance analysis, we examined the relative importance of each variable that was statistically significant in bivariate analyses (i.e., PHQ-9, ACEs, PCL-5, stimulant use, and marijuana use) in its association with a high level of ART adherence. The rank-order of the variables from this analysis was as follows: (1) depression, (2) adverse childhood experiences, (3) use of marijuana, (4) use of stimulants, and (5) experience of trauma.

### Qualitative results

We conducted IDIs with 29 YLWH with a mean age of 24.3 years. Similar to the total sample, this subset was also mainly African American (34.5%), male gender (55.2%), and gay-identified (55.2%). Approximately 37.9% of interviewees reported moderate to severe degree of drug use (based on DAST), 41.4% evidenced moderate to severe depression (based on PHQ-9), and 34.5% had high levels of trauma (based on PCL-5). Therefore, we focused our interviews and analysis on participant experiences with accessing and maintaining services for these issues (Table 3).

### Mental health

These data describe barriers to and facilitators of accessing and maintaining MH services for depression,

**Table 3.** Qualitative interview themes and exemplary quotes.

Theme	Sub-theme	Detail	Exemplary quote
Mental Health	Past experiences with mental health services	Negative childhood experience	"I think when I was younger, I went to, not like gay conversion, but just like, somewhere where it's like, 'Oh, you're not actually gay, you don't know what you want because you're 10.' And that, to me, left like a really negative view on therapy ... " (26 year-old, male)
		Medical mistrust	"I'm very skeptical. I don't really like to – unless it's a reason or something that's beneficial, I really don't like meeting a lot of new people and telling people my life". (20 year-old, female)
	Relationships with mental health providers	Positive qualities of a therapist	"She listened to everything that I was going through ... I was really in a deep depression. It was like a lot of stuff she did or a lot of stuff like services she gave me or told me about. It kind of worked for me". (24 year-old, female) "I like a therapist that's adaptable ... If ... you're adaptable, no matter what the mood, no matter what the situation, no matter where we at, I'd like that, because that means I could talk to you like I could talk to you like I talk to my friends". (29 year-old, female)
		Negative qualities of a therapist	"They said, 'uh-huh, okay.' That was all I got ... Well I could have done this myself ... I could have talked to a teddy bear. Thank you, no!" (23 year-old, male)
	Stability in accessing mental health services	Overbooked and unavailable providers	"So, the therapist there ... just overbooked like Beyoncé or somebody. And our initial visit was – well, it was cool. Like I was talking about stuff, but then that was the only visit. It was like, oh, well, like I can see you once a month. And for me, I don't think that that would work. Like, the once-a-week thing really worked for me, and it helped me stay consistent and committed". (25 year-old, straight, female)
		Turnover of providers	"When I have regular therapy, [providers] keep quitting me ... Well, my last therapist, I had her for five years. She left for more money. The [other] therapist, I had her for a year, she left for more money". (29 year-old, female). She went on to report that "the agency doesn't have another therapist and I have to wait pretty much on a waiting list"
Substance use	Social, community, and mental health-related reasons for substance use	SU to feel less bothered by realities of lives, and wanting to forget about HIV serostatus	"I did meth and I drank a lot, but the meth would just take me into a different world. And, yeah, I didn't have any care. I was like invincible Wonder Woman ... [alcohol and meth] just helped numb things, put it in the back of my mind where I didn't have to remember about it and talk about it with people ... " (25 year-old, transgender female)
	Medication non-adherence due to substance use	ART non-adherence	"Sometimes when I get too high I might fall asleep and forget about the pills ... I couldn't take it the next morning because, you know, the hours. So I would have to wait until the next night". (20 year-old, female)
Use of technology for health	Facilitators of videoconferencing	Convenience, less travel time, prevent inadvertent disclosure	"... if I could ... [videoconferencing platform] with a therapist, that would make things so great for me, because ... I don't want to travel to wherever you are and have to wait in your waiting room ... So, I think it's convenient". (25 year-old, transgender female)
	Barriers to videoconferencing	Rapport building	"Personally, yes. I do think it should be a face-to-face, a physical thing. I mean, granted that technology is great ... technology is helping people, but we're getting too tied into it. Like, okay, great, you want to [videoconferencing platform] them from time to time, go for it. But, don't eliminate the person-to-person. It has to happen at some point in my opinion". (25 year-old, genderqueer)
		Lack of private space	"It seems good but a lot of people don't have space for them to talk about it because it's a public place and if you're at work it's hard to find a private place to talk because there's people running in and out. I mean, when I got that call [referring to the call when her provider told her she tested positive for HIV] I couldn't talk to her really so she just had to tell me about it because I was in the kitchen". (20 year-old, female)

anxiety, trauma, and social isolation, which included: (1) past experiences with MH services; (2) relationships with MH providers; and (3) stability in accessing MH services. For each of these themes, participants discussed barriers that had deterred them from actively seeking or maintaining MH support.

*Past experiences with MH services:* Participants who had sought MH services indicated their belief in and willingness to accept help from providers, whereas those not seeking services reported a range of reasons for declining MH support. Negative childhood experiences and medical mistrust were reported as reasons for not seeking therapy.

*Relationships with MH providers:* According to those who received MH services, establishing a connected and consistent relationship with their MH providers was essential to their satisfaction with and continued use of services. Several YLWH echoed the desire for a therapist who was genuine, responsive, provided responses tailored to the individual (i.e., adaptability), and made sessions feel like a conversation with a friend or family member.

YLWH described a number of factors that prevented or disrupted the connection with their MH providers, including poor communication, not feeling believed, and not feeling benefit from the sessions. Participants expressed frustration with MH providers who were perceived as impersonal or lacking the ability to actively engage with them in the ways they needed.

*Stability in accessing MH services:* Once a connected and consistent relationship with a MH care provider was established, YLWH faced additional obstacles in maintaining ongoing participation in MH care. YLWH described issues related to overbooked staff, frequent turnover in therapists and providers, and health insurance or financial-related barriers to maintaining ongoing MH care.

### **Substance use**

YLWH who reported SU noted a range of social, community, and MH-related reasons for their use. In this domain, participants discussed barriers that had resulted in their SU or deterred them from actively seeking and maintaining treatment for their SU. Participants also described SU impacting their medication adherence.

*Social, community, and MH-related reasons for SU:* Participants described social situations or settings as a trigger for their SU and spoke of finding themselves in situations of peer pressure or community-wide drug use as negatively impacting their choices about substances. Many YLWH reported SU stemming from MH-related factors, such as stress and anxiety, wanting to escape from emotions or the realities of their lives, or as a way of coping with long-term mental illness. Participants reporting high levels of stress described SU as a way of feeling less bothered by the realities of their everyday lives, and at times specifically cited wanting to forget about their HIV serostatus.

*Medication non-adherence due to SU:* YLWH who reported that SU impacted their HIV care described ART non-adherence while under the influence.

### **Use of technology for health**

Participants indicated a variety of uses for technology that they felt could help them with their healthcare and access to MH/SU services. These included using existing

social media, technology to build online communities and social support, and technologies to access services or healthcare (e.g., telehealth or videoconferencing with a counselor).

Based on our pre-specified interest in videoconferencing with a counselor, we further probed this idea to assess facilitators of and barriers to using this counseling modality from the participants' perspective. The vast majority of participants favored the use of videoconferencing with a counselor and noted the convenience, absence of need for the transportation time and financial resources, possibility of quick response in times of crisis, and avoiding the chance of running into acquaintances or community members in clinic waiting areas.

Barriers to using videoconferencing included a belief that it might be more difficult to establish rapport without face-to-face sessions. Another potential challenge was lacking private space to talk.

## **Discussion**

We surveyed a demographically diverse group of YLWH who were majority youth of color and men who have sex with men, with a high level of adverse childhood experiences, depression, post-traumatic stress, and SU. ART adherence was significantly negatively associated with measures of MH such as depression, trauma, and adverse childhood experiences. Participants reported high use of marijuana and stimulants, which were both negatively correlated with ART adherence, whereas alcohol use was not highly reported and not associated with ART adherence.

In qualitative interviews, participants highlighted their past experiences with MH services, their relationships with MH providers, and the stability in accessing MH services as important facilitators of or barriers to continued receipt of these services. Negative childhood experiences, medical mistrust, characteristics of the therapist or counselor, and system-level factors (e.g., provider turnover, overbooked schedules, and financial burden) defined the participants' experience with MH services. Given the high prevalence of MH challenges among YLWH, future research and counseling interventions should address these specific barriers to accessing care. Additionally, depression was indicated as the variable with the highest level of relative importance in its association with ART adherence in the dominance analysis, which highlights the need for providers to address depressive disorders as a priority.

Participants noted social situations and MH-related factors as triggers for their SU. The desire to temporarily forget about their HIV serostatus was an important reason for SU, highlighting the interplay between



emotional factors and SU. In quantitative surveys, alcohol use was not associated with ART adherence, but in qualitative interviews, some participants noted that alcohol use had been a factor in their non-adherence.

Most participants had access to mobile telephones and reported consistently high amounts of daily internet use. Therefore, we explored whether participants were open to using technology as a means of addressing both MH/SU challenges. Participants reported enthusiasm for use of videoconferencing with a counselor to address MH/SU. They noted the convenience, decreased transportation time and commitment of financial resources, potentially enhanced response time during crises, and avoidance of acquaintances or community members in clinic waiting areas. Qualitative interviews revealed barriers to using videoconferencing, such as the need for establishing rapport during face-to-face sessions with the counselor and lack of private space to talk. The need to establish rapport may be remedied by a combination of face-to-face and video-chat appointments. The lack of private space may be resolved by brainstorming potential community or clinical spaces that the individual can use for counseling sessions. Another challenge identified in our quantitative surveys was the high frequency in changes in mobile telephone numbers and breaks in service in this population. Similar data have been reported in prior studies (Mitchell et al., 2015). Providers will need to set guidelines related to this issue with their patients and collect secondary contact information, including social media information, to prevent patients from falling out of care.

Videoconferencing or telehealth has successfully been used for smoking cessation (Carlson et al., 2012) and for delivery of MH/SU treatment in rural communities (Benavides-Vaello, Strode, & Sheeran, 2013). As a way to alleviate the shortage of trained MH/SU counselors (Dotson et al., 2014), the American Telemedicine Association has described the use of telehealth as a method of relieving this shortage (American Telemedicine Association (ATA); Myers et al., 2017). Research on telehealth for MH counseling has demonstrated feasibility, acceptability, and efficacy across different racial/ethnic and age groups (Chong & Moreno, 2012; De Las Cuevas, Arredondo, Cabrera, Sulzenbacher, & Meise, 2006; Garcia-Lizana & Munoz-Mayorga, 2010). In our prior research, we had examined the feasibility and acceptability of providing medication counseling sessions via videoconferencing to African American YLWH (Saber, Yuan, John, Sheon, & Johnson, 2013). Similarly, participants in this study described the convenience, efficiency, and privacy of videoconferencing. Additionally, they noted the less intimidating aspects of videoconferencing with a healthcare provider compared to in-person sessions.

In another study, we conducted qualitative interviews with 17 healthcare providers and staff members at clinics serving YLWH (Saber et al., 2018). Provision of youth-friendly services, namely use of technology, was reported to be an important facilitator of engagement in HIV care. These interviewees discussed challenges of using technology in organizations and clinics from the system-level (e.g., availability of technology), provider/staff-level (e.g., familiarity with technology), and youth-level (e.g., changing of mobile telephone numbers). Attention to these challenges can provide guidance for clinicians providing care for and researchers conducting research with YLWH around the use of technology for enhanced care and intervention delivery.

Our findings are limited in their generalizability given that our sample was composed of mainly male-identified individuals and men who have sex with men. Even though we did not exclude those who did not have a mobile telephone, the majority of our participants had access to mobile telephones; therefore, our results may not be generalizable to those who do not have access to mobile telephones. Additionally, the results of our cross-sectional survey cannot establish causality. Finally, our study included a limited number of participants; therefore, the lack of association between various variables (such as alcohol use and ART adherence) should be interpreted with caution. However, the use of mixed-methods provided the context for further understanding the nuances of MH/SU in our demographically diverse population, the majority of whom had experienced homelessness and about a quarter of whom had ever been incarcerated.

In summary, we were able to examine the association between ART adherence and measures of MH/SU, evaluate the facilitators of and barriers to accessing MH/SU services and treatment by YLWH, and establish modes of delivery of MH/SU interventions. In our ongoing pilot randomized trial, we are currently examining the feasibility, acceptability, and preliminary efficacy of a brief MH/SU interventions based in the theoretical framework of the Information, Motivation, and Behavioral Skills model (Amico, Toro-Alfonso, & Fisher, 2005; Fisher, Fisher, Misovich, Kimble, & Malloy, 1996) and delivered via videoconferencing to 80 YLWH. Through this study, we hope to address many of the shortcomings of prior technology-enabled interventions aimed at improving engagement in HIV care among YLWH (Navarra et al., 2017).

### Acknowledgements

The authors thank the San Francisco Bay Area youth and young adults who participated in this study.

## Disclosure statement

No potential conflict of interest was reported by the authors.

## Funding

Research reported in this publication was supported by the California HIV/AIDS Research Program (CHRP) award numbers HD15-SF-060 (co-PIs Saberi and Dawson Rose) and the National Institutes of Health award numbers K23MH097649 (PI Saberi) and K24DA037034 (Johnson). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

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