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Nurse-Led Intervention to Decrease Drug Use among LTBI Positive Homeless Adults

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Abstract

Background.—People experiencing homelessness (PEH) are disproportionately diagnosed with active tuberculosis. While promoting latent tuberculosis infection (LTBI) treatment has been a call to action, PEH engaging in substance use often experience challenges in completing LTBI treatment.

Methods.—In this non-randomized single arm study, we tested an innovative, community-based, nurse-led community health worker (RN-CHW) model, on reducing drug use among 50 PEH, residing in homeless shelters or living on the streets in Los Angeles. Follow-up was at three- and six- months.

Results.—Findings revealed significant and ongoing decrease in any drug use (odds ratio [OR]=0.30; 95% confidence interval [CI]=0.14–0.68); p=.004), amphetamine use (OR=0.14; 95% CI=0.02–0.81; p=.029), cannabis use (OR=0.26; 95% CI=0.12–0.57; p=.001) and methamphetamine use (OR=0.30; 95% CI=0.10–0.90; p=.031) at six-month follow-up.

Conclusions.—To our knowledge, this pilot study is the first to evaluate the impact a RN-CHW delivered intervention on reduction in drug use among PEH enrolled in a LTBI intervention. LTBI interventions may serve as an entryway into reduction in drug use among this underserved population.

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Keywords

People experiencing homelessness; substance use; Latent TB treatment

Introduction

Nationwide in 2019, there were 8,916 new cases of active tuberculosis (TB) (Schwartz et al., 2020), and an estimated 13 million people living with latent TB infection (LTBI) (CDC, 2018). In 2019, 383 (4.5%) of persons experiencing homelessness (PEH) were newly diagnosed with active TB (CDC, 2020 a,b). As a result, public health leaders have recommended that PEH be offered treatment for LTBI, as there is a 5–10% lifetime risk of active TB developing because of prior TB exposure (Ma et al., 2018). In several studies of PEH, up to 17.5% have been found to be LTBI positive (Aldridge et al., 2018; Rosales & Guevara, 2018). However, few studies have explored the impact of delivering an intervention program, primarily focused on treatment completion for LTBI, on reducing active substance use among homeless adults.

Impact of Substance Use on LTBI Treatment Completion

PEH are 2.3 times more likely to not complete treatment for LTBI as compared to the general population (Bamrah et al., 2013). While substance use is often closely related to homelessness (Doran et al., 2018), PEH who use drugs and other substances often experience significant barriers to LTBI treatment completion (Stuurman et al., 2016; Yamin et al., 2016). In a clinic-based LTBI study of homeless and immigrant patients, researchers found that individuals who were using alcohol (> 3 drinks) (p=0.02) or tobacco (p=0.04) were significantly less likely to complete HCV treatment, as compared to those who did not use at treatment initiation (p 0.05) (Eastment et al., 2017). This was similarly true for people who inject drugs (IDUs), who were less likely to complete a nine-month treatment course for LTBI as compared with non-injectors (Horsburgh Jr et al., 2010). Thus, recommendations for shorter treatment regimens to increase completion rates are warranted (Onwubiko et al., 2019).

This paper is based on a single-arm study, in which we assessed the impact of a novel intervention, wherein homeless adults who were found to be LTBI positive, and met eligibility criteria, were subsequently offered a 12-dose (i.e., 3HP; rifapentine plus isoniazid) weekly treatment by our Registered Nurse-Community Health Worker (RN-CHW) team. Our findings were promising in that among LTBI positive PEH, a 92% 3HP completion rate was achieved, regardless of drug use, anxiety, or depression (Salem et al., 2020), as compared to a 65% clinic based, historical control (Chang, 2016).

Factors Impacting Intervention Success in Reducing Substance Use

A number of factors have been found to impact the success of interventions aimed at reducing drug and other substance use among PEH; these have included lack of social support, mental health disorders (Alene et al, 2018; Duko, Bedaso, & Ayano, 2020; Janse Van Rensburg et al., 2020; Koyanagi et al., 2017; Sweetland et al. 2017), and lack of coping mechanisms (Baggett et al., 2018). Among female PEH who use substances, investigators

found that associating with their intimate partners or social groups served as a barrier to quitting drugs (David et al., 2016). In addition, several study participants spoke about their experiences of overwhelming physical pain during withdrawal and how those experiences diminished their likelihood of quitting drugs (David et al., 2016).

Depression and anxiety constitute additional barriers to treatment completion (Sweetland et al., 2017; Ruiz-Grosso et al., 2020). In a cross-sectional analysis of mental health, social support, and perceptions of general health among PEH in this sample, Garfin et al (2020) found that the prevalence of depression and anxiety were 40% and 48%, respectively. These variables, in turn, were significantly associated with severe substance use ($ps < .05$). Further, a history of childhood physical abuse was associated with worse drug use and homelessness outcomes (Attah et al., 2018).

While greater negative consequences of substance use were associated with higher motivation to reduce illicit drug use (Collins & Slesnick, 2011), homeless smokers with greater subsistence difficulties (*e.g., locating shelter, food, clothing, etc.*) perceived more barriers to quitting and were less likely to do so despite similar readiness, confidence, and attempts (Baggett et al., 2018). An additional barrier to quitting included lack of awareness of where to get help (Baggett et al., 2018); further, being homeless was associated with significantly lower odds ($OR = .45$, $CI = .21, .97$) of initiating brief behavioral treatment for opioid and/or alcohol use (Ober et al., 2018).

Successful Interventions Impacting Reduction of Substance Use among PEH

Several successful interventions have been developed to reduce substance use among PEH, including motivational interviewing, supported employment, and peer supports. A pilot test of a motivational interviewing social network intervention was found to reduce high risk alcohol and other drug (AOD) use among transitioning PEH. The intervention utilized personalized social network visualization feedback to help participants understand the people in their network who trigger substance use behavior (Kennedy et al., 2018).

In another study, PEH were enrolled in the AWARE intervention, consisting of four, 45-minute group-based MI sessions focused on the effects of AOD use on the brain, risky situations, and coping strategies. AWARE participants reported change in their past 3-month and past 30-day alcohol use (p .05), and motivation to change drug use ($p<.05$) compared to the control group receiving usual care (Tucker et al., 2017). For participants receiving supported employment, the support appeared to positively influence the way in which they managed their substance use (Poremski et al., 2016).

In their extensive review of recent literature, Miler et al. (2020) found that peer support studies were aimed at several aspects of the lives of PEH, including homelessness itself, physical illness (i.e., HIV, TB, hepatitis), harm reduction, AOD abstinence and recovery, and smoking cessation. These authors point out that there has been an increase in research on peer support interventions to decrease substance use among PEH and conclude that most of the peer led or peer supported interventions they reviewed showed positive AOD outcomes (Miler, Carver, Foster & Parkes, 2020). For example, in the PROMPT study, researchers found that in addition to a decrease in smoking (the main target of the intervention),

participants in the peer intervention reported a reduction of other substance use (including opioids, 18.8%) (Pakhale et al., 2018).

Purpose

The objective of this study was to assess the impact of our RN-CHW intervention on change in substance use, in the form of amphetamine, methamphetamine, cocaine, heroin, cannabis and any drug use over three and six months. We hypothesize that a tailored, intervention program delivered to LTBI positive, drug-using PEH by a supportive RN-CHW team, can reduce drug and other substance use over six months.

Comprehensive Heath Seeking and Coping Paradigm Guiding Theoretical Framework

The Comprehensive Heath Seeking and Coping Paradigm (Nyamathi, 1989) was the guiding framework for selection of variables including sociodemographic characteristics (e.g., age, gender, place of birth and education), and physical and psychological health (e.g., anxiety, depression) on outcomes (e.g., drug use).

Methods

In this non-randomized single-arm design, among a sample of 466 homeless adults who were screened, 10.7% (N=50) PEH were eligible. Once enrolled, the education and support aspects of the program were delivered over 12 weeks, with weekly interaction and delivery of one weekly dose of 3HP. High follow-up post-intervention was found at three-and six-months (94% and 88%, respectively) after enrollment. The University of California, Irvine Institutional Review Board Human Subjects Protection Committee approved the study, and the protocol was registered with ClinicalTrials.gov (NCT03702049). The TREND Checklist was used to ensure quality reporting of the study (Des Jarlais et al., 2004). The study was conducted between January 2019 and September 2020.

Sample and Setting

Based on power analysis, a sample size of 50 participants were needed to have sufficient power to conduct the study. PEH were recruited from several sites in the Skid Row (Los Angeles) area including shelters, tent areas, or on the streets. PEH met the inclusion criteria based on the following parameters: 1) self-reported as homeless, defined as anyone who spent the previous night in a public or private shelter, or on the streets (Hoben, 1995); 2) 18 years of age and over; 3) willing to sign an informed consent; and 4) reported current or recent substance use within the last 12 months. PEH were excluded if they were screened as having/being: 1) active TB confirmed by chest X-ray or been treated for LTBI; 2) a serum aspartate aminotransferase (AST) level of 5 times the upper limit of normal; 3) HIV-infected and receiving antiretroviral therapy; 4) positive pregnancy test; and 5) judged to be cognitively impaired by the research staff, assessed as being unable to comprehend the informed consent after multiple attempts, or under the influence of substances.

Among the 466 PEH screened, 336 were determined as ineligible as they were either diagnosed with active TB, received prior treatment for active TB or LTBI, or were pregnant. Another 80 did not return for TB and other test results.

Recruitment

After IRB approval was obtained, information about the study was disseminated to participating shelters and clinic sites by IRB-approved flyers, and information sessions were provided in these sites. Among PEH who were interested, a brief two-minute structured questionnaire was administered which assessed basic sociodemographic and history of LTBI and active TB. For a full description of study procedures, see Salem et al., 2020.

Based on the screener, all persons who were determined as eligible were tested with QuantiFERON-TB Gold Plus, a blood assay, or a Tuberculin Skin Test, or both, as well as other routine testing (i.e., liver function and HIV tests), followed by a chest x-ray to rule out active TB. After clearance for LTBI treatment, a second informed consent was administered along with a 60-minute questionnaire that assessed general health, psychosocial and behavioral variables. All participants were paid $3 for the screening questionnaire, $5 for laboratory tests and $20 for the completion of baseline measures.

RN-CHW LTBI Intervention Program

A research RN and four, part-time CHW composed the RN/CHW team. As CHW were primarily formerly homeless themselves, and have moved out of homelessness, they serve as role models for this community. As such, developing trust with clients and being a positive role modeling are hallmarks of CHW qualities and characteristics. Furthermore, as members of the community, they have extensive knowledge of the community and its culture. Extensive training was included prior to the initiation of this grant. This included knowledge of LTBI, completion delivery of the intervention program, of competency assessments, and of the CITI/HIPAA training.

RN/CHW Intervention Delivery

Each CHW was assigned 7 – 8 participants, who met weekly with participants, and assessed for side effects prior to administering the next dose of 3HP. The team also provided 20-minute weekly case management sessions over 12 weeks. During the case management sessions, detailed information was provided about TB, impact of substance use on completing 3HP program, as well as how substance use negatively impacts the body. Participants were encouraged to use problem-solving, create short- and long-term goals to improve medication adherence, and identify and address substance use triggers, etc. Such triggers were discussed with each participant and positive coping strategies reinforced.

Importantly, the team also provided health and social service referrals (e.g., physical, mental health, substance treatment, housing) and regularly tracked (detailed searching) participants who missed a 3HP LTBI dose. The clinic physician or nurse practitioner was involved in the decision-making for ongoing treatment. Acceptability and feasibility of the RN/CHW LTBI intervention is detailed in a separate publication (Salem et al., 2020).

Instruments

Sociodemographic Factors were measured and included age, gender, race/ethnicity, county of birth, and housing history.

General Health was measured using five items from the general health perceptions subscale of the RAND 36-Item Short Form Health Survey (SF36) (Ware & Sherbourne, 1992). Participants responded to five statements such as "my health is excellent", with "true" and "false" as response options, and endpoints 100, 75, 50, 25, and 0. Several items were reverse scored. A total score was determined by calculating the average, where a higher score represented a better general perception of health. For this measure, Cronbach's $\alpha = 0.78$.

Drug Use was measured using the Texas Christian University (TCU) Screen V (Knight et al., 2014), a 17-item measure that screens for mild to severe substance use disorder (SUD) in accordance with the Diagnostic and Statistical Manual for Mental Disorders 5 (DSM-5). Participants indicated either "yes" or "no" responses to substance dependency questions and frequency of drug use based on a 5-point scale from 1 (never) to 5 (daily). The TCU Screen V is scored on a point-system ranging from 0–11. Problematic use of specific drugs was defined as self-identified as being a problem (TCU Item #12) or daily consumption.

Urinalysis:

A five-panel Food and Drug Administration-approved urine test cup (Phamatech, Inc.) was used at baseline, 3-month and 6-month follow-up. The test cup screened for metabolites of Amphetamines (1000 ng/mL), Cocaine (300 ng/mL), Methamphetamines/MDMA (500 ng/mL), Opiates (2000 ng/mL), and THC (50 ng/mL).

Social Support was measured using the Medical Outcome Study (MOS) Social Support Survey (Sherbourne, 1991), a 19-item instrument that assesses availability of social support. Four sub-scales are included: emotional/informational support (eight items, $\alpha = 0.95$); tangible support (four items, $\alpha = 0.94$); positive support (three items, $\alpha = 0.98$); and affectionate support (three items, $\alpha = 0.96$). Participants responded on a 5-point Likert scale ranging from 1 (none of the time) to 5 (all the time), with higher scores indicating more social support. An overall support index was also calculated ($\alpha = 0.98$).

Anxiety was measured using the Generalized Anxiety Disorder-7 (GAD-7), a seven-item self-report instrument used to screen and assess for anxiety, using a 4-point Likert scale ranging from 0 (not at all) to 3 (nearly every day) (Spitzer et al., 2006). Example items include "worrying too much about different things," "trouble relaxing," and "not being able to control worrying." Scores are summed and range from 0 to 21. Severity of anxiety was determined with cut-off scores 5 (mild anxiety), 10 (moderate anxiety), 15 (severe anxiety). In this study, reliability was very good (Cronbach's $\alpha = 0.87$).

Depression was assessed using the Center for Epidemiological Studies Short Depression Scale Revised (CESD-R-10), a 10-item measure used to screen for depression (Eaton et al., 2004). Depressive symptoms were assessed using a 4-point Likert scale that reflects the frequency of a symptom in the past week, ranging from 0 (rarely or none of the time) to 3 (most of the time). Example items include "I was bothered by things that don't usually bother me," "I felt depressed," and "I felt fearful." Responses are summed (range 0–30). A total score above 10 indicates depression. Reliability was good (Cronbach's $\alpha = 0.79$).

Data Analysis

We calculated frequencies and percentages of each category for all variables. The reliability of psychosocial scales was assessed by calculating Cronbach's alpha. Imputation of missing data was not needed. Our primary outcome was problem use of any drugs (any drug use). This was a composite variable of urinalysis verified use of the following drugs: cannabis, cocaine, heroin, amphetamines, and methamphetamines. For each drug, self-reported problem use was defined as: 1) participant indicated this drug for the TCU screen V question, "Which drug caused the most serious problem during the last 3 months?" or 2) daily use of the drug. These self-reported results were confirmed using urinalysis, whereby participants with positive test for the drug was reclassified as having problem use for that drug. The composite Any Drug Use variable was coded as 1 if the participants had problem drug use for any of drugs and 0 if the participants were not problem users for any of the drugs. Secondary outcome variables included problem use of individual drugs.

We used generalized estimating equation (GEE) modeling to estimate the change in drug use between baseline and the 3- and 6-month follow-up periods. For each model, the primary or secondary drug use variable was specified as the dependent variable with a binomial distribution and logit link. We did not model heroin/opiate use separately due to the small number of participants reporting use (n = 4 at baseline). We specified time point, age (continuous), gender, and country of birth as independent variables. These variables were specified *a priori* given the relatively small sample size, which limited data-driven covariate selection.

The model-derived coefficient for timepoint (3 or 6 months versus baseline) was exponentiated to calculate the estimated odds ratio (OR) adjusted for confounding by the other covariates. We used robust standard errors to calculate the 95% confidence intervals (CI). Study ID code was specified as the ID variable to account for clustering within individual participants. We used an exchangeable correlation structure for the GEE models. We also conducted bias-corrected GEE analysis, described by Mancl and DeRouen (2001), using the method for adjusting the robust standard error estimate for small samples (Paul & Zhang, 2014) described by Mancl and DeRouen (2001). As the estimates using this method were nearly identical to the estimates using standard GEE, we report only the standard GEE results in this paper. R v4.0.2 was used for all analyses with the gee and geesmv packages used for fitting the GEE models (Carey, 2019; R Core Team, 2020).

Results

Participant Characteristics

Table 1 presents baseline descriptive statistics of 50 PEH enrolled in the study and stratified by current or no drug use. Among PEH, those aged 50–59 were more likely to not report current drug use, while those aged 60 and older were more likely to report current use (See Table 1). While about three quarters were male, no differences were noted in terms of current use by gender. However, among those who were born in the US, lived on the street, and were of poor health, current drug use was more prevalent. This was likewise

true for PEH who experienced depression and mild anxiety. No differences were found for problematic alcohol use.

Problematic Use of Drugs at Baseline

Problematic drug use was reported as mild/moderate (22%) and severe (24%) by more than one third of the sample. As illustrated in Figure 1, among study participants, 70% reported using any drug. Primarily, study participants used stimulants (62%), cannabis (60%), cocaine (24%), methamphetamine (22%), and amphetamine (16%). Heroin was the least often used drug (8%). No significant predictors of any drug use were found in terms of variables such as age, gender, race/ethnicity, country of birth, social support, depression, or anxiety (data not shown).

Change in Drug Use Over Three-and-Six Months

When change in problem drug use was assessed over time, significant reductions were found in several drugs at three-and six-month follow-up periods (see Table 2). The odds of any drug use declined at three- and six months (OR = 0.34, p=.009; and OR = 0.30, p=.004, respectively) compared to baseline. Likewise, cannabis use decreased at both three-and six months (OR = 0.23, p<.001; and OR = 0.26, p=.001, respectively) compared to baseline. However, for drugs such as amphetamine, and methamphetamine, only the six-month period showed significant decline in odds (OR = 0.14, p=.029; and OR = 0.30, p=.031, respectively) compared to baseline. Cocaine showed no significant change over time.

Discussion

While PEH who concurrently engage in substance use have historically experienced challenges completing LTBI treatment (Stuurman et al., 2016; Yamin et al., 2016), RN-CHW interventions have the potential to not only impact LTBI treatment completion, but also decrease substance use. Currently, no studies to date have specifically assessed the impact of a disease-specific intervention program for LTBI on reduction of substance use. The purpose of this paper was to examine the supplemental impact of the RN-CHW intervention on change in substance use over three and six months, as well as assess opportunities for future research generated from these findings.

Findings of our study revealed a significant decrease in any drug use, including cannabis use at three months, and ongoing decrease in use of any drug, as well as use of amphetamines, cannabis, and methamphetamines at six-month follow-up. Notably, the odds of any drug use declined by 66% at three months and remained 70% lower than baseline at 6 months. It is important to note that collecting drug use data with an instrument that includes cannabis along with more serious drugs, such as cocaine, methamphetamine, opiates, etc., raises concerns about a now-legal drug being included and called "problematic" (TCU Item #12) (Knight et al., 2014). Yet, despite the 2016 Adult Use of Marijuana Act, permitting adults aged 21 or over to legally grow, possess, and use cannabis for non-medicinal purposes, with certain restrictions (California Cannabis Portal, 2021), our findings indicate that there was still a decrease in cannabis use at six-month follow up.

Findings also revealed that the critical elements of the RN-CHW intervention included the provision of culturally sensitive and linguistically appropriate health education for the PEH by the RN-guided CHW, which informed about the dangers of drug use, triggers to use, as well as referral to health and social service resources. As an integral part of the healthcare work force, CHWs have been utilized by many services, such as maternal child health (Haver et al., 2015), management of infectious diseases (Neupane et al., 2014), diabetes management (Shah, Kaselitz, Hesler, 2013), etc. At three-month follow-up, the majority (79.8%) of our participants received assistance completing one or more healthcare visits, while 16.9% of participants reported receiving assistance in completing one or more mental healthcare visits. In a systematic review of impact of peer recovery support services on SUD, Eddie and colleagues (2019) found these supports resulted in reduction of substance use and treatment retention, improved relationships with treatment providers, and resulted in greater treatment satisfaction.

In the current study, it is quite possible that entry into the RN-CHW intervention enabled LTBI positive PEH to not only be provided LTBI therapy, but replaced negative social networks, which had previously normalized amphetamine, and methamphetamine use. Consistent healthcare provider appointments, prioritizing health care, and meeting with the RN-CHW team may have created a climate of developing and reflecting on specific, measurable, action-oriented, and time-limited goals inclusive of a harm reduction approach. Future research is needed to consider the impact of linkage to care, number of referrals, and costs associated with delivering this intervention as compared to not using an RN-CHW team to deliver care.

Supplementing these approaches, positive role modeling of CHW and sharing of their lived experiences may serve as a bridge between the two worlds of drug-using and non-drug-using PEH populations and the problem-solving possibilities, which exist to change behavior. One key element of CHW peer support is the powerful use of storytelling and sharing experiences of overcoming adversity, prioritizing healthcare, and accessing stable housing. The provision of such resources may serve as a catalyst and source of inspiration for the PEH. Clearly, social interventions, such as peer counsellors, adherence coaching, and other cultural interventions have proven more effective in improving adherence to LTBI treatment than incentivization (Stuurman, et al., 2016).

In addition, the socio-demographics of the generally older PEH enrolled in our study are important to consider as well; in particular, older LTBI positive PEH had a higher rate of drug use as compared with younger counterparts. These findings are consistent with previous literature which found that older PEH have high rates of comorbidity (Salem et al., 2013), which may include physical health, mental health, and/or substance use disorders (Garibaldi et al., 2005). Future research needs to include larger samples and investigate the unique needs across LTBI positive PEH.

The current study found that unsheltered LTBI positive PEH had a greater percentage of current drug use. Given that some programs within the Skid Row may not use a harm reduction model and integrate abstinence-only approaches, PEH who are currently using drugs may be more apt to live on the streets and continue their drug-using behaviors. Not

known is the impact of harm reduction strategies, which have focused more on safety than decreasing substance use, by utilizing pragmatic interventions, such as Supervised Injection Sites, Syringe Service Programs, and Overdose Prevention Programs (Card et al., 2020; Magwood et al., 2020). Regardless, interventions designed to impact current drug use necessitates street outreach teams inclusive of multidisciplinary providers who can meet clients where they reside.

We also found that enrolled participants who self-reported poorer health, had more prevalent and current drug use. There are, however, other possible explanations for this result; in particular, LTBI positive PEH may be in poorer health because of their current drug use. Thus, it can be presumed that interventions which address current drug use may then improve self-reported health and these findings warrant further examination.

One unanticipated finding is that among PEH, this study did not show a decrease at three- and six-month follow-up in cocaine use. In our sample, 24% were cocaine users. Future research necessitates examining the unique culture around cocaine use and ways in which to intervene successfully. For example, assessing physical and psychological pain and type of coping mechanisms used is critical.

Finally, enrolled participants who experienced depression and mild anxiety were more likely to report current drug use. In fact, an association between mental health, substance use and physical disease has been documented utilizing meta-analyses (Hughes et al., 2017). It is thought that mental health disorders lead to physical diseases as a result of greater engagement in risky behaviors and reduced self-care (Firth et al., 2019). However, more telling is the fact that low socioeconomic status has also been found to be associated with about a third of significant health disorders (Kivimaki et al., 2020). Yet, current strategies to overcome global chronic diseases do not reflect the preceding mental health and substance use problems (Kivimakiet al., 2020). Thus, there is a significant need for wholistic approaches to dealing with psychiatric disorders, physical disease and substance use, with dual expertise in substance use and mental health needed (Kivimaki et al., 2020; Minkoff, 2001), particularly in light of social disadvantage. Thus, the design of RN-CHW interventions that focus as the triad of mental health, substance use and physical illness is of critical importance for subgroups who may have higher acuity in health care needs.

Limitations

The generalizability of these results is subject to several limitations inclusive of the characteristics of the sample and data collection approach. For one, this study was not a randomized clinical trial. Also, consistent with being a pilot study, the sample size was small and predominantly male, and generally older; thus, it is unclear if inclusion of a greater number of female, and younger PEH would result in similar findings. Because of the small number of opioid users in the study sample, we are not able to draw conclusions about the results for this population.

In addition, while the literature points to the fact that a greater percentage of heroin users were associated with lower dropouts for SUD treatment, while cocaine users had the opposite effect (Lappen, Brown & Hendricks, 2019), our study was not focused on SUD

treatment completion. Moreover, no literature was found on impact of treatment for opioid use on LTBI treatment completion. Further research is warranted in this area.

Our research was also limited by screened participants who did not return to continue in the study. Thus, our findings can be limited by those who have readiness to participate in the study. Further, since drug use was assessed only three times during this investigation, positive results only support what participants were using around the time of the test (1–3 days) and not proof of long-term abstinence if substance were not detected. Future researchers may want to conduct more regular substance use testing during the intervention.

In our sample, 30% of PEH had problematic drug use; however, there was no decrease in problematic alcohol use among LTBI positive PEH across six months. Previous studies have also found that there were high rates of at-risk drinking among PEH, but no significant differences between men and women (Neisler et al 2019). Future research needs to evaluate how utilization of evidence-based interventions for problematic alcohol use among LTBI positive, PEH can be implemented and evaluated. Additionally, future research should assess how problematic alcohol use interferes with LTBI treatment.

While urine assays were used to define current versus no current drug use, findings were limited to self-reported data on other variables, which can include either recall bias, selective memory, and/or exaggeration. In addition, social-desirability bias among participants may have been a factor, particularly if they get emotionally attached in some way to the intervention staff. Further, having a historical control group is not an official control group; and biases may have crept in as well. We were also not able to control for the possibly confounding effects of other services or interventions in which study participants may have participated during the study. Finally, while both drugs and alcohol contribute as barriers to treatment compliance, our study urinalysis was able to verify self-report for drugs only. Despite these limitations, these findings warrant future randomized controlled trials to generate definitive evidence of the effectiveness of our intervention on reducing drug use within a larger, more representative sample.

Conclusions

The evidence from this study, conducted in a real-world setting, suggests that a RN-CHW delivered, community-based intervention, reduced several types of substance use among LTBI positive, homeless adults. The current study highlights the importance of delivering LTBI, short course medication, and providing wraparound health and social service resources to address the social determinants of health among this underserved community. The present study raises intriguing questions about LTBI interventions serving as an entryway into addressing the social determinants of health, reduction in substance use among this underserved population, and opportunities for future research.

While years of research have resulted in an extensive list of evidence-based practices (EBPs) for SUD (Louie, Barrett, Baillie, Haber & Morley, 2021), most of these EBPs are siloed within structured SUD treatment programs. The outreach provided by the RN-CHW teams provides a bridge to health for LTBI positive PEH who may be reticent to enter treatment at an SUD program.

Future Research Implications

Several research questions emerge from these study findings and remain unanswered. First, how can RN-CHW interventions be further refined for not only LTBI positive, PEH cocaine or heroin/opiate users but as well alcohol abusers? Mixed methods studies, which delve more deeply into the culture of cocaine/heroin/opiate and alcohol users and develop interventions for this subpopulation, need to be undertaken. Second, given the sample was disproportionately male, would interventions need to be tailored differently for LTBI positive, female PEH? Third, given that about a third of our sample were both frail and aging, and use drugs, what is the best combination of multidisciplinary providers, inclusive of geriatricians, to be engaged in care? How can RN-CHW interventions be tailored for these populations? Further, integrating process variables that assess change in variables such as housing, and completion of goal-oriented referrals would add measurably to the literature.

Lastly, it is critical to conduct a randomized controlled trial to fully study the impact of the RN-CHW intervention compared to a clinic-based, control group as well as cost effectiveness as compared to a clinic-based, standard of care or other modes of delivery (e.g., DOT via telehealth). Building from these significant findings is critical.

Data Availability Statement:

Data is available on request from the authors. The data that support the findings of this study are available from the corresponding author upon reasonable request.

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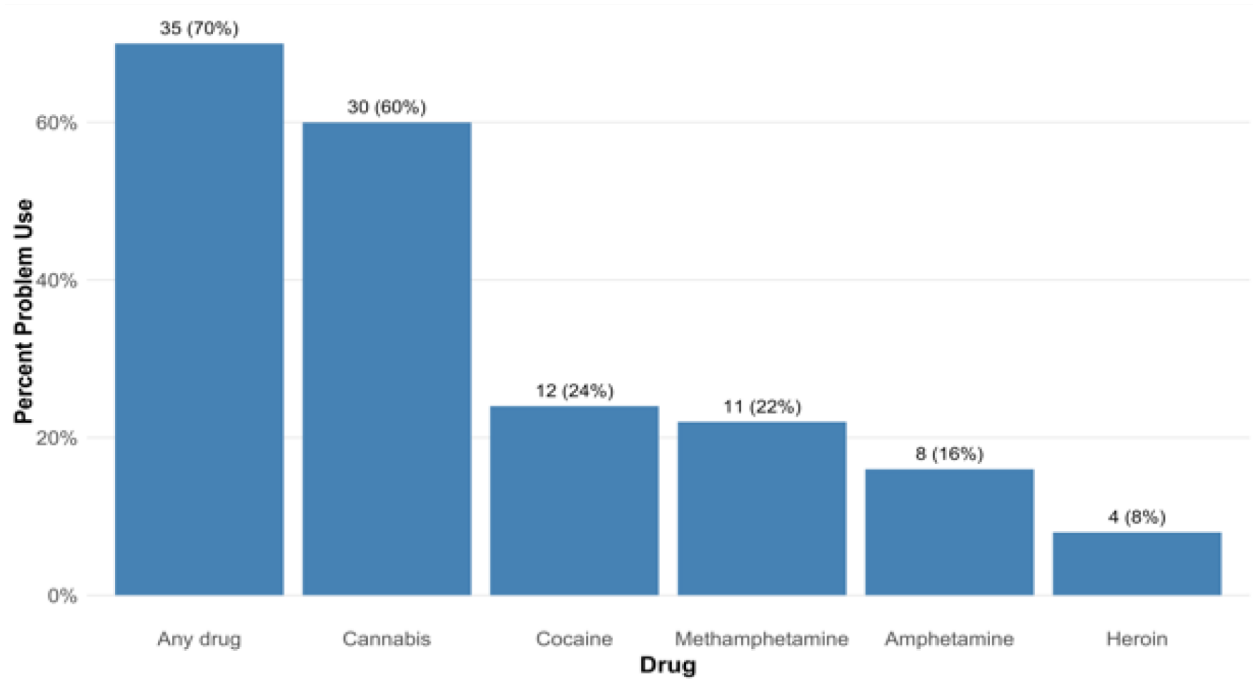
Figure 1.
Baseline Findings of LTBI Positive, People Experiencing Homelessness, Reporting Drug Use (N = 50)

Table 1.

Baseline Sociodemographic, Physical and Mental Health Characteristics of LTBI Positive, People Experiencing Homelessness (N=50)

Characteristic	Category	Current Drug Use (n = 35)	No Current Drug Use (n = 15)	All Participants (N = 50)
Age	<50	10 (28.6%)	5 (33.3%)	15 (30.0%)
	50–59	10 (28.6%)	6 (40.0%)	16 (32.0%)
	60+	15 (42.9%)	4 (26.7%)	19 (38.0%)
Gender	Male	26 (74.3%)	11 (73.3%)	37 (74.0%)
	Female	9 (25.7%)	4 (26.7%)	13 (26.0%)
Race/Ethnicity	Latino	15 (42.9%)	6 (40.0%)	21 (42.0%)
	Black	15 (42.9%)	8 (53.3%)	23 (46.0%)
	Other	5 (14.3%)	1 (6.7%)	6 (12.0%)
Country of Birth	Non-US	10 (28.6%)	8 (53.3%)	18 (36.0%)
	US	25 (71.4%)	7 (46.7%)	32 (64.0%)
Housing History	Own Apt/Family/Friend	4 (11.4%)	3 (20.0%)	7 (14.0%)
	Shelter	22 (62.9%)	10 (66.7%)	32 (64.0%)
	Street	9 (25.7%)	2 (13.3%)	11 (22.0%)
General Health	<60	14 (40.0%)	4 (26.7%)	18 (36.0%)
	60–80	11 (31.4%)	3 (20.0%)	14 (28.0%)
	80+	10 (28.6%)	8 (53.3%)	18 (36.0%)
Problematic Alcohol Use	No	24 (68.6%)	11 (73.3%)	35 (70.0%)
	Yes	11 (31.4%)	4 (26.7%)	15 (30.0%)
Social Support	<25	10 (28.6%)	4 (26.7%)	14 (28.0%)
	25–74	15 (42.9%)	5 (33.3%)	20 (40.0%)
	75+	10 (28.6%)	6 (40.0%)	16 (32.0%)
Depression	No	19 (54.3%)	11 (73.3%)	16 (32.0%)
	Yes	16 (45.7%)	4 (26.7%)	21 (42.0%)
Anxiety	None	18 (51.4%)	8 (53.3%)	13 (26.0%)
	Mild	12 (34.3%)	4 (26.7%)	30 (60.0%)
	Moderate/Severe	5 (14.3%)	3 (20.0%)	20 (40.0%)
Frailty	No	18 (51.4%)	9 (60.0%)	26 (52.0%)
	Yes	17 (48.6%)	6 (40.0%)	16 (32.0%)

Table 2.

Three- and Six-Month Trends in Problem Drug Use among LTBI Positive, People Experiencing Homelessness

Drug	Baseline (n = 50)	3-month (n = 46)			6-month (n = 40)		
	n (%)	n (%)	OR (95% CI)	P	n (%)	OR (95% CI)	P
Any Drug Use	35 (70%)	22 (48%)	0.34 (0.15 – 0.76)	0.009	18 (45%)	0.30 (0.14 – 0.68)	0.004
Amphetamine Use	8 (16%)	5 (11%)	0.65 (0.19 – 2.23)	0.492	1 (2%)	0.14 (0.02 – 0.81)	0.029
Cocaine Use	12 (24%)	13 (28%)	1.17 (0.51 – 2.68)	0.717	9 (22%)	0.78 (0.42 – 1.42)	0.409
Cannabis Use	30 (60%)	13 (28%)	0.23 (0.11 – 0.48)	<0.001	12 (30%)	0.26 (0.12 – 0.57)	0.001
Methamphetamine Use	11 (22%)	5 (11%)	0.43 (0.15 – 1.24)	0.120	3 (8%)	0.30 (0.10 – 0.90)	0.031