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## Homelessness predicts attrition but not alcohol abstinence in outpatients experiencing co-occurring alcohol dependence and serious mental illness

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### Abstract

**Background:** Adults experiencing homelessness and serious mental illnesses (SMI) are at an increased risk for poor mental health and treatment outcomes compared to stably housed adults with SMI. The additional problem of alcohol misuse further complicates the difficulties of those living with homelessness and SMI. In this secondary data analysis, we investigated the impact of homelessness on attrition and alcohol use in a contingency management (CM) intervention that rewarded alcohol abstinence in outpatients with SMI.

**Methods:** The associations between housing status and attrition and alcohol abstinence during treatment, as assessed by ethyl glucuronide (EtG) urine tests, were evaluated in 79 adults diagnosed with alcohol dependence and SMI.

**Results:** Thirty-nine percent ( $n=31$ ) of participants reported being homeless at baseline. Individuals who were homeless were more likely to drop out of CM ( $n=10$ , 62.5%), than those who were housed ( $n=4$ , 16.7%),  $X^2 = (1) 8.86, p < 0.05$ . Homelessness was not associated with attrition in the non-contingent control group. Accounting for treatment group and pre-randomization EtG levels, neither the effect of housing status nor the interaction of housing status and group were associated with EtG-assessed alcohol abstinence during treatment.

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#### AUTHOR CONTRIBUTIONS

Emily Leickly and Jordan Skalisky wrote the manuscript and contributed significantly to data collection, data analysis, and interpretation. Dr. Oluwoye provided critical revisions of the manuscript and data analyses. Drs. McPherson, Srebnik, Roll, and Ries contributed to the revision of the final submission and research conception and design. Dr. McDonell oversaw manuscript writing, including final submission, and provided significant support for data analyses and interpretation.

**Conclusions:** Individuals experiencing homelessness and co-occurring alcohol dependence and SMI receiving CM had higher rates of attrition, relative to those who were housed. Homelessness was not associated with differences in biologically assessed alcohol abstinence.

### Keywords

Homelessness; serious mental illness; substance use; addiction treatment; contingency management; alcohol use disorder

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## INTRODUCTION

Up to 24% of individuals with serious mental illness (SMI) enrolled in the community mental health system have experienced homelessness in the previous three years.<sup>1</sup> Homeless individuals with SMI are more likely to be arrested, become victims of sexual and physical assault, and experience HIV and hepatitis C infection, relative to those who are housed.<sup>2,3</sup> Homeless individuals may also be less likely to receive and complete addiction treatment.<sup>4</sup> Non-adherence to behavioral health treatment is prevalent in homeless individuals.<sup>5</sup> While the negative impact of homelessness on psychiatric or addiction treatment alone has been well characterized, few studies have investigated how homelessness impacts treatment outcomes for adults with co-occurring SMI and alcohol use disorders (AUDs).<sup>6</sup>

A number of interventions, including housing first, where individuals are offered low-barrier housing, as well as intensive case management programs are associated with improved outcomes for adults with SMI and substance use.<sup>7,8</sup> Another promising intervention is contingency management (CM), where reinforcers, such as prizes, housing, or employment are provided when substance abstinence is confirmed with a urine test or similar biomarker.<sup>9</sup> Contingent housing interventions, where housing is contingent on regular submission of drug-negative urine tests, are associated with higher rates of drug abstinence relative to treatment as usual in adults experiencing homelessness.<sup>10</sup> Koffarnus and colleagues found that adults experiencing homelessness and AUDs who were assigned to a therapeutic workplace, where opportunities to work were contingent on submitting alcohol-negative breath tests, were more likely to submit alcohol-negative breath tests during the intervention and follow-up than those in the control condition.<sup>11</sup>

In a small CM pilot study ( $N=30$ ) conducted at a homeless shelter, participants who received a prize-based CM intervention had higher levels of drug abstinence and treatment completion, relative to those in the control condition.<sup>9</sup> While these interventions were tailored to homeless adults with substance use disorders, less is known how homeless versus housed individuals respond to a typical, non-tailored CM intervention. More generally, little is known about the impact of homelessness on alcohol treatment outcomes in adults with co-occurring SMI and AUDs.

The present study is a secondary analysis of a randomized controlled trial of CM for alcohol abstinence, assessed by the ethyl glucuronide (EtG) biomarker, conducted in a sample of 79 outpatients diagnosed with alcohol dependence and SMI.<sup>12</sup> In this paper, we describe rates of homelessness in the sample, and determine if homelessness was a predictor of treatment attrition or EtG-assessed alcohol abstinence (the two primary endpoints of the trial) over the

12-week treatment period, accounting for pre-treatment alcohol use and treatment group assignment.

## METHODS

### Participants

Participants were recruited from an urban multisite community mental health and addiction treatment agency and met DSM-IV-TR criteria for alcohol dependence, and schizophrenia, schizoaffective disorder, bipolar I or II, or recurrent major depressive disorder as assessed by the *MINI International Neuropsychiatric Interview*.<sup>13</sup> Other eligibility criteria were alcohol use on at least 5 of the last 30 days and enrollment in outpatient addiction treatment at the participating agency. Exclusions were comorbid DSM-IV-TR diagnosis of current drug dependence, or medical or psychiatric severity that would compromise safe study participation. One hundred twenty-one participants consented to take part in the study. After completing a 4-week induction period, 79 of the 121 participants were randomized. Participants provided written informed consent and procedures were approved by the University's Human Subjects Division.

### Design

The parent study employed a 4-week pre-randomization induction period (weeks 1–4), followed by a 12-week randomized controlled trial of CM (weeks 5–16) with a 3-month post-intervention follow-up period (weeks 17–28).<sup>12</sup> Participants provided urine samples three times per week during the pre-randomization induction period and the intervention period, and at each follow-up visit. Urine samples were analyzed for the presence of alcohol using Diagnostic Reagents Incorporated EtG enzyme immunoassay on a Thermo Fisher Indiko analyzer (Fremont, CA).

Participants received treatment as usual, including case management and enrollment in outpatient addiction treatment group, throughout the study. Consented individuals ( $n=121$ ) then participated in the 4-week induction period where they received reinforcers in the form of prize draws (see below) for submitting urine samples three times a week (alcohol abstinence was not required). Only individuals who demonstrated minimal attendance (i.e., submitted at least one urine sample in week four of the induction) and a need for treatment (i.e., submitted at least one EtG-positive urine sample) were randomized.

### Treatment Conditions

Seventy-nine participants met criteria for randomization and were randomly assigned to either CM ( $n=40$ ), where they received reinforcers for submitting urine samples demonstrating alcohol abstinence (as assessed by EtG) and addiction treatment attendance, or the non-contingent control group (NC;  $n=39$ ), where they received opportunities to draw for prizes regardless of EtG results and treatment as usual attendance. Prize draws were given when individuals provided an EtG-negative (EtG<150 ng/mL) urine sample in the CM group or provided an EtG-positive or negative urine sample in the NC control group. Prize draws involved drawing from a container of tokens that read good job (no prize, 50% of tokens), small (\$1 prize, 42% of tokens), large (\$20 prize 7% of tokens), and jumbo (\$80

prize, <1% of tokens). Each token was exchanged for a corresponding prize. Prizes ranged from grocery store gift cards to household items (e.g. portable DVD players and microwaves) and basic hygiene items (e.g. toothpaste and shampoo).

Participants in the CM group received at least three prize draws for each EtG-negative sample submitted and received an additional prize draw for each week (three study visits) when they submitted EtG-negative urine samples. They also received gift cards if they attended some (\$5) or all (\$10) of their addiction treatment as usual sessions each week. Participants in the NC group received prize draws and gift cards equal to the average number of prize draws and gift cards received by all participants in the CM group in the week prior.

## Measures

**Outcome measures.**—Attrition during the intervention phase was defined a priori as nine consecutive missed study visits (approximately three weeks). Participants who met attrition criteria were not allowed to attend subsequent intervention visits but were eligible to complete monthly interviews. The primary outcome of the trial was the percentage of EtG-negative (<150 ng/mL) urine samples collected three times a week over the 12-week intervention phase (36 observations).

**Independent variable.**—At the baseline study appointment, participants were asked, “What is your current housing status?” Participants who answered “temporary” (e.g. staying on a friend’s couch;  $n=16$ ) or “literal homelessness” (e.g. sleeping on the streets,  $n=35$ ) were classified as “homeless” and participants who answered “stable” (e.g. housed,  $n=69$ ) or “institutional” (e.g. inpatient treatment,  $n=1$ ) were classified as “housed.”

**Control variables.**—We controlled for the effect of pre-randomization EtG-levels and treatment group membership on outcomes, as both are associated with EtG-assessed alcohol abstinence in our previous analyses of these outcomes in the parent study.<sup>12</sup> Group assignment was defined as CM or NC control condition. In a previous analysis we found that a mean pre-treatment EtG level of >499 ng/mL (a cutoff level that identifies 78% of heavy drinking [ $>4$  standard drinks] in the previous day) was the most powerful predictor of EtG-assessed abstinence in the intervention phase.<sup>14, 15</sup> Therefore, we also controlled for pre-intervention drinking (EtG >499 or <500 ng/mL) in our analyses.

## Data Analysis

Frequencies were calculated to determine the prevalence of homelessness in the sample. The bivariate association between housing status and attrition in the overall sample, and within each treatment group was investigated using chi-squared analyses. Generalized estimating equations (GEE) were conducted to investigate the main effect of housing status. The interaction between housing status and treatment group was associated with the proportion of EtG-positive urine tests during the 12-week treatment period (36 observations), accounting for pre-randomization EtG levels > 499 ng/mL and group assignment. Odds ratios (OR) and 95% confidence intervals (CI) were calculated for each main effect, interaction and control variables. Criteria for statistical significance was alpha  $p<0.05$ . Analyses were conducted in IBM SPSS version 24.

## RESULTS

Fifty-six percent of participants were white ( $n=44$ ), 29% were Black ( $n=23$ ), and 15% ( $n=12$ ) identified as another race. Sixty-three percent of participants ( $n=50$ ) were male, 37% ( $n=29$ ) were female, and the mean age was 45.87 ( $SD=10.30$ ). Thirty-nine percent of participants ( $n=31$ ) reported being homeless at baseline (CM group,  $n=16$ , 40%; control group,  $n=15$ , 38%).

Across the entire sample, those who were homeless ( $n=15$ , 62.5%) were more likely than housed individuals ( $n=9$ , 18.8%) to drop out of the study during the treatment phase ( $X^2 = (1) 7.82, p < 0.05$ ). Individuals who were homeless were more likely to drop out of CM ( $n=10$ , 62.5%), than those who were housed ( $n=4$ , 16.7%),  $X^2 = (1) 8.86, p < 0.05$ ). The association between housing status and attrition in the NC control condition was not significant (homeless individuals:  $n=5$ , 33.3%, housed individuals:  $n=5$ , 20.8%;  $X^2 = (1) 0.75, p=0.38$ ).

Accounting for the effect of pre-randomization EtG levels (OR=7.47, 95% CI=3.87–14.43,  $p < 0.05$ ) and group assignment (OR=2.97, 95% CI=1.23–7.18,  $p < 0.05$ ), neither homelessness at baseline (OR=1.28, 95% CI=0.44–3.76,  $p=0.66$ ), nor the interaction of homelessness and group assignment (OR=0.56, 95% CI=0.12–2.76,  $p=0.49$ ) were associated with the proportion of EtG-positive urine test results during the intervention phase (homeless participants: Estimated Marginal Mean=64%, Standard Error=7%; housed participants: Estimated Marginal Mean=65%, Standard Error=5%).

## DISCUSSION

Nearly 40% of the sample of adults with co-occurring SMI and alcohol dependence were homeless at study enrollment. Individuals who were homeless and randomized to CM were nearly four times more likely to drop out of CM, relative to those who were housed. The association between housing status and attrition was not significant in the NC control condition. Despite high rates of attrition among those randomized to CM, housing status was not significantly associated with EtG-assessed alcohol use during the CM intervention. This suggests that homeless adults who were able to attend CM visits attained a level of abstinence comparable to housed individuals. This finding is consistent with previous studies that found prize-based CM as well as housing and employment-based CM to be associated with increased abstinence in homeless populations.<sup>9–11</sup>

Reinforcing attendance (the behavior reinforced in the NC control condition) or reductions in drinking rather than abstinence may be strategies to retain those experiencing homelessness during treatment. Other strategies might include the addition of CM to low barrier housing arrangements, or delivering CM in shelters or other locations where individuals experiencing homelessness congregate. To better inform future CM modifications, further research is needed to explore why adults experiencing homelessness were less likely to complete CM, relative to individuals who were housed.

## Limitations

Limitations of this study include the relatively small sample size, which may have created challenges in detecting differences in alcohol abstinence based on housing status. However, GEE analyses included all randomized participants and power was increased by analyzing up to 36 urine samples per participant during the treatment phase. Participants were recruited from one large mental health agency in a city with high housing costs, potentially limiting generalizability. The parent study was not focused on homelessness, so assessment (i.e. number of nights spent unhoused, frequency of homeless episodes) was limited.<sup>12</sup> Additionally, as this was a randomized trial, attrition was defined as three weeks of no contact with the study team, whereas co-occurring disorder treatment programs typically have a higher threshold for attrition. Despite this relatively conservative definition of attrition, most individuals who dropped out of the intervention phase remained unreachable by study or clinic staff for extended periods of time.

## Conclusion

Individuals receiving CM who were experiencing homelessness, co-occurring alcohol dependence and SMI had higher rates of attrition than those who were housed. Homelessness was not associated with differences in EtG-assessed alcohol abstinence. Because homelessness is prevalent in populations with co-occurring substance use disorders and SMI (40% of the present sample), the unique barriers to addiction treatment engagement faced by this vulnerable population must be addressed by clinicians when providing CM. To reduce attrition, clinicians may want to provide reinforcers for attendance, in addition to abstinence. Research focused on understanding the reasons for CM attrition and strategies to improve retention of adults experiencing homelessness is needed.

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