

# Project-Based Housing First for Chronically Homeless Individuals With Alcohol Problems: Within-Subjects Analyses of 2-Year Alcohol Trajectories

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A review of 29 studies conducted worldwide estimated an alcohol dependence prevalence of 37.9% among homeless populations.<sup>1</sup> Among chronically homeless individuals (i.e., people with long-term, often-repeated episodes of homelessness<sup>2</sup>), the prevalence of alcohol dependence is even higher.<sup>3</sup> Alcohol dependence is associated with greater levels of alcohol problems, resulting from acute intoxication or long-term alcohol use, as well as increased risk for alcohol-related deaths.<sup>4-7</sup>

Unfortunately, traditional housing infrastructures designed to serve chronically homeless individuals with alcohol problems often fail to engage residents and comprehensively address their complex needs.<sup>8,9</sup> One reason for this failure might be perceived barriers to housing imposed by housing agencies, such as requiring psychiatric or substance abuse treatment attendance or abstinence from substance use.<sup>10</sup> Policymakers have therefore called for the development of low-barrier housing programs that might more effectively engage these individuals, house them, and attend to their needs.<sup>11,12</sup>

Housing agencies have begun to respond to this call by designing project-based Housing First approaches to fit the specific needs of chronically homeless individuals with alcohol problems.<sup>13</sup> As in other Housing First approaches (e.g., scattered-site Housing First), project-based Housing First for this population entails the provision of low-barrier, nonabstinence-based (i.e., not requiring abstinence from substance use), immediate, and permanent housing.<sup>14,15</sup> Specific to the project-based Housing First model, however, individuals are offered units within a single housing project, where they can elect to receive on-site case management and other supportive services. Although project-based Housing First programs are

**Objectives.** Two-year alcohol use trajectories were documented among residents in a project-based Housing First program. Project-based Housing First provides immediate, low-barrier, nonabstinence-based, permanent supportive housing to chronically homeless individuals within a single housing project. The study aim was to address concerns that nonabstinence-based housing may enable alcohol use.

**Methods.** A 2-year, within-subjects analysis was conducted among 95 chronically homeless individuals with alcohol problems who were allocated to project-based Housing First. Alcohol variables were assessed through self-report. Data on intervention exposure were extracted from agency records.

**Results.** Multilevel growth models indicated significant within-subjects decreases across alcohol use outcomes over the study period. Intervention exposure, represented by months spent in housing, consistently predicted additional decreases in alcohol use outcomes.

**Conclusions.** Findings did not support the enabling hypothesis. Although the project-based Housing First program did not require abstinence or treatment attendance, participants decreased their alcohol use and alcohol-related problems as a function of time and intervention exposure. (*Am J Public Health*. 2012; 102:511-519. doi:10.2105/AJPH.2011.300403)

receiving increased interest in the supportive housing field,<sup>16</sup> only a couple of studies to date have examined their effectiveness in this population.<sup>13,17</sup> These studies have shown that project-based Housing First programs are associated with increased housing stability, reduced use of publicly funded services and associated costs, and short-term reductions in typical daily alcohol use.<sup>13,17</sup>

Despite encouraging initial findings for the project-based Housing First approach,<sup>13</sup> abstinence-based programs are the mainstay of housing models in the United States.<sup>18</sup> Alcohol abstinence and abstinence-based treatment requirements are typical across a wide range of housing models (e.g., emergency shelters, transitional housing, halfway houses, permanent supportive housing).<sup>19</sup> Even as Housing First models are being recommended as evidence-based best practice<sup>12</sup> and are receiving more attention in the press,<sup>20,21</sup> debate continues about whether

nonabstinence-based housing approaches, such as project-based Housing First, are appropriate for chronically homeless individuals with alcohol problems.<sup>22</sup>

The argument for abstinence-based approaches is typically derived from the disease model of alcohol use disorder etiology, which conceptualizes alcohol dependence as a “chronic, relapsing brain disease.”<sup>23,24</sup> Proponents of the disease model posit that alcohol dependence should be treated through interventions designed to help people achieve and maintain abstinence.<sup>24</sup> The corollary is that by not prohibiting alcohol use and by supporting clients’ choices about their drinking goals, nonabstinence-based approaches may “enable” or facilitate continued, harmful drinking.<sup>25</sup> Despite this widespread belief, there is little empirical data to support it. Recent studies have shown that abstinence-based housing is not necessarily more effective than Housing First

approaches<sup>26,27</sup> and have indicated that clients and providers prefer the autonomy and sense of stability of Housing First over traditional housing models.<sup>28,29</sup>

The study aim was to address concerns about the appropriateness of project-based Housing First designed for chronically homeless individuals with alcohol problems. Specifically, we tested the enabling hypothesis,<sup>25,30</sup> which posits that the provision of nonabstinence-based Housing First would result in stable or increasing levels of alcohol use and alcohol-related problems. We predicted that the enabling hypothesis would not be confirmed and that participants in project-based Housing First would, on the contrary, show significant, within-subjects decreases in alcohol use and alcohol-related problems over a 2-year follow-up.

## METHODS

The follow-up study reported here was a 2-year expansion upon initial findings discussed in a previous article.<sup>13</sup> Data were collected in the context of a nonrandomized controlled trial comparing the effects of project-based Housing First and a wait list control condition on public system use and associated costs (details of the design, methods, and findings of the parent study are available in the initial report<sup>13</sup>).

### Participants

Participants were chronically homeless individuals with alcohol problems who had been allocated to the project-based Housing First condition in the parent study.<sup>13</sup> Participants were drawn from 2 sources: (1) a rank-ordered list of individuals who had incurred the highest public costs for alcohol-related use of emergency services, hospital, sobering center (a local sleep-off facility), and county jail in 2004 and (2) a list of eligible individuals suggested by community providers familiar with the target population.

In the parent study, housing program staff offered housing to people on the target list who were found in the community. Once housing was filled, additional participants were added to a wait list. Housing program staff obtained verbal consent. Interested individuals then met with research staff for an informational session, for which they were paid \$5, regardless of study participation. Those who

still wished to participate either completed the baseline assessment immediately or were scheduled for subsequent appointments.

Research staff obtained written, informed consent at baseline and verbally administered the questionnaires described here as part of a larger questionnaire battery. Research staff were trainees in social sciences fields, were required to attend a training session prior to conducting interviews, and were supervised by the research coordinator and research investigators (including licensed clinical psychologists). Research staff paid participants \$20 for each data collection interview, which occurred at baseline and 3-, 6-, 9-, 12-, 18-, and 24-month follow-ups.

When housing turnover occurred, research staff recruited control participants into the housing project according to their order on the wait list. Control participants who moved into a housing unit during the first 3 months of study enrollment were reassigned to the intervention group in the parent study ( $n=20$ ) and were included in the follow-up study ( $n=95$ ). The remaining wait-list control participants were not systematically assessed after the first 9 months because many moved into the Housing First project or other housing as it became available. Because complete 2-year data were available for the intervention group alone, analyses reported here only involve intervention participants.

### Measures

*Demographic variables for sample description.* Descriptive information (age, gender, ethnicity, education, employment, partnership status, and housing history) was assessed from single items in the baseline interview.

*Predictors and covariates.* Time spent in housing represented intervention exposure and was ascertained from program entry and exit dates recorded in housing agency records. Intervention exposure was calculated by subtracting the exit date from the entrance date for each housing episode at this specific housing project, summing the number of days across housing episodes, and converting the summary score from days to months of intervention exposure.

Mortality, including all causes of death during the 2-year study, was ascertained from agency records. Mortality was included as

a dummy-coded covariate to parallel previous analyses<sup>13</sup> and to account for the effects of data missingness on overall modeling of alcohol use outcomes in a group that experiences higher mortality attributable to conditions related to alcohol dependence.<sup>6</sup>

Illness burden was assessed at the baseline interview with the 19-item Medical Health Form.<sup>13</sup> Participants reported on the presence or absence of various medical disorders known to be common among chronically homeless individuals with alcohol problems (e.g., HIV, tuberculosis, hepatitis). Items were summed to generate an illness burden score. This measure was found to be reliable in this sample (Kuder-Richardson statistic of internal consistency for dichotomous items=0.70).

*Outcome variables.* The Alcohol Use Quantity Form was modified from the Timeline Follow-back for use with this population.<sup>13,31</sup> This measure was used at each interview and yielded alcohol quantity on typical and peak drinking occasions in the past 30 days (referred to as typical and peak quantity). Frequencies of alcohol use and drinking to the point of intoxication in the past 30 days were ascertained with items from the Addiction Severity Index.<sup>32</sup> These 2 items were dummy-coded in the final analysis to yield 30-day reports of at least 1 abstinent day and at least 1 day not drinking to intoxication.

Alcohol-related problems were measured at each interview with the 15-item Short Inventory of Problems (SIP-2R),<sup>33</sup> adapted from the Inventory of Drug Use Consequences-2R.<sup>34</sup> The SIP-2R features Likert scale items and was used to assess how often respondents experienced alcohol-related problems in the past 3 months (range: 0=never to 3=daily or almost daily). The SIP-2R summary scores range from 0 to 45 and have been shown to be both reliable and valid in substance-using populations.<sup>35</sup> Frequency of delirium tremens (DTs), a severe symptom of acute alcohol withdrawal, was measured during each interview with a single item from the ASI.<sup>32</sup> This item was dummy-coded to reflect any versus no self-reported DTs in the past 30 days.

Self-reported alcohol dependence symptoms were assessed during each interview with the Alcohol Dependence Checklist. This measure includes dichotomous, self-report items that correspond to the *Diagnostic and Statistical*

*Manual of Mental Disorders, Fourth Edition, Text Revision* (DSM-IV-TR) criteria for alcohol dependence.<sup>36</sup> The items were summed to generate a count of symptoms congruent with alcohol dependence ranging from 0 to 7 (Kuder-Richardson statistic of internal consistency for dichotomous items=0.70).

## Analyses

Multilevel growth models, which are a type of hierarchical linear model that includes random intercepts and time coefficients, were used to analyze the association between the predictors and outcome variables. Their usefulness in longitudinal, person-centered analyses have made multilevel growth models increasingly common in public health research.<sup>37,38</sup> Multilevel growth models allow for analysis of all available data with the maximum likelihood estimation method. This method avoids listwise deletion of participants with incomplete data over time, thereby minimizing bias and maximizing power.<sup>39</sup> Furthermore, it models individual changes in trajectories over time instead of averaging growth as a group.<sup>40</sup> Finally, many statistical software packages now offer generalized linear modeling options involving alternative distributions (e.g., Poisson and logistic), which can improve model fit when they better approximate the distributions of the outcome variables.<sup>41</sup>

Multilevel growth modeling with random intercepts and coefficients was conducted in Stata version 11<sup>42</sup> to test the hypothesis that intervention participants would evince significant, within-subjects decreases on alcohol use outcomes over the 2-year follow-up. Within-subjects analyses cannot imply causality because effects may reflect regression to the mean or other confounding variables. However, to increase confidence regarding the role of project-based Housing First in the effects observed in the study, both linear growth—which represented the passage of time in the study—and intervention exposure were examined as secondary covariates of interest. Variables were coded and centered (i.e., the grand mean was subtracted from each value to center it on the mean) to maximize interpretability and avoid problems of collinearity in the interaction effect.<sup>39</sup> A 2-level data structure was used, whereby individuals represented level 2 between-subjects effects, and nested, repeated observations represented level

1 within-subjects effects. Models incorporated 5 predictors and covariates: (1) time, (2) intervention exposure, (3) time  $\times$  intervention exposure interaction, (4) illness burden, and (5) mortality ( $n=10$ ). The level 2 model incorporated the random intercept and a random coefficient for time, which accounted for individual heterogeneity in growth on alcohol use outcomes.<sup>39</sup>

The 7 alcohol outcome variables were examined for univariate outliers and deviation from expected distributions. Because typical and peak alcohol quantity and symptoms congruent with alcohol dependence were positively skewed count or integer variables, Poisson growth models were used. Where necessary, additional overdispersion was modeled by adding a level 1 random intercept.<sup>40</sup> Alcohol-related problems were continuous summary scores, analyzed with a linear growth model. Because frequency variables were bimodally distributed and negatively skewed, they were dichotomized to facilitate analysis and interpretability of outcomes. The new, dichotomous frequency variables represented at least 1 abstinent day in the past month and at least 1 day not drinking to intoxication in the past month. Logistic growth models were used for the following variables: experience of DTs, at least 1 abstinent day, and at least 1 day not drinking to intoxication in the past month. All dichotomous outcome variables had sufficient cell frequencies for analyses. To enhance model interpretability, standardized coefficients were provided for linear models, and exponentiated coefficients (e.g., incident rate ratios, odds ratios) were provided for Poisson and logistic models. The significance level was set at  $P=.05$ , and confidence intervals were set at 95%.

## RESULTS

The sample ( $n=95$ ) was predominantly male (6.3% women) and was racially and ethnically diverse (Table 1). Participant response rates were 100% at baseline, 82% at 3 months, 79% at 6 months, 79% at 9 months, 80% at 12 months, 79% at 18 months, and 61% at 24 months.

Logistic regressions indicated that neither baseline drinking nor demographic variables significantly predicted missingness on corresponding outcome variables at the follow-up points ( $P>.05$  after Bonferroni corrections).

Although missingness occurring completely at random cannot be directly tested because the probability of missingness on the outcome variable is assessed as a function of the values of both the predictors and outcome variables, these tests suggested that the missingness mechanism was ignorable.<sup>43</sup> Use of maximum likelihood estimation in the analyses also served to minimize bias that might otherwise be introduced with listwise data deletion.<sup>43</sup>

The Poisson growth model for typical quantity was significant (Wald  $\chi^2$  [ $df=5$ ,  $n=95$ ]=25.51;  $P<.001$ ). After adjustment for mortality and illness burden, a significant effect for time and intervention exposure was observed (Table 2 shows model parameters). Thus, for each 3 months in the study, participants' typical quantity decreased by 7%, and for each month of intervention exposure, typical quantity decreased by an additional 3%. The Poisson model for peak quantity was also significant (Wald  $\chi^2$  [ $df=5$ ,  $n=95$ ]=35.48;  $P<.001$ ). As shown in Table 2, there was a significant time effect, which indicated that for each 3 months in the study, participants' peak quantity decreased by 8% (Figure 1). Participants' intervention exposure also predicted peak quantity: each month of intervention exposure was associated with an additional 3% decrease in peak quantity.

The logistic growth model testing the odds of reporting at least 1 day of abstinence in the past month was not significant (Wald  $\chi^2$  [ $df=5$ ,  $n=95$ ]=6.53;  $P=.26$ ). However, the logistic model testing the odds of participants reporting at least 1 day not drinking to intoxication was significant (Wald  $\chi^2$  [ $df=5$ ,  $n=95$ ]=14.12;  $P=.01$ ). After adjustment for mortality and illness burden, a significant time effect was observed (Table 2). For each 3 months in the study, participants' odds of reporting at least 1 day during which they did not drink to intoxication increased by about 21% (Figure 2). Also, the intervention exposure effect indicated an additional 6% increase in the odds of not drinking to intoxication for each month of intervention exposure (Table 2).

The model for alcohol-related problems, as measured by the SIP-2R, was significant (Wald  $\chi^2$  [ $df=5$ ,  $n=94$ ]=18.93;  $P=.002$ ). After adjustment for illness burden and mortality, participants reported lower frequency of alcohol-related problems for each

**TABLE 1—Baseline Descriptive Statistics for Study Sample of Chronically Homeless Individuals With Alcohol Problems Living in a Project-Based Housing First Program: US Pacific Northwest, 2005–2008**

Variable	Mean (SD) or %
Age, y	48.39 (9.39)
Race/ethnicity	
American Indian/Alaska Native	27.4
Asian	1.1
Black/African American	7.4
Hispanic	7.4
Native Hawaiian/Pacific Islander	3.2
White/European American	40.0
> 1 race	10.5
Other	3.2
Relationship status	
Married	2.1
Consider self married	1.1
Widowed	4.3
Separated	7.4
Divorced	33.0
Never married	52.1
Educational attainment	
Some high school	37.2
High school graduate/GED	29.8
Vocational school	8.5
Some college	18.1
College graduate	4.3
Some graduate school/advanced degree	2.2
Alcohol use	
Typical quantity (standard drinks/d)	24.39 (21.87)
Peak quantity (standard drinks/d)	39.85 (39.28)
Frequency (d/past mo)	23.75 (10.49)
Intoxication frequency (d/past mo)	19.82 (12.26)
Alcohol-related problems	
SIP-2R score <sup>a</sup>	23.34 (1.37)
Delirium tremens (lifetime experience)	65.2
Dependence symptoms currently endorsed <sup>b</sup>	5.22 (1.80)
Treatment episodes (lifetime)	17.19 (59.13)

Note. GED = general equivalency diploma; SIP-2R = Short Inventory of Alcohol Problems. Quantity and frequency variables were for the past 30 days. All other variables were for the past 3 months. The sample size was n = 95.

<sup>a</sup>Range = 0–45.

<sup>b</sup>Derived from *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision* (range = 0–7).<sup>36</sup>

3 months in the study and for each month of intervention exposure (Table 2). Time and intervention exposure also predicted participants' self-reported experience of DTs (Wald  $\chi^2$  [df = 5, n = 95] = 35.54;  $P < .001$ ). For each 3 months in the study, participants experienced a 30% decrease in the odds of

experiencing DTs (Table 2). For each month of intervention exposure, participants' odds of experiencing DTs decreased by an additional 10% (Figure 2).

The Poisson model testing the experience of symptoms congruent with alcohol dependence was significant (Wald  $\chi^2$  [df = 5, n = 95] =

25.88;  $P < .001$ ). For each 3 months during the study, symptoms congruent with dependence decreased by 4%, after adjustment for illness burden and mortality. Each month of intervention exposure was associated with an additional 2% reduction in symptoms congruent with dependence (Table 2).

## DISCUSSION

Two-year alcohol use trajectories were documented among chronically homeless individuals with alcohol problems living in a project-based Housing First program. These results extended previous studies' findings on this approach, which had focused primarily on housing stability, use of publicly funded services, and costs related to the use of those services.<sup>13,17</sup> The primary aim of the study was to test the enabling hypothesis,<sup>25,30</sup> which holds that nonabstinence-based housing encourages drinking and leads to increases in or maintenance of alcohol use and alcohol-related problems.

Contrary to the enabling hypothesis, participants showed statistically significant, within-subjects improvements on alcohol use outcomes over the 2-year follow-up. For every 3 months in the study, participants decreased their alcohol use on typical and peak drinking occasions by 7% and 8%, respectively. This decrease was not merely statistically significant but sizable: means for peak drinks decreased from nearly 40 drinks to 26 drinks over the 2-year follow-up. A corresponding reduction in alcohol-related problems was reflected in a 10-point decrease in mean SIP-2R scores over the course of the study. Furthermore, self-reported experience of DTs, a life-threatening health problem resulting from acute alcohol withdrawal, decreased from 65% to 23%. Participants were also more likely to avoid drinking to intoxication. At baseline, 54% of participants reported at least 1 day in the past month on which they did not drink to intoxication. By the 2-year follow-up, that number had increased to 73%. Moreover, alcohol dependence symptoms significantly decreased by 4% every 3 months, reflecting a change from 5 symptoms to 2 symptoms on average. These consistent improvements across alcohol use outcomes contradicted the enabling hypothesis, which would have predicted



**TABLE 2—Fixed-Effects Parameters for Alcohol Use Growth Models Among Chronically Homeless Individuals With Alcohol Problems in a Project-Based Housing First Program: US Pacific Northwest, 2005–2008**

Predictor	Model Coefficients (SE; 95% CI)	z Score	P
<b>Typical quantity (drinks in past 30 d)<sup>a</sup></b>			
Mortality covariate	0.25 (0.10; 0.12, 0.55)	-3.45	.001
Time	0.93 (0.02; 0.89, 0.97)	-3.12	.002
Illness burden	0.99 (0.03; 0.94, 1.05)	-0.37	.712
Intervention exposure (mo)	0.97 (0.01; 0.94, 0.99)	-2.62	.009
Time × intervention exposure	1.00 (0.003; 0.99, 1.005)	-0.38	.701
<b>Peak quantity (drinks consumed on peak drinking day in past 30 d)<sup>a</sup></b>			
Mortality covariate	0.13 (0.06; 0.05, 0.31)	-4.45	<.001
Time	0.92 (0.02; 0.87, 0.96)	-3.52	<.001
Illness burden	0.97 (0.03; 0.91, 1.04)	-0.88	.381
Intervention exposure (mo)	0.97 (0.01; 0.94, 0.997)	-2.13	.033
Time × intervention exposure	0.99 (0.003; 0.99, 1.005)	-0.48	.631
<b>Abstinent ≥ 1 d in past 30 d<sup>b</sup></b>			
Mortality covariate	2.33 (1.78; 0.52, 10.45)	1.11	.268
Time	1.02 (0.06; 0.90, 1.16)	0.36	.718
Illness burden	1.04 (0.06; 0.93, 1.15)	0.70	.485
Intervention exposure (mo)	1.03 (0.03; 0.97, 1.09)	1.03	.303
Time × intervention exposure	1.02 (0.01; 0.998, 1.03)	1.78	.075
<b>Did not drink to intoxication ≥ 1 d in past 30 d<sup>b</sup></b>			
Mortality covariate	7.08 (6.50; 1.17, 42.76)	2.13	.033
Time	1.21 (0.08; 1.06, 1.39)	2.73	.006
Illness burden	1.03 (0.06; 0.92, 1.15)	0.44	.661
Intervention exposure (mo)	1.06 (0.03; 1.002, 1.13)	2.02	.044
Time × intervention exposure	1.01 (0.01; 0.99, 1.02)	0.94	.348
<b>SIP-2R<sup>c</sup></b>			
Mortality covariate	-0.19 (0.10; -0.38, 0.01)	-1.87	.061
Time	-0.10 (0.04; -0.17, -0.03)	-2.69	.007
Illness burden	0.09 (0.09; -0.08, 0.27)	1.03	.304
Intervention exposure (mo)	-0.26 (0.10; -0.46, -0.05)	-2.48	.013
Time × intervention exposure	-0.02 (0.04; -0.10, 0.06)	-0.56	.572
<b>Experience of delirium tremens in past mo<sup>b</sup></b>			
Mortality covariate	0.24 (0.27; 0.02, 2.27)	-1.25	.211
Time	0.70 (0.05; 0.61, 0.80)	-5.12	<.001
Illness burden	1.23 (0.11; 1.03, 1.47)	2.24	.025
Intervention exposure (mo)	0.90 (0.04; 0.83, 0.98)	-2.36	.019
Time × intervention exposure	0.99 (0.01; 0.97, 1.01)	-1.01	.312
<b>Symptoms congruent with DSM-IV-TR alcohol dependence<sup>a</sup></b>			
Mortality covariate	0.69 (0.14; 0.47, 1.02)	-1.85	.064
Time	0.96 (0.01; 0.94, 0.99)	-3.20	.001
Illness burden	1.03 (0.01; 0.997, 1.06)	1.76	.079
Intervention exposure (mo)	0.98 (0.01; 0.97, 0.99)	-2.65	.008
Time × intervention exposure	1.00 (0.001; 0.997, 1.003)	-0.16	.875

Note. CI = confidence interval; SIP-2R = Short Inventory of Alcohol Problems; DSM-IV-TR = *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision*.<sup>36</sup>

<sup>a</sup>Poisson growth model (incident rate ratio).

<sup>b</sup>Logistic growth model (odds ratio).

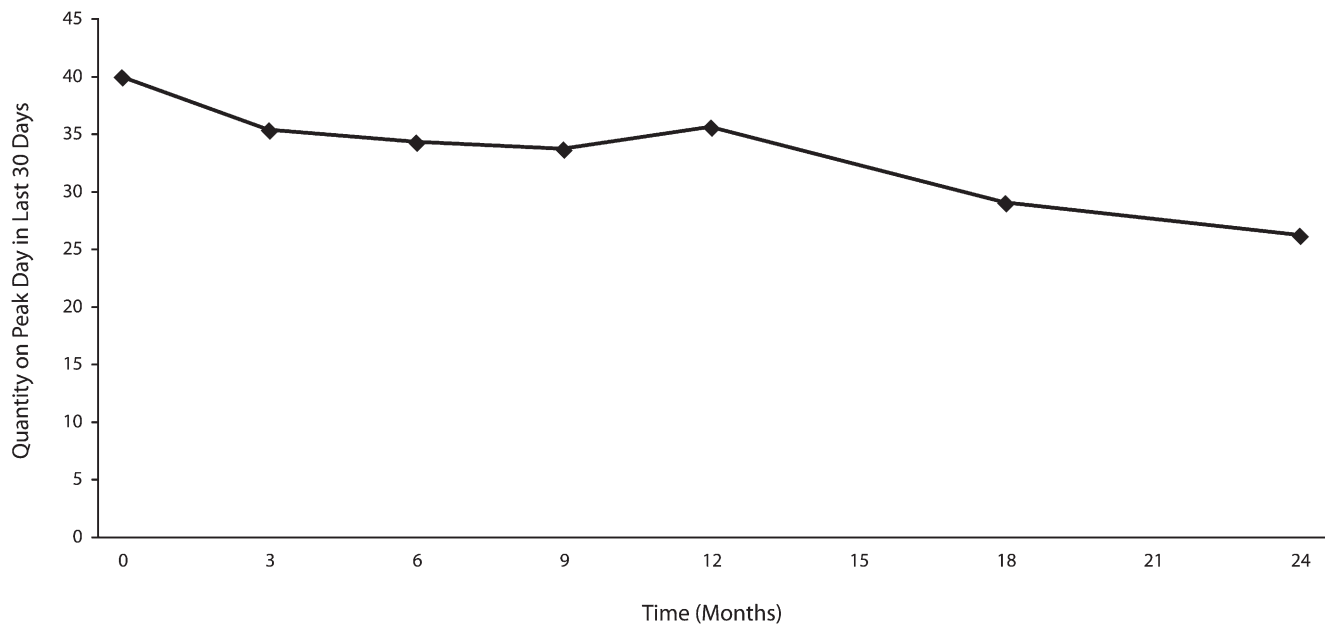
<sup>c</sup>Linear growth model (standardized coefficient [B]).

increased alcohol use attributable to less restricted access to alcohol and the lack of traditional treatment requirements associated with the project-based Housing First approach.

In addition to the linear decreases on alcohol use outcomes over time, the number of months residents were housed—which explicitly modeled intervention exposure—was a significant covariate in all models. Thus, greater intervention exposure was correlated with improved alcohol outcomes even after adjustment for overall time effects. Although analyses were within-subjects, which precluded causal conclusions regarding project-based Housing First effects, the consistent, significant associations between intervention exposure and improved alcohol outcomes provided correlational support for the hypothesis that project-based Housing First may be an important factor accounting for decreases in alcohol use and alcohol-related problems.

Within-subjects effects for time and intervention exposure remained significant even after adjustment for 2 clinically relevant covariates that commonly affect outcomes in this population: mortality and illness burden. Mortality in this sample was associated with less alcohol use prior to death. This finding is unsurprising because mortality was most often precipitated by long-term, chronic disease acquired prior to study recruitment (e.g., liver cancer, cirrhosis),<sup>13</sup> which likely limited participants' physical ability to consume alcohol. It should also be noted that the observed mortality rates corresponded to those in the larger population of chronically homeless individuals with alcohol problems.<sup>13</sup> Illness burden did not significantly predict alcohol use, dependence, or alcohol-related problems as measured by the SIP-2R, but illness burden was associated with a greater experience of DTs. It may therefore be concluded that, even after accounting for these clinically relevant and influential covariates, the association between project-based Housing First and improved alcohol use outcomes remained robust.

A controversial topic in the housing literature—whether Housing First approaches enable continued problem drinking—was addressed. Some researchers have questioned the clinical appropriateness of nonabstinence-based housing for populations with substance use disorders.<sup>22,44</sup> It has been suggested that



**FIGURE 1—Graph of mean peak alcohol use quantity by assessment time point in a sample of chronically homeless individuals with alcohol problems living in a project-based Housing First program: US Pacific Northwest, 2005–2008.**

Housing First interventions should be limited to people with primary psychiatric disorders and that providing housing for people with primary substance use disorders should be contingent on attendance at and success in abstinence-based treatment.<sup>45</sup> Multisite studies and reviews, on the other hand, suggest that permanent, low-barrier, supportive housing may be associated with longer-term housing stability, greater perceived consumer choice, and lower experience of coercion than are traditional, abstinence-based programs.<sup>15,17,19,28,46–48</sup> The follow-up study contributes to this growing literature because it is the first to show that the project-based Housing First approach is associated with improved alcohol use outcomes over the longer term—despite the fact that it does not require abstinence or treatment attendance. Nonetheless, randomized controlled trials are necessary to establish a causal link between project-based Housing First and alcohol use outcomes.

### Public Health Relevance

Housing First is increasingly advanced by government and public health agencies as an evidence-based best practice for addressing homelessness.<sup>11,12,49</sup> It is therefore important to critically examine programs on the verge of widespread adoption and understand their

associated effects across various health-related outcomes and affected populations.

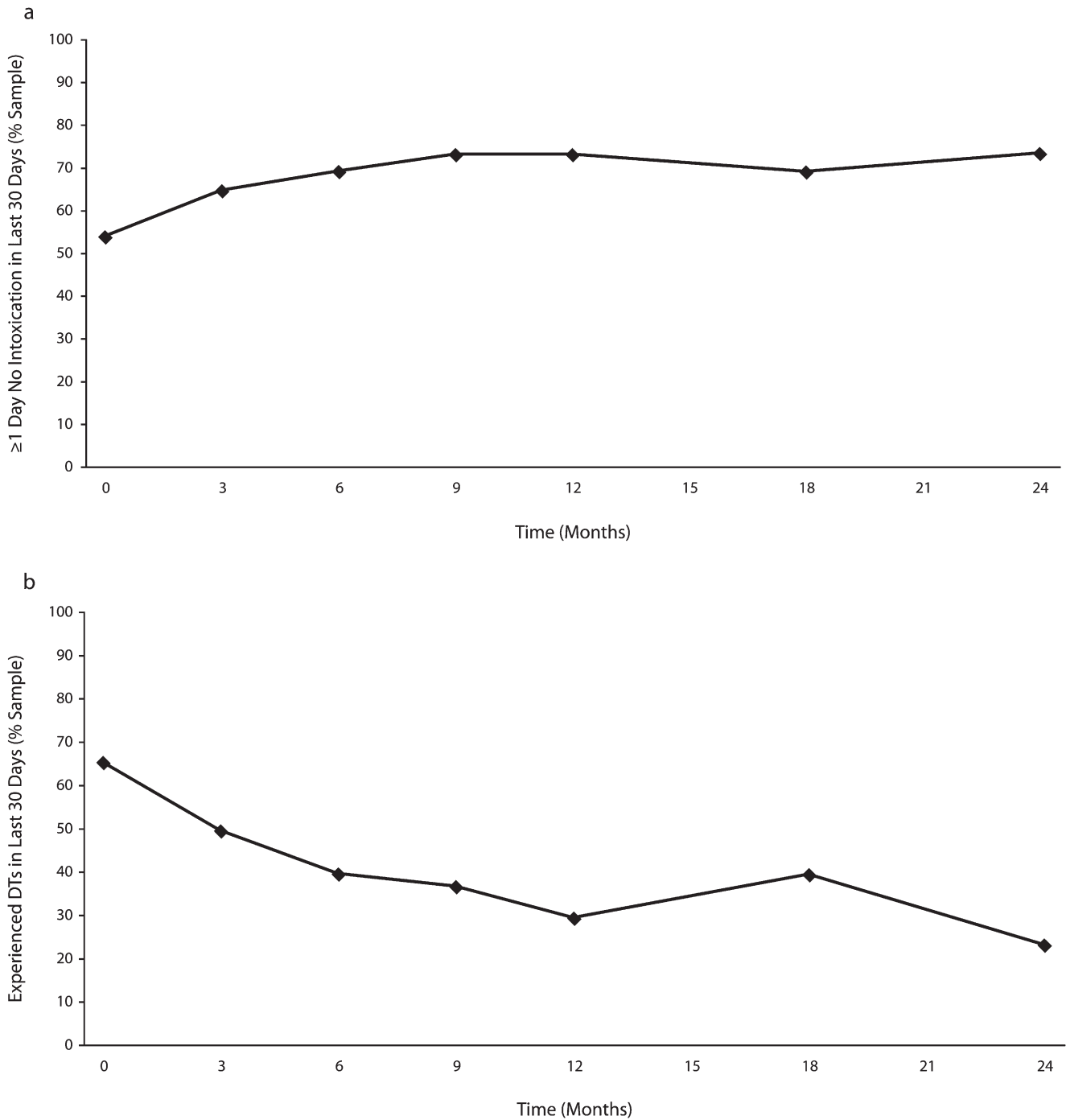
These findings contribute a more comprehensive, in-depth look at the association between project-based Housing First and alcohol use outcomes than is provided by previous studies. The focus on alcohol use outcomes is particularly clinically relevant because of the high prevalence of alcohol dependence reported in this population.<sup>1,50</sup> In addition, most Housing First interventions have been tested among individuals with primary psychiatric disorders.<sup>14,15,28</sup> Our study therefore extended the evidence base for project-based Housing First to a subset of the homeless population that accounts for a disproportionate amount of use of publicly funded services and related costs.<sup>2,13,51</sup>

### Limitations

The study sample represented a specific segment of the homeless population in a specialized setting and its larger social context (a progressive midsized city in the Pacific Northwest). The sample was more ethnically and racially diverse than the surrounding region, and its diversity may have differed from homeless populations in other areas of the United States. These findings may therefore not

be generalizable to other types of housing programs (e.g., scattered-site Housing First, transitional housing, traditional continuum-of-care housing), other segments of the homeless population, or settings with a less uniform population. Care should be taken when interpreting these findings and applying them to other populations, settings, and approaches.

Previous literature has suggested that self-report data can be subject to inaccuracies resulting from cognitive impairment, memory biases, social desirability, and item wording,<sup>52–56</sup> particularly for more specific, count-based questions.<sup>57</sup> Although these limitations may have affected the follow-up study, evidence for the validity of these self-report data also exists. First, findings involving specific, count-based measures (e.g., number of drinks) corresponded to noncount-based measures (e.g., occurrence of DTs). Next, questions were piloted and developed with the specific study population in mind and therefore focused on the discrete, recent, and manageable time frames recommended by researchers working with homeless populations and alcohol use outcomes.<sup>57–59</sup> Moreover, a psychometric study conducted parallel to the follow-up study indicated that participants' self-reported, 30-day service use showed acceptable concordance with



**FIGURE 2—Longitudinal graph of the percentages of a sample of chronically homeless individuals with alcohol problems in a project-based Housing First program reporting (a) at least 1 day on which they did not drink to the point of intoxication and (b) delirium tremens during the past 30 days: US Pacific Northwest, 2005–2008.**

archival records.<sup>58</sup> Taken together, these various means of ensuring the psychometric validity of self-report have increased our confidence in these findings.

Because of data-collection limitations and ethical concerns, the study did not include a randomized design or a control group. The within-subjects, correlational design therefore

precluded causal interpretations regarding associations between project-based Housing First and alcohol use trajectories. Thus, it is possible that other factors besides the housing

intervention might have accounted for the observed improvements in alcohol use outcomes. For example, steady decreases on alcohol use could point to statistical artifacts, such as the ceiling effect (i.e., participants may not have been physically able to increase drinking beyond current levels) and regression to the mean.<sup>60</sup> Nonetheless, intervention exposure was correlated with improved alcohol outcomes, even after adjustment for time effects that would take regression to the mean into account. Most important, our findings provide clear evidence in support of our hypothesis: we found consistent improvements across all alcohol use outcomes instead of the deterioration predicted by the enabling hypothesis.

## Conclusions

Two-year alcohol use trajectories were documented among residents in a project-based Housing First program to address concerns that such low-barrier, nonabstinence-based housing would enable increased or sustained alcohol use and alcohol-related problems. Contrary to the enabling hypothesis, participants decreased their alcohol use and alcohol-related problems as a function of time and intervention exposure. Because the study was correlational in nature, future randomized controlled trials are needed to establish whether these preliminary positive outcomes may be causally attributed to project-based Housing First.

Another important direction for future research is the exploration of mechanisms that might explain the association between project-based Housing First and alcohol use outcomes. Recent studies have suggested that the autonomy and sense of stability afforded by Housing First provide a foundation upon which residents may take their own steps toward positive behavior change,<sup>28,29</sup> including changes in their alcohol use. We look forward to the next research developments that will further establish and explicate these promising Housing First effects. ■

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At the time of the study, Susan E. Collins, Seema L. Clifasefi, Bonnie Burlingham, Elizabeth A. Dana, Megan Kirouac, and G. Alan Marlatt were with the Addictive Behaviors Research Center; Joshua A. Ginzler and Heather S. Lonzczak were with the Alcohol and Drug Abuse Institute; and Mary

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## Contributors

S.E. Collins developed the study idea, design, and methodology; conducted the primary statistical analyses; and served as the lead author or editor for most sections of the article. D.K. Malone contributed to study design and interpretation of the findings; contributed summaries of relevant literature for the introduction; outlined and wrote initial discussion drafts; and critically reviewed drafts of the article. S.L. Clifasefi contributed to literature searches and summaries of previous, related work; drafted key paragraphs for the introduction and the Discussion section; and edited drafts of the article. J.A. Ginzler contributed to data interpretation, provided critical feedback throughout study implementation, and reviewed the final article. M.D. Garner drafted paragraphs for the Methods section and reviewed and edited drafts of the article. B. Burlingham drafted paragraphs for the Methods section and critically reviewed and revised drafts of the article. H.S. Lonzczak drafted paragraphs for the Methods section and critically reviewed drafts of the article. E.A. Dana helped with data interpretation and reviewed multiple drafts of the article. M. Kirouac helped enter, clean, manage, and code the data; contributed to the literature review; conducted descriptive analyses; and critically reviewed and commented on drafts of the article. K. Tanzer provided feedback on earlier iterations of the article and reviewed the final version of the article. W.G. Hobson provided feedback on earlier aspects of this work. G.A. Marlatt gave feedback on study design and implementation and critically reviewed and provided feedback on drafts of the article. M.E. Larimer contributed to the design, methods, and data interpretation and critically reviewed and provided feedback on the article. All authors approved the final article.

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Institutional review board approval was obtained from the University of Washington and the King County Mental Health Chemical Abuse and Dependency Services Division.

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