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Improving Recovery Outcomes among MSM: The Potential Role of Recovery Housing

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Abstract

Background: Gay, bisexual, and other men who have sex with men (MSM) face unique recovery challenges. Recovery housing may play an important role in improving outcomes among MSM, but little is known about their experiences in these settings.

Methods: This study examined 3-month outcomes among MSM (N=22) living in a group of recovery residences in Texas, one of which is a home specifically designated for gay and bisexual men. Upon intake, adult MSM were recruited to participate in the study, which involved a baseline and 3-month phone interview and allowing study staff to access records maintained by the program about their stay.

Results: At follow-up, only two (9.1%) reported used of any substances in the past 30 days. The vast majority (73%) had attended outpatient substance use treatment in the past three months, and 86% reported working for pay during the past 30 days. All participants reported attending four or more 12-step meetings in the past 30 days. Use of dysfunctional coping strategies significantly decreased, however so did scores on health-related quality of life.

Conclusions: MSM have complex treatment needs. Recovery housing may help improve outcomes among MSM by bridging formal substance use treatment with community-based recovery support.

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Keywords

Recovery; MSM; recovery housing; recovery residences; recovery capital

Introduction

In the US, men who identify as gay or bisexual are more likely to meet criteria for a past year substance use disorder (SUD) than those who identify as heterosexual (16.7% vs. 10.6%; Medley et al., 2016). Among those who access substance use treatment, gay, bisexual, and other men who have sex with men (MSM) present complex challenges. MSM are at increased risk for depression (Cochran & Mays, 2000; Cochran, Sullivan, & Mays, 2003; King et al., 2008) as well as infectious, chronic, and life threatening medical conditions, including HIV (Baker et al., 2009; Centers for Disease Control and Prevention (CDC), 2017; CDC, 2010; Silverberg et al., 2012; Witt et al., 2013). Histories of childhood sexual/physical abuse and other forms violent victimization are also more common among MSM (Friedman et al., 2011; Goldberg & Meyer, 2013). Indeed, substance use, depression, HIV, and violence are often interconnected and mutually reinforcing among MSM and characterized as "syndemic" in nature (Friedman, Marshal, Stall, Cheong, & Wright, 2008; Herrick et al., 2013; Mustanski, Andrews, Herrick, Stall, & Schnarrs, 2014; Singer, 2009; Stall et al., 2003).

MSM encounter similar risk factors for SUD as other men, but they also experience risk factors that are unique to sexual minorities. Stigma, prejudice, and discrimination create hostile environments that increase risk for negative outcomes (Meyer, 2003). Solidarity and cohesiveness within the gay community can serve as a critical resource (Kelly, Carpiano, Easterbrook, & Parsons, 2014; Meyer, 2003; Toomey, Ryan, Diaz, & Russell, 2018), but substance use is common in places where MSM may go to spend time with their peers, such as in bars and clubs (Green, 2003; Greenwood et al., 2001; Halkitis & Parsons, 2002) as well as in gay neighborhoods and other social enclaves (Carpiano, Kelly, Easterbrook, & Parsons, 2011). These settings may not only elevate risk for SUD but may also complicate addiction recovery, as drinkers in one's social network is a consistent predictor of substance use and relapse (Delucchi & Kaskutas, 2010; Delucchi, Matzger, & Weisner, 2004; Mericle, Kaskutas, Polcin, & Karriker-Jaffe, 2018).

By facilitating connections with others in recovery, encouraging involvement with mutual aid groups, and providing supportive and drug/alcohol-free environments in which residents learn and practice strategies to address the challenges of everyday life, recovery housing (e.g., Oxford Houses and other sober living environments) plays an important role in the recovery process (Jason, Mericle, Polcin, & White, 2013). The notion of recovery capital has been used to describe resources one might have available to initiate and sustain recovery (Cloud & Granfield, 2008). Although this was originally developed to understand how individuals were able to overcome addiction without formal treatment (Granfield & Cloud, 1999, 2001), it is also a useful framework to conceptualize targets of intervention to achieve favorable outcomes, which are increasingly recognized in terms of health, wellness,

meaningful connections with others, and quality of life (Belleau et al., 2007; Laudet, 2011; Substance Abuse and Mental Health Services Administration, 2012).

Studies of residents in Oxford Houses (Jason & Ferrari, 2010; Jason, Olson, Ferrari, & Lo Sasso, 2006; Jason et al., 2007) and California sober living houses (Polcin, Korcha, Bond, & Galloway, 2010; Polcin, Korcha, Bond, & Galloway, 2010) have consistently found positive substance use, employment, and criminal justice outcomes. Some more recent studies have also examined recovery capital and quality of life among recovery housing residents (Cano, Best, Edwards, & Lehman, 2017; Mericle & Miles, 2017; Stevens, Guerrero, Green, & Jason, 2018). However, we know very little about the outcomes of sexual minorities, like MSM, in recovery housing. This is an unfortunate gap in the literature. In addition to being at increased risk for SUD, MSM face unique challenges in their recovery, and recovery housing may be an especially valuable resource for MSM to build connections with others in recovery. Recovery housing specifically for MSM may help men feel more comfortable sharing their experiences with other residents and facilitate connections with *other MSM in recovery*.

To begin addressing this gap, the aims of this study were to present short-term recovery outcomes of MSM entering a group of recovery homes, one of which was designated as a home for gay/bisexual men (hereafter referred to as the gay/bi men's home—(see Mericle, Carrico, Hemberg, de Guzman, & Stall, Under review). We calculated rates of substance use, 12-step involvement, and employment in the past 30 days at follow-up and collected program data on length of stay, outpatient treatment involvement, and discharge status. We also examined differences from baseline to follow-up across of variety of recovery measures, including quality of life, general health, depression, coping skills, social support, and overall recovery capital. We hypothesized that we would see improvements on these measures from baseline to follow-up. Because MSM could have entered the gay/bi men's home or another one of the men's homes, we also explored differences in these outcomes by house type. We hypothesized that MSM living in the gay/bi men's home would have better outcomes than those living in the other men's homes.

Methods

Study Site, Participants, and Recruitment Procedures

The recovery homes studied were located in Austin, Texas. At the time of the study, there were 10 homes (3 for women; 7 for men) with a total capacity of 113 beds. These homes were similar to other types of recovery residences, however unlike Oxford Houses and California sober living homes, residents in these homes participated in routine urine drug screens, met regularly with professional recovery coaches, and had access to substance use treatment services via linkage to an intensive outpatient program (IOP) opened specifically to meet the needs of the recovery home residents (Mericle, Polcin, Hemberg, & Miles, 2017).

All procedures involving human subjects were approved by the Public Health Institute IRB. Newly admitted male residents were eligible to participate if they were 18 or older and had a male sex partner in the past five years or reported their sexual orientation as something other

than “only heterosexual.” During the 15-month recruitment period, 43 residents met these criteria; 35 consented to participate, and 25 completed their baseline interview within the first month after moving in. Seventeen moved into the gay/bi men’s home. No difference were found between MSM who were eligible and completed an interview and those who did not.

As Table 1 displays, the majority were coming from residential/inpatient substance use treatment. Over half reported that amphetamine/methamphetamine use was the focus of their recovery efforts. Consistent with other studies of MSM, participants reported a number of co-occurring conditions. Participants moving into the gay/bi men’s home were older and more likely to report that the focus of their recovery efforts was amphetamine/methamphetamine use, that they suffered from a chronic medical illness, and that they had been physically assaulted as an adult (see Mericle, Hemberg, Stall, & Carrico, Under review for addition background on recruitment procedures and participant characteristics).

Data Collection Procedures

Interviews were completed by phone. Participants could complete the interviews at a place of their choosing, but arrangements were made so that residents could use the recovery home central offices. Data were collected with a computer-assisted, web-based interview platform, and the baseline interviews generally lasted 60–90 minutes. Participants received a $25 gift card for completing the baseline interview and an additional $10 for completing it when initially scheduled.

Two weeks prior to the 3-month anniversary of their baseline interview, participants were recontacted to schedule their 60-minute follow-up interview, for which they could receive a $50 gift card. A total of 22 participants completed a follow-up interview (88% retention rate). The three who did not had moved into the gay/bi men’s home, but few differences were found between those who completed 3-month follow-ups and those who did not on demographics or baseline levels of various outcomes investigated. Those who did not complete follow-ups rated their overall quality of life higher at baseline than those who did (5.0 vs. 3.9, $p<0.05$).

Three months after the last 3-month follow-up interview was completed, administrative data was obtained from the recovery home program’s management information system. These data were collected to gather information on enrollment in the program’s companion intensive outpatient (IOP) program and to track participants’ program status beyond the 3-month follow-up interview.

Measures

Substance use and related recovery outcomes.—Demographics and information about use of substances as well as days worked in the past 30 days was assessed with the Addiction Severity Index-Lite.(Cacciola, Alterman, McLellan, Lin, & Lynch, 2007) Information on receipt of outpatient substance use treatment in the past 3 months as well as 12-step involvement in the past 30 days was gathered with an augmented version of the Treatment Services Review (Cacciola et al., 2008; McLellan, Alterman, Cacciola, Metzger,

& O'Brien, 1992). Length of stay was calculated from program admission and discharge dates. We also collected data on discharge status and whether participants were enrolled in the program's affiliated IOP program.

General quality of life, health-related quality of life, and current depression.— Two summary items from the WHOQOL-Bref (Skevington, Lotfy, & O'Connell, 2004) were used to measure general and health-related quality of life. Participants rated their quality of life in the past 30 days from 1 (Very poor) to 5 (Very good) and as well as how satisfied they were with their health from 1 (Very dissatisfied) to 5 (Very satisfied). To screen for current depression, we used the Patient Health Questionnaire-8 (PHQ-8; Kroenke et al., 2009) which asks respondents how often in the past two weeks they experienced eight different depressive symptoms with response options ranging from 0 (Not at all) to 3 (Nearly every day). Ratings for each item were summed to produce a total score which could range from 0 to 24 (α>0.80).

Coping strategies.—The Brief COPE (Carver, 1997) assesses the use of a variety of different coping strategies. Respondents were asked to indicate how often, on a scale ranging from 1 (not doing it at all) to 4 (doing it a lot), they had been implementing various coping strategies. Following work of Cooper and colleagues (Cooper, Katona, & Livingston, 2008; Cooper, Manela, Katona, & Livingston, 2008), we created subscales to measure problem-focused coping as well as dysfunctional coping. Items were summed to produce subscale scores, with higher scores indicating greater use of the particular types of strategies: problem-focused coping scores could from 6 to 24 (α>0.80), and dysfunctional coping scores could range from 8 to 32 (α=0.73 baseline; α>0.80 follow-up).

General Social Support.—We assessed general social support from friends and family separately using the 7-item versions of the Perceived Social Support instrument (Connors et al., 1994; Rice & Longabaugh, 1996). These items ask respondents to rate from 1 (Disagree) to 3 (Agree) how much they agree with statements about their friends and then again about their family. After recoding reverse-scored items, ratings for each item were summed to produce a total score which could range from 7 to 21 ($\alpha \geq 0.80$). Higher scores indicate greater social support.

Recovery Capital.—We used the Assessment of Recovery Capital (ARC; Groshkova, Best, & White, 2013) to measure participants' overall recovery capital. Participants were asked to indicate whether or not they agreed with statements that described their experience on the day of assessment. The 50 items assess recovery capital across a variety of dimensions and were summed to create an overall score which could range from 0 to 50, with higher scores indicating greater levels of recovery capital (α>0.80).

Statistical Analyses

Descriptive statistics were used to summarize 3-month outcomes as well as program status and length of stay. Due to the small sample size, non-parametric tests were used to examine differences between MSM living in the gay/bi men's home and those living in other men's homes. Generalized estimating equation (GEE; Diggle, Heagerty, Liang, & Zeger, 2002)

techniques were used to examine differences from baseline follow-up. Separate interaction models were run to test the differential changes over time by house type. To minimize potential bias in our GEE estimates due to sample size (Paul & Zhang, 2014), we applied a degrees of freedom correction (Cook, 2015; Manci & DeRouen, 2001). Scale scores were assumed to be normally distributed. When violations were suspected, sensitivity analyses were conducted with transformed variables. All analyses were conducted in Stata v15 (StataCorp., 2017).

Results

Table 2 displays key recovery outcomes assessed during the 3-month follow-up interview. Among the 22 interviewed, 16 participants (73%) were still in the program. Only two reported any substance use in the past 30 days. The majority had attended an outpatient substance use treatment program in the past three months (73%). Most (86%) reported working for pay during the past 30 days, reflecting an average of 18.7 days (*SD*=10.2). All participants reported attending four or more (roughly one per week) 12-step meetings in the past 30 days; the average number of meetings attended was 18.2 (*SD*=7.5). All but one participant reported meeting with a 12-step sponsor in that past 30 days. There were no differences in these outcomes by house type.

Table 2 also displays program-related outcomes for study participants. Nearly a third (32%) participated in the affiliated IOP program. Five were still residents when the administrative data was pulled. Among those with an admission and discharge date, the average length of stay was 123 days (SD=92). Thirty-five percent of participants were recorded in the administrative data as successfully completing the program, 45% were recorded with a discharge status reflecting unsuccessful completion (i.e., they had left the program early (n=5), relapsed (n=3), or were otherwise non-compliant (n=1)), and 20% were missing information on their discharge status. No differences were found with respect to length of stay or discharge status by house type.

Table 3 displays scores on various measures assessed at baseline and again at follow-up. Effects sizes (i.e., Cohen's d adjusted for correlation between scores; Morris & DeShon, 2002) were calculated to aid in the interpretation of differences over time. With a few exceptions, effects were generally small to medium (Cohen, 1992). Dysfunctional coping scores decreased from baseline to 3-month follow-up ($B_{\text{interview}}$= −4.83, p<0.001). There was also a significant decrease in health-related quality of life ($B_{\text{interview}}$= −0.56, p<0.05). Changes in scores on other scales were generally in the anticipated direction, and many approached statistical significance (p<0.10). In sensitivity analyses, a cubic transformation of scores on the friend's perceived social support scale resulted in the model coefficient for interview time point reaching statistical significance (p<0.05). No differential effects of time were found by house type on any of these measures.

Discussion

MSM residents at follow-up reported low rates of substance use and high rates of employment. Findings also highlight the important role that recovery housing can play in

extending the substance use continuum of care by bridging formal substance use treatment and community-based supports. Many of the MSM in this study were coming from residential/inpatient substance use treatment. During the first three months after moving in, the majority continued to be involved in outpatient treatment, and all were actively engaged in 12-step activities.

Among those for whom it could be calculated, the average length of stay was only four months, and many participants for whom a reason was given for why they were no longer active in the program left unsuccessfully. Prior studies of other types of recovery housing have highlighted the importance of ensuring that residents stay a minimum of six months (Jason et al., 2007; Jason, Salina, & Ram, 2016). The homes in this study represent a higher level of care than other types of recovery housing; it is possible that a shorter length of stay may represent the natural point at which residents transition to a less-intense living setting. Regardless, it would be important at the 3-month juncture to begin working with residents to either remove barriers to staying on or to begin discussing other living settings to ensure that those who leave prior to completing a 6-month stay will be as prepared as possible for future recovery challenges.

We found that health-related quality of life decreased from baseline to 3-month follow-up. This finding serves as a reminder of the unique challenges facing MSM in recovery. In our sample, nearly half reported having a chronic medical condition, the most commonly reported being HIV positive (Mericle, Hemberg, et al., Under review). It is critical that risk reduction strategies and linkage to healthcare providers be integrated into recovery support services for MSM. While we did not find differential changes in health-related quality of life by house type, we did find that significantly more men with chronic health conditions were in the gay/bi men's home. Recovery residences designated specifically for MSM may encourage those with HIV to pursue recovery housing and help operators focus resources to address their needs.

While changes in depression and social support were in the expected direction and of a moderate magnitude, they were not statistically significant. Since depression is common among MSM (Joseph et al., 1990; Mills et al., 2004; Paul et al., 2002) and social support key to recovery and general wellbeing (Broome, Simpson, & Joe, 2002; Groh, Jason, Davis, Olson, & Ferrari, 2007; Turner, 1981), though encouraging, additional work is needed to understand the role of recovery housing for these outcomes among MSM. However, consistent with notions about recovery housing being an environment in which individuals can learn and practice life skills, we did find significant reductions in dysfunctional coping. We did not find increases in problem-focused coping. In addition to helping those in recovery *not* do things, it is important that programming also address adaptive coping strategies and generalizable problem-solving.

We did not find evidence for differential outcomes by home type. In some respects, this is fortunate. Specialized substance use treatment in the US for members of the LGBT community is scarce (Cochran, Peavy, & Robohm, 2007); recovery housing even more so. However, our work with MSM in recovery housing has found that men living in LGBT-specific recovery housing have unique needs and recovery goals, and that it is important to

them to be living with residents who share a common understanding their experiences (Mericle, Carrico, et al., Under review; Mericle, Hemberg, et al., Under review). Future studies enrolling larger samples of MSM are needed to more definitively address the question of whether LGBT-specific housing is associated with improved outcomes and to more thoroughly investigate factors related to successful outcomes (short- and long-term) among MSM.

Several limitations of this work should be noted. In addition to a brief follow-up timeframe and small sample, this study recruited participants from one group of recovery homes in Texas, potentially limiting the generalizability of these findings to other types of recovery residences in other geographic regions. Additionally, only slightly more than half of all eligible residents participated in the study. Based on feedback from participants, we know that the first month was a particularly chaotic time for new residents, and it is possible that our findings represent the more motivated and highly functional MSM. If that it is the case, however, it underscores the urgency to study and intervene with MSM in recovery housing given the complex needs reflected in this sample. Finally, we found low rates of substance use in the past 30 days, but this was based on self-report. It should be noted, however, that the program operating the homes routinely conducted urine drug screens, and study participants gave us permission to access results from these tests and their discharge status. Notably, only three participants were discharged due to substance use—one after he had completed the 3-month follow-up interview.

Conclusions

Addiction recovery among MSM is fraught with a variety of challenges. Findings from this study suggest that recovery housing may play an important role in the recovery process among MSM in many of the same ways that it does for all residents, but particularly with respect to serving as critical bridge between inpatient/residential treatment and engagement in community-based 12-step groups. Given the increased risk for HIV among MSM, it is critical that risk reduction strategies and attention to the healthcare needs of MSM via linkage to healthcare providers be integrated into recovery support services provided to them. Housing specifically for MSM may reduce perceived barriers to recovery housing and help operators ensure that their needs are addressed by targeting resources and adapting programming to meet the unique needs of this population.

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Table 1.

Baseline Sample Characteristics

	Full Sample (N=25)		Gay/Bi Men's Home (N=17)		Other Men's Homes (N=8)		
	n	%	n	%	n	%	
Race/Ethnicity							
White/Caucasian	17	68.0	10	58.8	7	87.5	
Black/African American	1	4.0	1	5.9	0	0.0	
Hispanic	1	12.5	5	29.4	6	24.0	
Other	0	0.0	1	5.9	1	4.0	
Age (M, SD)	33.4	10.1	36.6	9.4	26.4	8.3	*
Sexual Identity							
Straight/heterosexual	2	8.0	0	0.0	2	25.0	
Gay/homosexual	21	84.0	16	94.1	5	62.5	
Bisexual	2	8.0	1	5.9	1	12.5	
Educational Attainment							
Less than high school diploma (<12 yrs)	1	4.0	0	0.0	1	12.5	
High school diploma	6	24.0	4	23.5	2	25.0	
Some college or higher (>12 yrs)	18	72.0	13	76.5	5	62.5	
Residential Treatment Prior to Entry	19	76.0	13	76.5	6	75.0	
Primary Focus of Recovery							**
Alcohol	5	20.0	3	17.7	2	25.0	
Heroin/other opiates or analgesics/sedatives or hypnotics	4	16.0	1	5.9	3	37.5	
Amphetamines/methamphetamines	14	56.0	13	76.5	1	12.5	
Marijuana	1	4.0	0	0.0	1	12.5	
Polysubstance use	1	4.0	0	0.0	1	12.5	
Co-occurring Syndemic Conditions							
Chronic medical conditions	11	44.0	10	58.8	1	12.5	*
Verbal/physical assault or threats of violence (age 12–14)	24	96.0	16	94.1	8	100.0	
Verbal/physical assault or threats (age 12–14, orientation related)	17	68.0	12	70.6	5	62.5	
History of sexual victimization	19	76.0	13	76.5	6	75.0	
Physically assaulted as an adult	16	64.0	14	82.4	2	25.0	*

NOTES. Differences by house type and follow-up interview status were tested with non-parametric tests (Wilcoxon rank-sum and Fisher's exact tests). A total of 22 participants completed their 3-month follow-up interview (88% follow-up rate). Few differences were found between those who completed follow-ups with those who did not on demographics or baseline levels for various outcomes investigated. Those who did not complete a follow-up rated their overall quality of life higher at baseline than those who completed it (5.0 vs. 3.9, p=0.046) and had attended fewer than half as many 12-step/self-help meetings in the past 30 days (12.0 vs. 24.9, p=0.085).

* p<0.05

** p<0.01

Table 2.

3-month and Program Outcomes

	Full Sample		Gay/bi Men's Home		Other Men's Homes	
	n	%	n	%	n	%
Recent Substance Use (Past 30 Days; N=22)	2	9.1	1	7.1	1	12.5
Worked for Pay (Past 30 days; N=22)	19	86.4	11	78.6	8	100.0
Attended 4+ Mutual Aid Meetings (Past 30 days; (N=22)	22	100.0	14	100.0	8	100.0
Met with a Mutual Aid Sponsor (Past 30 days; N=22)	21	95.5	14	100.0	7	87.5
Attended Outpatient Substance Use Treatment (Past 3 months; N=22)	16	72.7	10	71.4	6	75.0
Attended Program's Companion Intensive Outpatient Program (N=25)	8	32.0	5	29.4	3	37.5
Program Discharge Status (N=20)						
Unsuccessful (left early, non-compliant, relapsed)	9	45.0	6	46.2	3	42.9
Successful completion	7	35.0	5	38.5	2	28.6
Missing	4	20.0	2	15.4	2	28.6
Length of Stay (N=20; M, SD)	123	92.0	113	77.8	143	118.4

NOTES. A total of 22 participants completed 3-month follow-up interviews. Five participants were still in the houses when administrative data was pulled; length of data available for 20 participants. Differences in outcomes between those in the gay/bi men's home and those in the other men's homes were analyzed with non-parametric tests (Wilcoxon Rank-sum and Fisher's exact tests) due to small sample sizes.

Table 3.

Changes from Baseline to Follow-up

	Baseline Scores						3m Follow-up Scores								
	Full Sample (N=25)		Gay/Bi Men's Home (N=17)		Other Men's Home (N=8)		Full Sample (N=22)		Gay/Bi Men's Home (N=14)		Other Men's Home (N=8)		Effect Size	GEE Models Testing Effect of Interview Time point	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	d	Coef	p
Quality of Life (1–5)	4.08	0.95	4.24	0.90	3.75	1.04	4.05	1.00	4.14	0.86	3.88	1.25	−0.05	0.07	0.574
Health-related Quality of Life (1–5)	4.24	0.83	4.35	0.86	4.00	0.76	3.64	1.09	3.64	1.22	3.63	0.92	−0.56	−0.56	0.015
Depression (0–24)	8.60	5.18	8.53	5.15	8.75	5.60	7.00	5.58	6.93	5.23	7.13	6.53	−0.37	−1.76	0.060
Problem-focused Coping (6–24)	20.12	3.42	20.88	2.89	18.50	4.07	18.91	3.84	19.86	3.61	17.25	3.88	−0.30	−1.09	0.205
Dysfunctional Coping (8–32)	16.72	4.81	17.06	5.14	16.00	4.24	11.91	3.15	11.21	2.36	13.13	4.09	−1.03	−4.83	0.000
Social Support-Friends (7–21)	18.24	3.26	19.06	1.78	16.50	4.90	18.95	2.73	19.43	1.65	18.13	4.02	0.37	0.84	0.053
Social Support-Family (7–21)	15.64	4.58	15.71	4.45	15.50	5.15	16.82	4.64	16.93	4.58	16.63	5.04	0.40	1.38	0.082
Recovery Capital (0–50)	41.48	7.57	42.71	6.11	38.88	9.99	43.18	8.48	43.86	4.50	42.00	13.24	0.32	1.65	0.152

NOTES. Means and standard deviations of scale scores are presented for illustrative purposes. Effect sizes (Cohen's d) were adjusted for dependence between means. A negative effect size indicates that means at follow-up were lower than at baseline. Generalized estimating equation (GEE) techniques were used to examine differences on measures of quality of life, depression, social support, coping, and recovery capital from baseline to the 3-month follow-up interview. Separate interaction models were run to test the differential effects of time by house type. There was no evidence for a differential effect of time by house type, so these results were not listed (available from corresponding author).