Full length article

Beneficial effects of motivational interviewing case management: A latent class analysis of recovery capital among sober living residents with criminal justice involvement

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ABSTRACT

Background: This secondary analysis uses data from a recent clinical trial conducted with probationers and parolees with substance use disorders (N = 330) residing in Sober Living Houses (SLHs). The treatment condition received Motivational Interviewing Case Management (MICM), while controls received usual care SLH residency. Both conditions improved on multiple domains, though residents randomized to MICM improved significantly more than usual care controls on criminal justice outcomes. Because MICM is designed to help ex-offenders attain more recovery capital (RC) in multiple domains, we hypothesized MICM participants that already possessed higher RC would show significantly greater improvement at follow-up than usual SLH residents with higher RC. Moreover, MICM and usual SLH residents with low RC would show no differences at 1-year follow-up.

Methods: A latent class analysis (LCA) grouped participants into two patterns of RC: those with low RC and those with high RC. These classes were interacted with study condition to predict change on six Addiction Severity Indices (ASI) at follow-up.

Results: MICM was more effective for the higher RC class, with greater improvement in drug, legal, and psychiatric outcomes for those who attended at least three MICM sessions. MICM was no more beneficial than usual care for those in a low RC class.

Conclusions: SLH operators should consider implementation of MICM for residents with more RC resources. Those with fewer recovery resources, such as a history of psychiatric problems or physical/sexual abuse, would benefit from a more intensive intervention to assist them with improving the amount and quality of their RC.

1. Introduction

For many persons on probation or parole, lack of access to a stable, alcohol- and drug-free living environment is a serious hindrance to avoiding recidivism and a host of related problems. In California, sober living houses (SLHs) have increasingly become a viable option for many of these individuals. The essential characteristic of SLHs is that they are alcohol- and drug-free living environments for persons attempting to maintain abstinence from these substances (Polcin and Henderson, 2008). Although SLHs have a long history of providing housing to persons on probation or parole (Wittman and Polcin, 2014), only a limited number of studies have examined outcomes among SLH residents. One such study showed probationers and parolees residing in SLHs made significant improvements in terms of reducing alcohol and drug use that were similar to other residents (Polcin et al., 2010).

However, criminal justice-involved residents were found to have relatively poorer ASI legal and employment outcomes. One conclusion was that some probationers and parolees need additional support in these areas.

To address the needs of SLH residents on probation or parole, implementation of a new intervention, motivational interviewing case management (MICM), was studied (Polcin et al., 2018). While significant improvement relative to baseline data on substance use, criminal justice, HIV risk, and employment outcomes were found under the MICM (experimental) and usual care (control) conditions, participants in the MICM condition who attended at least one MICM session had significantly better ASI criminal justice outcomes compared to participants in the SLH as usual condition at one-year follow-up (described more fully below). The current study further examines the "recovery assets" of the probationers and parolees to understand the

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interaction of these resources with treatment condition to affect more than criminal justice outcomes for participants in the MICM condition. Recovery assets, as used here, borrow from constructs advanced in the recovery capital (RC) narrative and defined in the seminal work by Granfield and Cloud as internal and external resources that can be drawn upon to initiate and maintain a recovery effort (Granfield and Cloud, 1999, 2001). These resources tap into, for example, physical, human, social and cultural factors. Conversely, they conceptualized negative RC as factors that act to impede successful change. They offered poor health or incarceration as examples of potentially negative capital (Cloud and Granfield, 2008). Moving the discourse forward, Hennessy (2017) systematically reviewed and described how the RC dialogue has progressed and concluded that multiple individual, micro- and meso-level resources interact to produce more or less RC at any given time (Hennessy, 2017). Negative and positive RC can be acquired throughout the life course, and addressing negative RC while maintaining and bolstering the acquired positive RC is central to wellbeing and sustained recovery. Research indicates that both the quality and quantity of RC influence the success or failure of natural and assisted recoveries (Groshkova et al., 2013; Laudet and White, 2008; White and Cloud, 2008).

1.1. Parent study: quantitative and qualitative information

The parent study recruited men and women on parole or probation and residing in sober living houses (SLHs) in Southern California. Residents in a random selection of SLHs who received the MICM intervention were compared to residents in a random selection of usual SLHs on various 6- and 12- month follow-up outcomes. Quantitative baseline data showed substantial lifetime involvement in the criminal justice system for this sample. For example, the mean number of lifetime arrests was 20, and lifetime incarcerations averaged 93 months. At study entry, 41% reported spending time in jail, and 20% reported spending time in prison in the prior 6 months.

Drawing in part on syndemics theory (Singer, 2009), the research team developed a manualized "Motivational Interviewing Case Management" (MICM) intervention designed to improve the outcomes of ex-offenders in SLHs. Therapists with prior experience in motivational interviewing (MI) and case management (CM) were trained to administer the MICM intervention, and all in-person sessions were audiotaped to monitor therapeutic adherence to the manual. Though these tapes were not systematically coded to specifically study participant-level characteristics, this qualitative information nonetheless provided a subjective picture of the complex nature of problems related not only to the participants' legal involvement but also personal histories involving constellations of concurrent addiction and chronic mental health symptoms, as well as the social, medical, and emotional complications that often co-occur with these conditions.

1.2. Aim

We use a latent class analysis (LCA) approach, which postulates that a mutually exclusive underlying set of latent classes (subgroups or typologies) can be inferred from a set of observed measures to identify groups of people who are alike. LCA has become increasingly popular with psychological researchers (Nylund-Gibson and Choi, 2018). We relied upon a comprehensive set of variables collected at the onset of the parent study, first to group people and secondly to explore how these subgroups differentially predict distal Addiction Severity Index (ASI) 12-month outcomes based on study condition. Observed measures mapped well with several elements within domains defined by the recovery literature (Best and Laudet, 2016; Hennessy, 2017). Based on primary study findings and audiotaped therapy sessions, we hypothesized that 1) MICM participants would have better 12-month ASI outcomes than usual SLH participants in a class defined by higher RC (more resources), and 2) MICM and SLH participants would have similar 12-month ASI outcomes in class(es) defined by lower RC (fewer resources). The latter assumes that MICM as delivered was insufficient to impact more than legal outcomes for a subset of residents. Our hypotheses were further guided by literature suggesting that recovery capital interacts with problem severity, and thus combinations of both are integral to prescribing appropriate levels of care (Burns and Marks, 2013; Lyons and Lurigio, 2010; White and Cloud, 2008). For example (and as described by White, 2008), clients with high problem severity and low recovery capital will require higher-intensity services than those with low to moderate severity and high recovery capital.

2. Methods

2.1. Parent study background

The purpose of the parent study was two-fold: first, to describe a variety of outcomes among ex-offenders on probation or parole who were entering SLHs, and second, to test the effectiveness of MICM. MICM by intention combines motivational interviewing strategies with standard case management to help ex-offenders adapt to the SLH living environment, adhere to the terms of their probation or parole, engage in employment or job training, reduce HIV risk, and access needed services in the community. Following on a "social model" approach to recovery, SHLs traditionally emphasize peer support and involvement in 12-step recovery groups (Polcin et al., 2014) and do not provide on-site treatment services. For at least some ex-offenders, SLHs offer the type of support and stability needed to adapt successfully to life in the community (Polcin, 2006). A house manager oversees operation of the SHL facility, such as monitoring compliance with house rules, upkeep of the facility, and payment of rent and bills. The house manager is usually in recovery and lives in the home with other residents.

The study enrolled 330 ex-offenders on probation or parole between 2013 and 2017. Randomization occurred at the house-level to avoid mixing individuals who received the MICM intervention with individuals who did not within the same house. Once a house was randomized to a study condition, either MICM (n = 22 houses; 149 residents) or SLH as usual (n = 27 houses, 181 residents), all individuals recruited from that house received the same intervention. Study residents in MICM houses could receive MICM over a full 12-month period without personal cost.

MICM provided the most intensive help at the onset of a resident's stay and, by design, aimed to meet with the client for three individual sessions within the first month, the period when many residents leave prematurely. Thereafter, sessions occurred monthly regardless of whether the resident had exited the SLH. The first session was required to be in-person, but subsequent sessions could be by phone when necessary. The initial goal was to help incoming residents access other types of services needed and settle into the SLH environment. After leaving the SLH, the goal was to help them adapt to independent living in the community. Study residents in the SLH (control condition) consisted of ex-offenders receiving usual care along with a list of community services and agencies that addressed a variety of problems. The latter procedure, by intention, attempted to minimize any potential intervention effects for MICM that were not simply the result of receiving information about various services available in the community.

MICM study therapists were required to have previous clinical experience with motivation interviewing (MI), case management, and criminal justice populations. As well, they attended a five-hour workshop that reviewed the basics of MI, procedures for the study, and the MICM manual. The MICM manual was designed to use standard MI techniques (e.g., reflections, open questions, feedback, developing discrepancies, engaging ambivalence, change planning, etc.) (Miller and Rollnick, 2012; Miller et al., 2003) to enhance the case management process. For a more complete description of the MICM manual and its implementation in the study, see Polcin et al. (2018). A copy of the MICM manual can be obtained from the corresponding author.

Table 1
Baseline characteristics for total sample and by study condition.

	Total sample (N = 330)		Control (n = 181)		MICM ITT (n = 149)	
Male gender (%)	74.2		77.4		70.5	
Age (mean, SD)	38.7	(11.7)	38.0	(11.9)	39.5	(11.5)
Age categories						
18-29	27.0		27.6		26.2	
30-44	38.8		41.4		35.6	
41-74	34.2		30.9		38.3	
Race/ethnicity (%)						
White	47.3		48.6		45.6	
African-American	24.2		18.9		30.9	
Hispanic	19.1		22.1		15.4	
Other/Mixed	9.4		10.5		8.1	
Education (%)						
LE High School diploma	64.2		65.2		63.1	
GT High School diploma	35.8		34.8		36.9	
Marital Status (%)						
Never married	66.4		68.0		64.4	
Married/live-in partner	6.4		5.0		8.1	
Divorced/separated/widowed	27.3		27.1		27.5	
DSM-IV alcohol dependence	36.4		35.4		37.6	
DSM-IV drug dependence [a]	80.6		75.1		87.3	
Past 30 day ASI Scores (mean, SD)						
ASI alcohol	0.137	(0.188)	0.126	(0.187)	0.150	(0.190)
ASI drug	0.084	(0.104)	0.077	(0.105)	0.092	(0.104)
ASI employment	0.815	(0.233)	0.812	(0.238)	0.814	(0.228)
ASI legal	0.176	(0.185)	0.178	(0.189)	0.173	(0.181)
ASI psychiatric	0.294	(0.251)	0.289	(0.249)	0.301	(0.254)
ASI medical	0.321	(0.390)	0.310	(0.383)	0.334	(0.398)

Notes. [a] Significantly (p < .05) different by study condition.

Quantitative interviews were conducted at baseline (within one month of entering the houses) and at 6- and 12- months by trained research staff. All participants signed an informed consent, and the Public Health Institute Institutional Review Board approved all study procedures.

2.2. Sample

All residents were on probation or parole. Thirty-eight percent were mandated to a SLH as part of their probation or parole, and 62% were on probation or parole but sought out residence in a SLH voluntarily because they needed a place to live. Thirty-three percent were in a residential treatment program prior to entering the house. Participants were mostly male (74%), nonwhite (53%), never in a partnered relationship (67%), and without education beyond high school (68%; refer to Table 1). Their mean age was 38.6 (SD = 11.8). Eighteen percent reported homelessness or living in a shelter as their primary living situation in the 6 months prior to entering the SLH. Three-quarters reported they were in an unstable or temporary living arrangement at study entry, with most coming from residential treatment (33%) or incarceration (21%). Methamphetamines (41%), alcohol (35%), and opiates (16%) were the most commonly used drugs in the 6 months prior to SLH entry (results not tabled).

Because a large number of MICM participants did not receive any MICM sessions (n = 44, 29.5%), the parent study conducted two types of analyses when comparing study conditions. These were an intent-to-treat analyses (ITT), which included all study participants enrolled in the study, and a modification of per protocol (PP) analyses (Gupta, 2011; Porta et al., 2007), which dropped participants in the MICM condition who never attended any MICM sessions (PP-1). We followed that same procedure in our LCA auxiliary regression analyses and, additionally, added a more stringent per protocol analysis that dropped MICM participants who had not attended at least three (prescribed minimum) MICM sessions (PP-3). Among those receiving at least one MICM session, seventy percent received three or more sessions.

2.3. LCA measures

LCA modeling was enabled in this secondary analysis by the availability of several baseline measurements covering factors known to facilitate the course of recovery. (Hennessy, 2017; White and Cloud, 2008). LCA indicator measures broadly included baseline demographic characteristics, alcohol and drug use involvement, social network support and integration, criminal justice involvement, past victimization and trauma, psychological and physical health, and motivation for change. All measures were selected a priori and dichotomized for use here. They characterize measures that overlap commonly-identified domains as described by the recovery literature (Hennessy, 2017). Table 2 lists these measures and includes a correlation matrix that indicates the strength and direction of relationships between the variables. R-values greater than 0.30 (medium to strong relationships) are highlighted (Cohen, 1988) to show the configuration of high correlation among measures. ASI scores were used as 12-month outcome measures.

2.3.1. Indicator variables

Demographic measures including gender, age, race/ethnicity, education, and sexual minority tap into cultural and human capital. Age was dichotomized at 18–29 (and 30+) because substance use is typically highest in young adulthood (Barnett and Read, 2005). These demographic indicators are associated with greater risk for hard drug-using patterns and riskier health behaviors as well as adverse impacts on employment (Dean et al., 2015).

DSM-IV Checklist was used to assess both alcohol and drug dependence in the prior 12 months (American Psychiatric Association, 2000; Forman et al., 2004).

Social support/integration variables included relationship status, unemployed full- or part- time in past 3 years, and lack of a valid driver's license. Important people seen daily who are heavy substance users was used as a measure of negative network support (Rice and Longabaugh, 1996; Zywiak et al., 2002). Social integration was further assessed based on support received as compared to whether one gave more support or had equal amounts of giving and taking (Mulia et al., 2008). We considered two items from the Alcoholics Anonymous

Table 2
Tetrachoric correlations between bivariate indicator variables (bolded values, r ≥ .30).

	Indicators	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	Male	1																							
2	Ages 18-29	-.05	1.0																						
3	Non-white	-.14	-.19	1.0																					
4	≤ HS	.15	.14	**.34**	1.0																				
5	GLBQO	**-.45**	-.03	.17	-.27	1.0																			
6	DSM alcohol	.21	-.14	.00	.08	.00	1.0																		
7	DSM drug	-.18	.26	-.09	.07	**.31**	.00	1.0																	
8	Employment	.19	.25	-.17	-.15	-.04	-.05	.12	1.0																
9	License	.19	-.08	-.23	-.14	-.19	-.04	-.02	.22	1.0															
10	Relationship	-.03	-.25	-.21	-.04	.15	.09	.03	-.24	.09	1.0														
11	User network	-.14	.09	-.19	.02	.15	.23	.13	.22	-.12	-.22	1.0													
12	Homeless	-.11	.03	-.06	.08	.17	.05	**.37**	-.16	-.11	.24	.02	1.0												
13	Support	.20	-.01	-.06	.03	-.12	.14	-.03	.07	.00	-.09	-.08	-.17	1.0											
14	AA member	.06	.09	-.28	-.09	.07	.11	-.17	.02	-.02	.10	-.06	.06	.14	1.0										
15	AA service	.22	-.02	-.17	-.09	.06	.05	.00	.24	.09	-.23	.04	.02	-.02	**.55**	1.0									
16	Incarcerated	-.27	**.59**	-.26	**-.41**	.23	-.02	.10	**.37**	.05	-.09	.08	-.05	.09	-.01	.10	1.0								
17	TLE	.03	.10	.02	-.09	-.14	.08	.16	.11	.14	.09	-.08	.15	-.13	.14	.22	-.03	1.0							
18	Depression	**-.39**	.02	.06	-.06	**.41**	.27	.06	-.06	**-.31**	.11	.08	.18	-.22	.10	-.08	.13	**.42**	1.0						
19	Anxiety	-.18	-.08	-.07	-.10	**.36**	**.34**	.17	-.05	-.03	**.38**	.12	.17	-.14	.12	.12	.14	**.41**	**.83**	1.0					
20	Concentrate	-.22	.09	.08	.02	.29	.23	.19	.00	-.12	.15	.10	.25	-.02	.18	.10	.19	**.42**	**.74**	**.68**	1.0				
21	Violent	-.09	.14	.13	-.01	.12	.08	.18	-.18	-.23	-.16	-.07	-.18	.05	.13	.12	-.11	.19	**.39**	**.45**	**.36**	1.0			
22	Suicidal	-.29	.03	.05	-.16	.29	.19	.28	-.13	**-.30**	.21	.11	.25	-.16	.16	.07	.08	.22	**.64**	**.62**	**.72**	**.47**	1.0		
23	Psych rx	**-.38**	.06	.03	-.25	.27	.22	.09	-.25	**-.32**	**.38**	.18	.18	-.13	.02	-.05	.18	.08	**.61**	**.62**	**.56**	**.42**	**.79**	1.0	
24	Hospitalized	.04	.21	.01	.11	-.22	-.26	.03	.18	.18	-.21	-.15	-.20	.02	-.02	-.07	-.05	-.17	-.25	**-.35**	-.29	-.11	-.16	**-.33**	1.0
25	ADCQ	.05	.16	-.18	-.02	-.02	.11	**.36**	.12	-.06	.13	.09	.04	-.04	-.05	-.18	.19	.27	.25	.21	.12	.07	.09	.02	.02

Note: Referent group (below) is shown in parentheses.
1 Male (female).
2 Ages 18–29 (ages ≥30).
3 Race/ethnicity nonwhite (White).
4 Has high school or less education (any college).
5 Identifies as gay/lesbian/queer/bisexual/other (heterosexual).
6 Diagnosed as DSM-IV alcohol dependent (not dependent).
7 Diagnosed as DSM_IV any drug dependent (not dependent).
8 Past 3 years unemployed/jail/treatment (full/part time/student/retired).
9 No valid driver's license (has valid license).
10 Not currently in a committed relationship (in relationship).
11 Important people network with one or more heavy users (no heavy users).
12 Experienced month or more of homelessness since age 15 (none).
13 Has received more support than given (same or less than given).
14 Never considered oneself an AA member (ever).
15 Never done AA service work (ever).
16 Incarcerated for more than 1 year in lifetime (less than one year).
17 Ever experience a traumatic life event (never experienced).
18 Ever experienced serious depression (never experienced).
19 Ever experienced serious anxiety (never experienced).
20 Ever experienced trouble understanding, concentrating, or remember (never).
21 Ever experienced trouble controlling violent behavior (never experienced).
22 Ever experienced serious thoughts of suicide (never experienced).
23 Ever been prescribed meds for any psych problems (never experienced).
24 Hospitalized two or more times in lifetime (less than twice).
25 ADCQ subscale costs of change score ≥ median value (< median value).

Table 3

Fit indices for 1-, 2- and 3- class LCA models.

Number of classes	1	2	3
Fullest model (25 DVs)			
AIC	10240.9	9734.7	9662.8
BIC	10335.9	9928.5	9955.3
aBIC	10256.6	9766.7	9711.1
LMR	NA	p < .001	p > .05
BLRT	NA	p < .001	p > .05
Entropy	NA	0.885	.786
Classification Probabilities	NA	0.97, 0.93	.90, .93, .89
Class counts	NA	251, 79	122, 120, 88
Parsimonious model (15 DVs)			
AIC	6236.8	5839.2	
BIC	6293.8	5972.2	
aBIC	6246.2	5861.2	
LMR	NA	p < .001	
BLRT	NA	p < .001	
Entropy	NA	0.892	
Classification Probabilities	NA	0.98, 0.96	
Class counts	330	251, 79	

Notes. DVs = dependent variables included in the LCA models; AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion; aBIC = sample size adjusted BIC; LMR = Lo-Mendell-Rubin adjusted likelihood ratio test; BLRT = bootstrapped likelihood ratio test; Classification Probabilities for the Most Likely Latent Class Membership (Row) by Latent Class (Column).

Affiliation Involvement Scale (Humphreys et al., 1998) as another form of social support: ever considered oneself a member and ever did service work. We viewed homelessness for a month or more since age 15 as a lifetime occurrence of housing instability and social marginalization. Social resources are viewed as especially important recovery assets (Granfield and Cloud, 2001; Neale and Stevenson, 2015).

Criminal justice involvement was measured as years of incarceration, dichotomized at 12 or more months. Literature on length of time served and negative impact is mixed (Mitchell et al., 2017). We chose 12 months because longer incarceration likely has greater impact on social reintegration into one's community.

The Psychiatric Diagnostic Screening Questionnaire root question, *"Have you ever experienced a traumatic event? This might include a physical or sexual assault, serious accident, being kidnapped, a life-threatening illness or injury, a sudden violent death, being in a war zone, or any other very stressful event of experience?"* was used to assess victimization and trauma (Zimmerman and Mattia, 1999).

A number of lifetime ASI psychiatric symptom-specific measures were also considered (McLellan et al., 1992). These included ever experiencing serious depression, serious anxiety or tension, trouble understanding, concentrating, or remembering, trouble controlling violent behavior, serious thoughts of suicide, and prescribed medications for any psychiatric problem. Having two or more lifetime hospitalizations (detox excluded) was used to measure physical health. Mental and physical health have high importance to sustained recovery (Neale et al., 2014).

The Alcohol and Drug Consequences Questionnaire (ADCQ), with subscales for costs and benefits of changing alcohol and drug behavior, was used to assess motivation for change (Cunningham et al., 1997). The ADCQ's costs and benefits subscales display good internal reliability (Cronbach alphas were 0.90 for the benefits subscale and 0.92 for the costs subscale). We chose to use the cost subscale, dichotomized at or above the sample median. Recovery literature defines this as individual growth capital.

2.3.2. Twelve-month outcomes

The alcohol and drug indices from the Addiction Severity Index Lite (McLellan et al., 1992) were used to assess severity of alcohol and drug problems in the prior 30 days. As well, ASI employment, legal, medical and psychiatric scores were used as 12-month outcomes.

2.4. Latent class analysis modeling

We used the BCH method in Mplus to conduct our LCA modeling (Asparouhov and Muthén, 2014a,b; Muthén and Muthén, 2017) and to study the differential effect of MICM on twelve-month outcomes between the groups of individuals with different constellations of RC. First, we applied a series of latent class measurement models (with 1–3 classes) to all RC indicator variables to determine the proper number of classes. Fit indices used for model selection included Akaike Information Criterion (AIC), the Bayesian Information Criterion (BIC), and the sample size adjusted BIC (aBIC), where lower AIC, BIC and aBIC indicate better fit. We also performed the Lo-Mendell-Rubin adjusted likelihood ratio test (LMR) and bootstrapped likelihood ratio test (BLRT) to assess the improvement in fit between nested latent class models (i.e., comparing k- and k-1 class models). At the 5% level, a p-value less than 0.05 suggests a statistically significant improvement in fit for the inclusion of one more class (Nylund et al., 2007). Class size (no less than 5% of total sample) and interpretability/theoretical plausibility were also taken into consideration along with the model fit statistics. Given a large number of RC indicators relative to the sample size, we then conducted an iterative process of successively dropping (or retaining) items in the selected LCA model. We assessed for indicators with large and significant residual covariance with other indictors within classes that violated local independence, which assumes that LCA class membership explains all of the shared variance among the observed indicators. We sequentially dropped indicators based on the significance of their residual covariances (MPLUS TECH10; see Asparouhov and Muthén, 2014a,b), substantive interpretation, and fit indices until we came to a point where the few remaining bivariate violations could be modeled for some bivariate residual covariances without any additional convergence issues. Once a final model was chosen, an auxiliary model (Asparouhov and Muthén, 2014a,b) combined with the BCH weights estimated during the step-1 LCA modeling was used to examine whether the effects of MICM differed among different RC classes.

3. Results

3.1. Estimating latent classes

Using the full set of indicators (as displayed in Table 2), we determined that a 2-class model provided the best solution for these data based on the set of fit indices shown in Table 3 (refer to fullest model with 25 DVs). AIC and BIC values for 2-class and 3-class models were incongruent as is often the case (Nylund-Gibson and Choi, 2018). Entropy (.889) and classification probabilities (0.97 and 0.93) were better for the 2-class solution. Both 2-class and 3-class models included a high number of indicators that violated the local independence assumption. We chose a 2-class model over the 3-class model at this point largely based on BIC, LMT and BLRT.

Next, we iteratively removed indicators (one-at-a-time) from the fullest 2-class model, starting with those with the largest chi square values for bivariate residual covariances provided by Mplus (TECH10). We also considered substantive interpretation and attempted to retain items that represented domains as defined in the RC literature as much as possible. Model statistics for the parsimonious 2-class model are shown in Table 3. Items retained in a final parsimonious model are shown in Fig. 1, Psychiatric symptoms, lifetime trauma, and hospitalizations differentiated the two classes most. Homelessness, costs of change, incarceration, and social support variables further distinguished the classes but to a lesser extent. Based on conditional item probabilities shown in Fig. 1, we refer to Class 1 as "high recovery capital" (high RC; solid line) participants (n = 79) and Class 2 as "low recovery capital" (low RC; dashed line) participants (n = 251). Despite lower overall severity and contrary to expectation, more high RC participants reported receiving support (compared with giving support;
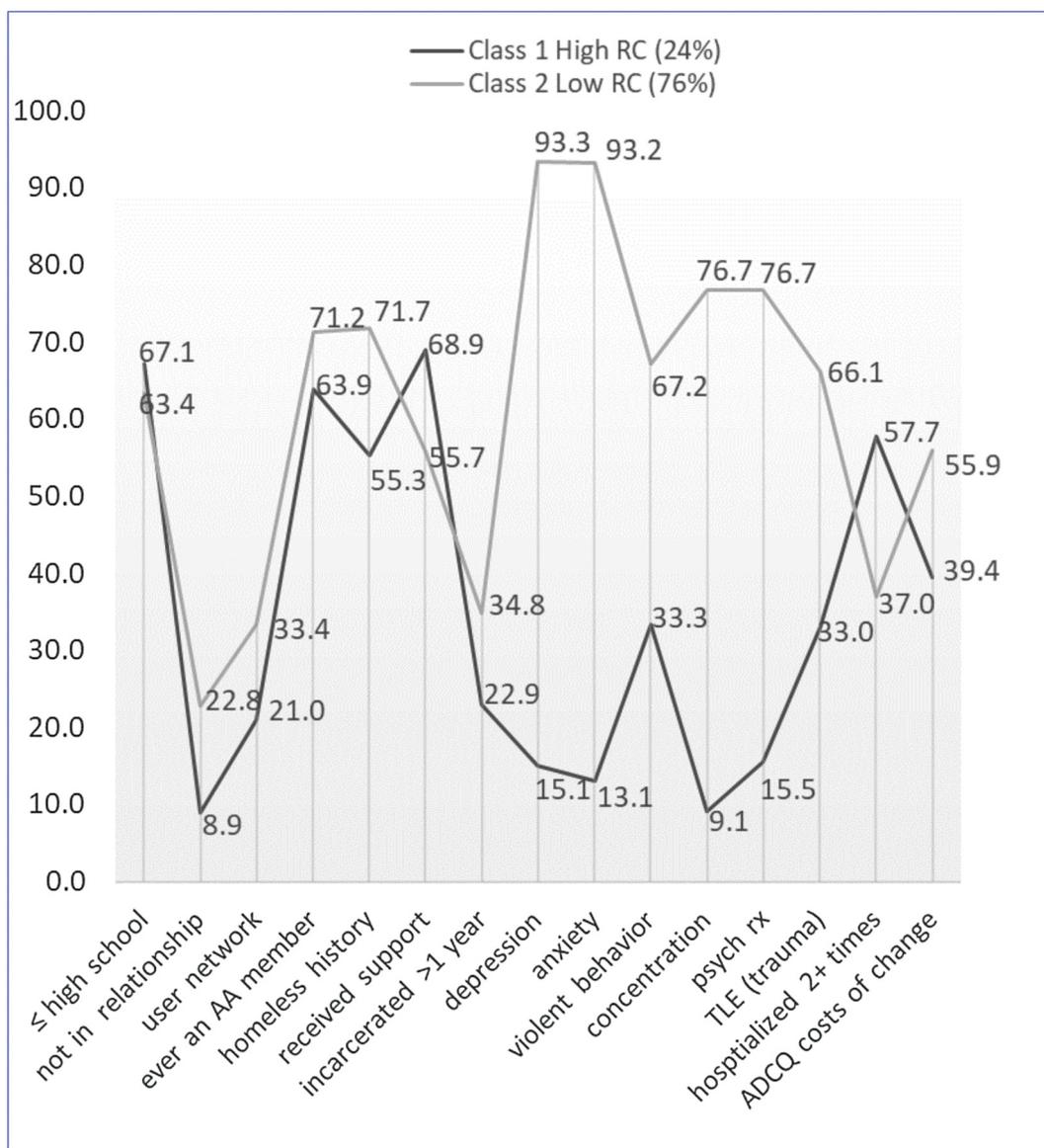
Fig. 1. LCA conditional probabilities by class assignment.

68.9% and 55.7%, respectively) and experiencing two or more lifetime hospitalizations than the low RC participants (57.7% and 37.0%). Moreover, low RC participants were more likely than high RC participants to have ever considered themselves a member of AA (71.2% and 63.9%).

3.2. Twelve-month outcomes and auxiliary analyses

Table 4 displays the ASI outcomes (mean scores) treated as distal outcomes tested in the final regression auxiliary model. These were log transformed at analysis. Similar outcomes at 12 months were observed across analysis groupings (i.e., Control, ITT, PP-1 and PP-2). The response rate at 12 months was 81%. Participants not located at 12-months did not differ (p < .05) from those interviewed on baseline characteristics, study condition, or class membership (results not tabled). At the 12-month follow-up time point, only 13% of the study participants remained in the SLH. However, 55% of the residents stayed in the houses for at least six months. Length of stay did not vary by study condition.

Table 5 displays results of the auxiliary step-3 regression analyses. In support of our hypotheses, we found that MICM participants in the

high RC class had better outcomes than SLH usual participants in the same class did, and depending on degree of MICM involvement (ITT or PP-1 or PP-3) MICM outcomes emerged accordingly. Negative coefficients indicate that, compared with SLH participants, MICM participants were less likely on average to increase their ASI severity scores at 12 months. In the ITT analysis, MICM participants had better ASI psychiatric outcomes (*coef.* = −.094; *p* = .021). In the PP-1 analysis, both legal and psychiatric outcomes were better (*coef.* = −.124, *p* = .003 and *coef.* = −.143, *p* < .001 respectively) for MICM participants; in the PP-3 analysis, drug, legal, and psychiatric outcomes were better for MICM participants (*coef.* = −.057, *p* = .005; *coef.* = −.159, *p* = .003; and *coef.* = −.193, *p* < .001, respectively). MICM and usual SLH outcomes were not significantly different for participants in the low RC class.

4. Discussion

This study builds upon a variety of studies validating the efficacy of MI-based interventions (Miller and Rollnick, 2012). Specifically, this is the first study to show how an MI-based intervention designed to enhance case management (MICM) can be helpful for some SLH residents.

Table 4
ASI composite mean scores at 12-month follow-up interview by analysis group.

	Control (n = 150)[a]		MICM ITT (n = 118)[a]		MICM PP-1 (n = 88)		MICM PP-3 (n = 65)	
	mean	(SD)	mean	(SD)	mean	(SD)	Mean	(SD)
ASI alcohol	0.085	(0.186)	0.099	(0.178)	0.098	(0.169)	0.115	(0.188)
ASI drug	0.056	(0.093)	0.056	(0.087)	0.050	(0.080)	0.052	(0.085)
ASI employment	0.673	(0.319)	0.697	(0.310)	0.695	(0.306)	0.711	(0.281)
ASI legal	0.132	(0.211)	0.088	(0.164)	0.077	(0.149)	0.078	(0.157)
ASI medical	0.242	(0.346)	0.259	(0.359)	0.209	(0.333)	0.231	(0.355)
ASI psychiatric	0.252	(0.242)	0.250	(0.253)	0.233	(0.248)	0.245	(0.256)

Notes. SD = Standard deviation. ITT refers to the intent-to-treat MICM sample; PP-1 is the subsample of MICM participants who attended at least one MICM session; PP-3 is the subsample of MICM participants who attended three or more MICM session. PP-1 and PP-3 participants did not differ from ITT participants on baseline measures shown in Table 1. These ASI scores were log transformed at analysis. PP_1 and PP-2 did not differ from the ITT sample on baseline characteristics shown in Table 1. Response rate for the full sample at 12 months (81%) did not differ by treatment condition.

In addition, it is one of few MI-based studies using a more intensive dose of MI that goes beyond the standard one or two sessions at the beginning of treatment. Study findings also add to a variety of previous studies highlighting the importance of recovery capital (Best and Laudet, 2010; Laudet and White, 2008). Results demonstrate how MICM and recovery capital interact in SLHs to be helpful to a subgroup of residents. Specifically, MICM for probationers and parolees residing in SLHs is effective for those with higher recovery capital. Among probationers and parolees in the high RC group, those who attended at least three MICM sessions had significantly better ASI drug, legal, and psychiatric outcomes. Participants with high RC who attended at least one session had better outcomes on measures of ASI legal and psychiatric problems. Using a standard intent-to-treat analysis comparing all study participants with high RC who were assigned to the MICM condition with those assigned to the control group resulted in better ASI psychiatric outcomes for those in the MICM condition.

Additional research is needed to understand why MICM affected some issues but not others, such as the lack of effect on alcohol, medical, and employment severity. However, several factors may have been influential. For medical and employment issues, personal history may be particularly influential (Dugosh et al., 2016; Webster et al., 2014). All of the individuals in the study had recent criminal justice involvement and many had extensive incarceration histories over many years. Chronic medical problems and very poor work histories are widespread in this population, and the severity of these problems may make them less responsive to MICM. Individuals mandated into services through

the criminal justice system are more likely to be coerced due to illicit drug use rather than alcohol use. That could result in greater motivation to address drug use during the MICM sessions.

MICM was not shown to be more beneficial for probationers and parolees with low RC. It was notable that in the LCA analysis lower RC was defined largely by characteristics that inhibit successful adaptation to the community. Persons in the low capital group evidenced higher severity on lifetime measures of psychiatric symptoms including depression, anxiety/tension, concentration and violent behavior. Other factors that differentiated high from low recovery capital to a lesser extent included a history of extended homelessness, lack of social network support and lifetime length of incarceration. Compared with high RC participants, low RC participants were more likely to consider themselves members of AA. This may be due in part to the willingness of AA members to take anyone with an expressed desire to quit substance use into their membership. AA may be a primary support network for those with concurrent substance use and mental health disorders.

Consistent with prior research (Best and Aston, 2015; Kelly et al., 2017), the favorable outcomes for the high RC group are understandable given the combination of fewer lifetime psychiatric problems and higher support from social networks. In addition to the inherent advantages of higher recovery capital, this study revealed that the high RC class group was also able to benefit from receiving the MICM intervention.

More research is needed to clarify why probationers and parolees in

Table 5
Regression results predicting ASI 12-month outcomes within High RC and Low RC classes by ITT, PP-1 and PP-3 analysis groups.

	ITT model	PP-1 model	PP-3 model
	Coef. *(95% CI)*	Coef. *(95% CI)*	Coef. *(95% CI)*
ASI alcohol			
Low RC (MICM vs. SLH)	.004 *(-.040, .048)*	.009 *(-.039, .056)*	.025 *(-.030, .081)*
High RC (MICM vs. SLH)	.026 *(-.031,.084)*	.025 *(-.037, .085)*	−.011 *(-.083, .061)*
ASI drug			
Low RC (MICM vs. SLH)	.000 *(-.023, .023)*	−.004 *(-.029, .021)*	.002 *(-.025, .029)*
High RC (MICM vs. SLH)	-.016 *(-.051 .018)*	−.028 *(-.067,.011)*	**−.057 *(-.096, .017)*b**
ASI employment			
Low RC (MICM vs. SLH)	.005 *(-.048,.058)*	.003 *(-.053, .059)*	.008 *(-.051, .068)*
High RC (MICM vs. SLH)	.044 *(-.049,.137)*	.030 *(-.079, .140)*	.057 *(-.034, .148)*
ASI legal			
Low RC (MICM vs. SLH)	−.028 *(-.069,.012)*	−.021 *(-.065, .023)*	−.018 *(-.066, .030)*
High RC (MICM vs. SLH)	−.035 *(-.135, .064)*	**−.124 *(-.2049,-.043)*b**	**−.159 *(-.250, -.069)*b**
ASI medical			
Low RC (MICM vs. SLH)	.005 *(-.066, .076)*	−.046 *(-.120, .029)*	−.051 *(-.131,.028)*
High RC (MICM vs. SLH)	−.010 *(-.119, .099)*	.014 *(-.127, .155)*	.035 *(-.178, .247)*
ASI psychiatric			
Low RC (MICM vs. SLH)	.003 *(-.050, .056)*	−.011 *(-.069 .047)*	−.005 *(-.069, .058)*
High RC (MICM vs. SLH)	**−.094 *(-.174,-.014)*c**	**−.143 *(-.212,-.063)*a**	**−.193 *(-.282, -.104)*a**

Notes. [a] p < .001, [b] p < .01, [c] p < .05. SLH = Sober Living Home (referent group). Coef. = coefficient. CI = confidence interval. ITT refers to the intent-to-treat sample; PP-1 is the subsample of MICM participants who attended at least one MICM session; PP-3 is the subsample of MICM participants who attended three or more MICM sessions. Regression models adjusted for gender, age, education race/ethnicity, and DSM-IV alcohol or drug dependence.

the low RC class had difficulty benefiting from MICM, but their negative capital characteristics may have undermined motivation and confidence needed to change detrimental aspects of their lives. One important purpose of MICM was to help individuals examine and resolve their ambivalence (i.e., the pros and cons) about making changes in their lives. Ambivalence could be related to mixed feelings about entering the SLH, complying with house rules, interacting with peers, beginning school or work, or engaging in services they needed. The problematic histories the low recovery capital class presented may have made it difficult to identify reasons for making changes because they may not have trusted that benefits would be realized. In addition, they may not have felt they had the strengths needed to implement the change plans they made during MICM sessions. While case managers implementing MICM did advocate for residents, at times making appointments or addressing obstacles to accessing services, a fair amount of resident autonomy was needed to implement the plans.

Lack of confidence among the low RC class was evident in their scores on the Alcohol and Drug Consequences Questionnaire (ADCQ). Scores on this measure suggest that relative to persons with high recovery capital, residents with low capital felt abstinence would be more difficult to achieve. Moreover, they may have felt life without substances would be challenging in multiple respects. Examples of items on the costs scale suggest that the low RC class felt they would have difficultly relaxing and socializing with others. In addition, longstanding psychiatric symptoms, such as depression or anxiety, may have hindered their ability to engage independently in outside services (or seek out needed support) and pursue job opportunities, both of which were important elements of MICM. Given the high rates of psychiatric problems and traumatic events, we can surmise that some were self-medicating through their substance use and were uncertain how they would cope without substances.

The findings from this study support other studies that found worse outcomes for persons who enter SLHs with higher levels of psychiatric problems, higher perceived costs associated with abstinence, and lower social support. For example, in a study of 300 persons residing in SLHs, there was significant improvement over 18 months on an overall measure of psychiatric problems. However, residents with higher psychiatric severity had lower rates of abstinence (Polcin et al., 2016). In another study, Polcin and Korcha (2017) examined 245 persons in SLHs and found that social support variables, including 12-step affiliation, predicted better substance use outcomes for persons with low and moderate psychiatric severity. However, social support variables were most influential for the low psychiatric severity group. In a study of motivation and psychiatric severity, Polcin et al., 2015 recommended that helping residents address perceived challenges associated with abstinence was important for all residents, but it appeared to be especially critical for those with high psychiatric severity because of their high scores on costs of sobriety. Among the recommendations from all three of these studies were suggestions to increase use of professional psychiatric services in the community and consider ways that SLHs might modify their environments to maximize peer support toward helping residents manage their symptoms and prepare them for engaging in professional psychiatric services. Examples included strategies to mobilize experiential learning, which involved residents sharing the coping strategies they have found to be helpful in managing symptoms with each other. It also involved sharing information about use of mental health services in the community and residents' experiences and suggestions for using those services.

4.1. Limitations

A significant number of persons assigned to MICM did not attend any MICM sessions (30%), and we did not collect data on reasons for non-attendance. However, anecdotal feedback from study therapists suggested that some participants were not motivated to attend sessions because they felt their needs were already being met, either by current services they were receiving or services they received prior to entering the SLH. One might expect those who never attended a MICM session would be in the high recovery class. However, in a post hoc test we found they were equally represented in both RC classes.

Retained RC indicators and a 2-class solution are specific to this sample and may not replicate with other samples. Moreover, the RC indicators as operationalized here are those limited to the study and as such do not represent items in any validated scale. The number of indicators in a model, how well these differentiate classes, the degree of class separation, relative class sizes, and sample size all affect the model selection and stability. Given a larger sample, a 3-class (or greater) solution may have emerged. Last, ITT, PP-1 and PP-3 regressions estimated in our auxiliary analyses and shown in Table 5 were conducted using the full ITT sample and BCH weights in step 1. Post hoc, we ran step 1 using the PP-1 sample and the PP-3 sample and then re-estimated the auxiliary models. The same pattern of results was obtained for the six ASI outcomes.

5. Conclusions

Operators of SLHs should consider implementation of MICM to help improve outcomes for probationers and parolees who have high RC. Probationers and parolees with low RC may require a different approach, as study findings showed they were not helped by MICM. One option is to refer them to a higher level of residential service where a variety of coordinated professional services are provided onsite. Once they establish a higher level of recovery capital through their involvement in residential treatment, they may be able to transfer to a SLH environment with more confidence and success, and they may be more responsive to MICM. Clearly, SLHs should have good linkages to a variety of community services that can assist residents with low RC, such as medical, mental health, legal, and employment services. Although SLHs are not licensed to provide professional services, there is no reason they could not contract with outside professionals to provide services their residents need. Examples might include workshops or groups addressing psychiatric symptoms, psychiatric medications, managing anger, and strategies for building social support. Mobilizing the types of peer support strategies described by Polcin et al. (2014) to address various problems experienced by residents may help as well.

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