



Prospective patterns and correlates of quality of life among women in substance abuse treatment

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ABSTRACT

Background: Quality of life (QOL) is increasingly recognized as central to the broad construct of recovery in substance abuse services. QOL measures can supplement more objective symptom measures, identify specific service needs and document changes in functioning that are associated with substance use patterns. To date however, QOL remains an under investigated area in the addictions field, especially in the United States.

Methods: This study examines patterns and predictors of QOL at 1 and 6 months post treatment intake among 240 women enrolled in substance abuse treatment in Cleveland, Ohio. The World Health Organization Quality of Life (WHOQOL-BREF) measure was used to assess physical, psychological, social and environmental domains. Hierarchical multiple regressions were conducted to identify correlates of QOL at 6 months post treatment intake.

Results: All QOL domains across the follow up time points improved significantly. However, QOL scores across domains remained below those of healthy population norms. Trauma symptoms significantly predicted Physical and Psychological QOL. Among treatment process variables, alcohol use was the sole significant factor associated with QOL and only for Environmental QOL. Recovery support and friends support for abstinence were consistently associated with QOL across all four domains.

Implications: This study suggests the usefulness of the WHOQOL measure as an indicator of functioning in substance abusing populations. Findings underline the importance of helping women deal with trauma symptoms and develop support for recovery. Further research is needed on the longitudinal relationship between QOL and substance use patterns.

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1. Introduction

The Substance Abuse and Mental Health Services Administration (SAMHSA) defines recovery from substance use disorders (SUD) as “a process of change through which an individual achieves abstinence and improved health, wellness, and *quality of life*” (Center for Substance Abuse Treatment, 2007). Other recent data-driven definitions are consistent with that conceptualization (Belleau et al., 2007; Laudet, 2007). Common to these conceptualizations of recovery is enhanced QOL, a construct that incorporates objective functioning and the individual’s subjective view of a range of clinical, functional, and personal variables (Bonomi et al., 2000). Though increasingly used in biomedical research, QOL is relatively new in behavioral research, especially in the addictions field.

Historically, when assessing well-being, the SUD field has used the ‘health-related quality of life’ (HRQOL) measurement model, a patient’s perception of how his or her health status affects physical, psychological, and social functioning and well-being (Leidy et al., 1999). The frequently used Medical Outcome Study’s (MOS) Short Form instrument series (e.g., the SF36 and SF12) focuses on limitations caused by disease and treatment (Stewart and Ware, 1989; Ware and Sherbourne, 1992). For example, items assess “health-limited” functioning bearing on daily tasks and social functioning (e.g., “Has your health limited you in walking one block?”). The pathology-focused HRQOL approach is informative but may be less useful for the recovery context, given the emphasis on improved functioning inherent in the prevalent definitions of recovery (Laudet et al., 2009; Laudet, 2011).

A more useful conceptualization of QOL in the context of SUD is overall QOL encompassing satisfaction with life in general, not solely in relation to disease-related limitations. The World Health Organization (WHO) defines QOL as “an individual’s perception of their position in life in the context of the culture and value systems

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in which they live and in relation to their goals, expectations, standards and concerns” (World Health Organization Quality of Life Group WHOQOL, 1995). This conception includes domains typically included in definitions of behavioral health recovery, e.g., physical and mental health, social functioning, and living environment which includes safety, comfort and convenience of living environment and access to and availability of resources. These domains are cited by individuals in recovery as key priorities (Laudet and White, 2010) and consistent with experts’ guiding criteria for SUD treatment evaluation: reduction in substance use, improvement in personal health and social function, and lowered public health and safety risks (McLellan et al., 1996).

1.1. QOL, SUD and treatment outcomes

The strongest argument for considering QOL as an outcome domain of SUD treatment comes from studies examining the association between QOL and subsequent symptoms. For example, two studies were conducted in a sample of community-based formerly polydrug-dependent persons who, at recruitment, ranged in drug/alcohol abstinence duration from 1 month to over 10 years. In cross-sectional analyses, overall QOL satisfaction increased gradually from early recovery (under 6 months abstinent) to stable (3 years and over) abstinence; abstinence duration correlated positively with QOL satisfaction and accounted for 9% of the variance in QOL satisfaction (Laudet et al., 2006). In a prospective study, longer abstinence duration at baseline significantly predicted higher levels of QOL satisfaction one year later (Laudet and White, 2008). Another study reported that QOL satisfaction at the end of outpatient treatment significantly predicted commitment to abstinence (Laudet and Stanick, 2010). In opioid addiction treatment, improvement in health related QOL was associated with more successful treatment outcomes (Karow et al., 2010). Thus QOL assessments can serve as both an evaluation and a diagnostic tool (Rudolf and Watts, 2002).

1.2. QOL, trauma and social support

QOL is consistently poorer among persons with active SUD and treatment seekers than among cohorts without SUD or chronic psychiatric conditions (Donovan et al., 2005). Impairments in almost all life domains are noted as a function of physical and/or psychiatric comorbidity (Bizzarri et al., 2005). Rudolf and Priebe (2002) found that women in detox with alcoholism and co-occurring depressive symptoms had lower subjective QOL than women with no depressive symptoms, particularly in relation to their family situation and life as a whole. Heroin abusers with personality disorders have been shown to score lower on QOL (Fassino et al., 2004). QOL generally improves with abstinence (Kraemer et al., 2002; Villeneuve et al., 2006), especially *mental* functioning (Foster et al., 2000; Dawson et al., 2009). Thus far, the direct effect of SUD treatment on QOL has not been examined independent of treatment effects.

Overall, QOL research in the SUD field remains in its infancy and there are many unanswered questions. The influence of trauma symptoms on QOL over time, particularly among women, is not well understood. While there has been interest in assessing QOL following trauma, particularly childhood trauma (Janssens et al., 2008), not all studies show strong connections between exposure to trauma and subsequent QOL (Ventegodt, 1998). Grella’s (2008) literature review reveals that compared to men, women tend to enter treatment with greater psychological distress, mental health problems and exposure to past and current violence and trauma. Moreover, women’s spouses and partners may contribute to continued victimization and emotional problems, thereby adversely affecting physical health and QOL (Dawson et al., 2007). In addition, little is known about the role of social support as a predictor

or moderator of QOL in SUD populations. It might be expected that greater social support would be associated with higher QOL; in fact there is some evidence that family support might be a stronger predictor of QOL than exposure to traumatic events, as evidenced by Grills-Taquechel et al. (2011) QOL study following exposure to the Virginia Technological Institute shootings. Greater partner support significantly predicts health related QOL, particularly mental QOL, among injection drug users who were HIV-infected (Preau et al., 2007). Understanding the relationship between social support and QOL is important, since the social domain is especially critical to the recovery process. Studies have documented the enhanced need for and usefulness of social support, especially early on in post-treatment recovery (Humphreys et al., 1997; Laudet et al., 2004, 2006) in the context of a potential erosion of social networks as the individual pulls away from substance involved associates but has not yet established a sober network of friends (Ribisl, 1997; Tracy and Johnson, 2007; Tracy et al., 2010). Women may enter treatment with less social resources as compared to men; fewer social supports among women have been shown to negatively influence both treatment access and retention (Greenfield et al., 2007). In addition, social support provided through social networks can be predictive of treatment outcomes, with greater support for sobriety predicting less substance use (Warren et al., 2007; Wenzel et al., 2009). However, little is known about the role of social support as a predictor of QOL among women with SUD.

1.3. Study aims

The objectives of this study are to (1) describe trajectories of QOL in four domains (Physical, Psychological, Social and Environmental) from intake to 1- and 6 month-post intake among SUD treatment enrolled women; and (2) to identify the role of sociodemographic, clinical, treatment and social support domains as correlates of QOL changes at six months post treatment intake, controlling for baseline levels of QOL. This appears to be the first study in the US to examine these questions longitudinally and one of the few to use the generic/overall QOL model in SUD populations.

2. Method

2.1. Procedures

Data were originally collected from 305 women participating in a study of the role of personal social networks on post treatment functioning. Women were considered study eligible if they had been in treatment for at least one continuous week and had a diagnosis of substance dependence. Substance dependence was defined as a DSM-IV diagnosed substance dependence within the past 12 months of entry into the study for at least one drug, including alcohol. Women with a known diagnosis of schizophrenia or taking medication prescribed for a major thought disorder were excluded. Participation was voluntary; participants signed an informed consent document prior to their involvement. Overall participation rate of those eligible was 84%.

Face to face interviews were conducted at 1 week (T1), 1 month (T2) and 6 months (T3) post treatment intake between October 1, 2009 and August 30, 2011. All interviewers had been trained in research interviewing, research ethics and the use of a computerized assisted personal interview (CAPI). The interviews took on average 2 h to complete. The study was reviewed and approved by the Case Western Reserve University Internal Review Board for the protection of human subjects. A Certificate of Confidentiality was secured from the National Institute of Health. Participants received a \$35 gift card, plus reimbursement for travel at each interview.

Of the 305 baseline interviews, one interview was omitted from analysis due to incomplete data; in addition 4 women were not included in the follow up interviews due to medical reasons (including 3 deaths unrelated to the study) and 5 refused continued participation. Thus, 295 women were available for follow up. Of these, 55 women were lost to follow up, leaving a study sample of 240 women who completed the Time 3 follow up interview, representing an 81.3% retention rate.

All women were in county funded specialized treatment programs for women: 173 in intensive outpatient and 67 in non-medical community residential substance abuse treatment. Participants were 37.3 years old on average (SD=10.4, R=19–43). 62.9% (n=151) identified as African American. 45% had less than a high school diploma or GED. Three-fourths of the women (75.5%, n=172) received food stamps or welfare assistance. Nearly two-thirds of respondents were diagnosed with

cocaine dependence (62.1%, $n = 149$) and 45.5% ($n = 114$) and 41.3% ($n = 99$) respectively were diagnosed with alcohol and marijuana dependence. Over half (58.6%) were dependent on more than one substance.

Attrition analysis found three statistically significant differences. Those lost to follow up were on average 3 years younger than those interviewed ($p = .009$), were more likely to be non-African American women ($p = .016$), and to have been residential treatment ($p = .001$). None of the other variables examined (dual disorder status, homelessness, legal involvement, number of SUD and trauma symptoms) differed significantly.

2.2. Measures

Demographic information (age, education, race/ethnicity) and the **number of co-occurring mental disorders** (generalized anxiety disorder, posttraumatic stress disorder and mania/hypomania and major depression/dysthymia) were assessed at intake via the computerized Diagnostic Interview Schedule IV (CDIS; Robins et al., 1981; Helzer et al., 1985). The CDIS, based on DSM-IV criteria, has demonstrated validity and reliability (Robins et al., 1999). Based on the past 12 month presence of mental disorders as determined by the CDIS-IV, a continuous variable was created of the count of co-occurring mental disorders. Race was a dichotomous variable coded as African American/non-African American. Education was also coded as a dichotomous variable (less than high school/more than high school education).

The Trauma Symptom Checklist-40 (TSC-40; Elliott and Briere, 1992; Zlotnick et al., 1996) was used at intake to evaluate symptomatology associated with childhood or adult traumatic experiences. The TSC-40 is a 40-item self-report instrument. Symptom frequency over the prior two months was rated, using a four point Likert-type scale ranging from 0 (Never) to 3 (Often). Consistent with other reports of reliability of this measure (Briere, 1995), in this study, Cronbach alpha was .931 for the total scale.

Two instruments measured **social support** at T3. The Social Support for Recovery Scale (Laudet et al., 2000a), a 7-item scale, assessed the extent to which people in the participant's life supported recovery, (e.g., "The people in my life understand that I am working on myself"). Participants indicated their level of agreement with each statement on a 4-point Likert scale ranging from 1 (Strongly Agree) to 4 (Strongly Disagree). The Friend's Support for Abstinence Scale is an 8 item scale developed from the Social Network Social Influence Scale (Collins et al., 1990) and adapted by Humphreys et al. (1997) to measure friends' support of recovery efforts (e.g., "My friends offer advice about quitting drugs or alcohol, without nagging"). Participants rated each item using Likert scale response options ranging from 1 (Never) to 5 (Often). Reliability of both scales was satisfactory, with alphas of .881 and .717 respectively.

The Treatment Services Review (TSR) provided a quantitative assessment of treatment process variables at T3 (McLellan et al., 1992). Three TRS items were used to determine the extent of alcohol use ("How many days in the past 30 have you had at least one drink of alcohol?"), drug use ("How many days in the past 30 have you used any illegal drug or prescribed drug in a non-prescribed manner?"), and 12 step meeting attendance ("How many times in the past 30 days have you attended an AA/NA/CA or any other 12 step meeting?"). In previous research, test-retest reliability for the total TSR was high for in-person interviews spaced 1 day apart. Tests of concurrent validity showed the ability to discriminate different levels of treatment services (McLellan et al., 1992).

Quality of Life at each assessment point was measured by the WHOQOL-BREF (World Health Organization Quality of Life Group WHOQOL, 1995, 1998; WHOQOL Group, 1998; Bonomi and Patrick, 1997). The 26-item BREF is an abbreviated version of the WHOQOL-100. It incorporates items from each of the 24 QOL facets included in the longer form plus two 'benchmark' items on overall QOL and general health, retaining the comprehensiveness and psychometric properties of the 100. The BREF yields four domain scores: Physical, Psychological, Social and Environmental that correlate around 0.9 with the WHOQOL-100 domain scores (World Health Organization, 1997). Psychometric properties are excellent and comparable to that of the full instrument for internal consistency, construct and discriminate validity and sensitivity to change (Skevington et al., 2004). Reliability of the QOL domains as measured by Cronbach's alpha was moderate to high: Physical .806, Psychological .792, Social .642, and Environmental .769.

Previous research using the WHOQOL-BREF with a general population has established some normative mean scores. Using a random sample of adults in Australia, Hawthorne et al. (2006) reported the following domain mean scores and standard deviations: Physical Domain, mean = 73.5 (SD = 18.1), Psychological Domain, mean = 70.6 (SD = 14), Social Domain, mean = 71.5 (SD = 18.2), Environmental Domain, mean = 75.1 (SD = 13). In a Danish general adult population, Noerholm et al. (2004) observed the following: Physical Domain, mean = 77 (SD = 17), Psychological Domain, mean = 69 (SD = 16), Social Domain, mean = 69 (SD = 18), Environmental Domain, mean = 74 (SD = 16).

2.3. Data analysis

Frequencies and distributions were examined for all variables to determine if acceptable levels of skewness (<2) and kurtosis (<7) were evident (Curran et al., 1996). Two interval level variables with skewed distributions were re-coded as

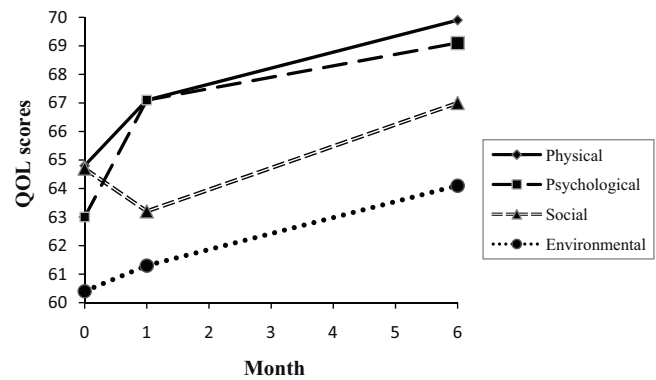


Fig. 1. QOL changes over 6 months.

dichotomous variables; days of drug use, and days of alcohol use in past 30 were re-coded as any days in past 30 (Yes = 1, No = 0). Bivariate correlations were examined to identify significant relationships among variables and multicollinearity was assessed using tolerance and variance inflation factor (Allison, 1999).

Repeated measures analysis of variance (ANOVA) was used to compare the four QOL domain scores at T1, T2 and T3 (Aim 1). When the overall test yielded significant group differences, follow-up pair-wise tests were conducted with a Greenhouse-Geisser correction.

Hierarchical multiple regressions were conducted to address Aim 2, to identify predictors of QOL at T3. Variables correlated ($p < .1$) at the bivariate level were entered using block entry with baseline QOL entered in Step 1, demographic and diagnostic characteristics (age, race, education, number mental disorders, trauma symptoms) in Step 2, treatment process (any alcohol/drug use, number 12 step meetings) in Step 3, and social support (friend support for abstinence and recovery support) in the final step.

3. Results

3.1. Sample characteristics and correlations at T3

Table 1 shows descriptive information and correlations among the variables used in the multivariate analyses. Participants had on average 1.6 mental disorders in addition to a SUD; nearly three-fourths (73.2%, $n = 175$) had co-occurring mental disorders. Mean score on the TSC was 43.2 (SD = 21.3). At Time 3, 16% reported alcohol use, while 6% reported drug use; women reported a mean of 12.7 days of attending AA or other 12-step meeting. While being in treatment was not correlated with QOL domains, it should be noted that at T2 210 women (87.5%) remained in treatment and by T3 70 women (29%) reported being in treatment (at the same or different program).

Being older was associated with lower Physical QOL ($r = -.167$) at Time 3, while non African American status was associated with lower Psychological QOL ($r = -.139$). As Table 1 indicates, the two measures of social support were positively correlated ($r = .508$); in addition, the four QOL sub-scales were positively correlated, with coefficients ranging from .445 to .589. Higher TSC scores were associated with lower QOL in all domains; friend and recovery support were positively correlated with all four QOL domains. The number of mental disorders was negatively associated with all QOL domains except the Environmental domain. Drug use was significantly correlated with lower QOL in all domains; alcohol use was negatively correlated with all QOL domains with the exception of social QOL. Twelve step attendance was weakly correlated with the Psychological and Environmental QOL domains only.

3.2. QOL Changes

Fig. 1 graphs QOL domain specific mean scores at the three data collection points. There were statistically significant differences in mean ratings of QOL across the follow up points for all domains: Physical QOL ($F(1.917, 460) = 10.172$,

Table 1
Correlations.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Age														
2. Non-African American	-.221**													
3. Education (1 = high school or above)	.292**	.099												
4. # of mental disorders	.131*	.193**	.100											
5. Trauma symptoms	-.014	.157*	-.036	.399**										
6. Any alcohol use (1 = yes)	-.025	.103	.032	.104	.172**									
7. Any drug use (1 = yes)	-.039	.103	.044	.064	.080	.420**								
8. Attend AA/NA/CA	.129*	.089	.145*	.026	-.040	-.145*	-.007							
9. Recovery support	.178**	-.044	.202**	-.102	-.106	-.123	-.162*	.228**						
10. Friends support	.124	.116	.118	-.043	-.134*	-.139*	-.147*	.227**	.508**					
11. Physical QOL	-.167**	-.079	.008	-.259**	-.426**	-.140*	-.164*	.101	.282**	.280**				
12. Psychological QOL	.028	-.139*	-.040	-.204**	-.419**	-.211**	-.177**	.181**	.421**	.359**	.589**			
13. Social QOL	.041	-.055	-.049	-.131*	-.286**	-.093*	-.152*	.106	.440**	.445**	.537**	.537**		
14. Environmental QOL	.002	.060	.104	-.049	-.300**	-.269**	-.155*	.175**	.413**	.473**	.558**	.579**	.556**	
M	37.3	-	-	1.6	43.2	-	-	12.7	28.9	31.1	69.8	69.0	67.0	64.1
SD	10	-	-	1.4	21.3	-	-	10.1	4.8	5.6	20.1	18.7	22.0	17.6
%	-	37%	55%	-	-	16%	6%	-	-	-	-	-	-	-

Note: 6–14 variables measured at Time 3.

* $p < .05$.

** $p < .01$.

$p < .000$), Environmental QOL ($F(1.948,460) = 6.076, p = .003$), Psychological QOL ($F(1.901, 456) = 16.407, p < .000$) and Social QOL ($F(1.942,456) = 3.337, p = .038$). Post-hoc tests revealed that Physical QOL was significant from T1 to T3 ($p < .000$), and T2 to T3 ($p = .031$) but not T1 to T2 ($p = .093$). Psychological QOL was significant from T1 to T2 ($p < .000$) and T1 to T3 ($p < .000$), but not T2 to T3 ($p = .148$). Environmental QOL was significant from T2 to T3 ($p = .034$) and T1 to T3 ($p = .006$), but not T1 to T2 ($p > .05$). Social QOL was significant from T2 to T3 ($p = .021$), but not T1 to T3 ($p = .495$). In each of these instances, the mean QOL score at the follow up point was higher than at the previous interview, indicating positive improvements in QOL, except for a decrease in mean Social QOL from T1 to T2, though this did not approach significance ($p = .822$).

3.3. Regression analysis of QOL

Controlling for the relevant T1 QOL score, Table 2 shows results of the hierarchical multiple regression analysis on QOL domain scores at T3. While race and number of mental disorders were significant at the bivariate level for one or more QOL domains, they did not remain significant in the final step of the models when the trauma and social support variables were included. Controlling for T1 Physical QOL ($\beta = .38$), higher Physical QOL at 6 month post intake ($R^2 = .42$) was associated ($p < .05$) with younger age ($\beta = -.17$), fewer trauma symptoms ($\beta = -.19$), greater perceived recovery support ($\beta = .16$) and friend support ($\beta = .15$). Improved Psychological QOL at 6 month post intake ($R^2 = .43$) was associated ($p < .05$) with fewer trauma symptoms ($\beta = -.15$), and greater perceived recovery support ($\beta = .20$) and friend support ($\beta = .16$), controlling for T1 Psychological QOL ($\beta = .36$). Likewise, Environmental QOL at 6 month post intake ($R^2 = .41$) was associated with ($p < .05$) less alcohol use in past 30 days ($\beta = -.17$), and greater perceived recovery support ($\beta = .18$) and friend support ($\beta = .28$), controlling for T1 Environmental QOL ($\beta = .30$). After controlling for T1 Social QOL ($\beta = .26$), Social QOL at 6 month post intake ($R^2 = .35$) was correlated ($p < .05$) solely with the support measures, recovery support ($\beta = .28$) and friend support ($\beta = .21$).

4. Discussion

4.1. Strengths and limitations

This paper examined changes in and correlates of QOL among women with SUDs. This study used a cross-culturally standardized measure of QOL, the WHOQOL BREF, which to our knowledge has not been used with this population in the United States. This QOL measure helps to determine the social context within which SUD treatment and recovery occur by asking about satisfaction with social relationships and environmental living conditions in addition to individual health related and emotional factors. The study used a longitudinal design with repeated measurements and obtained a high retention rate among a large sample size of low income women, the majority with dual disorders. In terms of generalizability, study findings may be limited to low income inner city women served by county service systems. In this study, there were a limited number of treatment process variables included and there was little variance in substance use, limiting our ability to examine past 30 day substance use as a predictor of QOL; we were also not able to examine whether or not reduction of substance use occurred in this study. In addition, the contribution of QOL or the way in which QOL changes might influence treatment outcomes, maintenance of outcome or long term recovery is not addressed in his study.

Table 2
Hierarchical multiple OLS Regression with QOL domains.

QOL domain (T3)	Physical			Psychological			Social			Environmental		
	B	SE(B)	β	B	SE(B)	β	B	SE(B)	β	B	SE(B)	β
Step 1												
QOL domain (T1)	.60	.06	.53***	.52	.05	.54***	.40	.06	.40***	.46	.06	.43***
	$\Delta R^2 = .28^{***} F(1,235) = 91.86^{***}$			$\Delta R^2 = .29^{***} F(1,233) = 94.73^{***}$			$\Delta R^2 = .16^{***} F(1,235) = 44.10^{***}$			$\Delta R^2 = .19^{***} F(1,236) = 54.30$		
Step 2												
QOL domain (T1)	.45	.07	.40***	.43	.07	.44***	.34	.07	.34***	.39	.07	.37***
Age	-.22	.11	-.11*									
Race				-.48	2.20	-.01						
Education										1.19	2.09	.03
# of mental disorder	-1.06	.86	-.07	-.15	.81	-.01	-.22	1.02	-.01			
Trauma symptoms	-.20	.06	-.21**	-.14	.06	-.16*	-.14	.07	-.14	-.14	.05	-.16*
	$\Delta R^2 = .06^{***} F(4,235) = 30.02^{***}$			$\Delta R^2 = .02 F(4,233) = 25.63^{***}$			$\Delta R^2 = .02 F(3,235) = 16.45^{***}$			$\Delta R^2 = .02^* F(3,236) = 20.78^{***}$		
Step 3												
QOL domain (T1)	.45	.07	.40***	.42	.07	.43***	.33	.06	.34***	.39	.07	.37***
Age	-.23	.11	-.12*									
Race				-.86	2.17	-.02						
Education										.94	2.03	.03
# of mental disorder	-.97	.85	-.07	-.09	.80	-.01	-.21	1.01	-.01			
Trauma symptoms	-.19	.06	-.20**	-.12	.06	-.14*	-.13	.07	-.12*	-.10	.05	-.12*
Drink of alcohol	-2.64	3.29	-.05	-6.21	3.20	-.12*				-8.97	3.00	-.19**
Use of illegal drug	-7.52	5.05	-.09	-3.79	4.80	-.05	-12.07	5.48	-.13*	-4.85	4.62	-.07
Attend AA/NA/CA				.22	.10	.12*	.16	.13	.07	.21	.10	.12*
	$\Delta R^2 = .01 F(6,235) = 21.04^{***}$			$\Delta R^2 = .04^{**} F(7,233) = 17.17^{***}$			$\Delta R^2 = .02^* F(5,235) = 11.35$			$\Delta R^2 = .07^{***} F(6,236) = 14.98^{***}$		
Step 4												
QOL domain (T1)	.42	.07	.38***	.35	.06	.36***	.25	.06	.26***	.32	.06	.30***
Age	-.33	.10	-.17**									
Race				-1.77	2.06	-.05						
Education										.70	1.87	-.02
# of mental disorder	-.73	.82	-.05	.11	.75	.01	.21	.92	.01			
Trauma symptoms	-.18	.06	-.19**	-.13	.06	-.15*	-.12	.07	-.12*	-.08	.05	-.10*
Drink of alcohol	-1.63	3.14	-.03	-5.46	3.00	-.11*				-8.21	2.73	-.17**
Use of illegal drug	-4.71	4.85	-.06	-.55	4.54	-.01	-5.64	5.02	-.06	-.18	4.24	-.01
Attend AA/NA/CA				.08	.10	.05	-.08	.12	-.04	.05	.09	.03
Recovery support	.65	.25	.16*	.77	.24	.20**	1.24	.29	.28***	.65	.22	.18**
Friends support	.54	.21	.15*	.55	.20	.16**	.84	.25	.21**	.88	.19	.28***
	$\Delta R^2 = .06^{***} F(8,235) = 20.49^{***} R^2 = .42^{***}$			$\Delta R^2 = .09^{***} F(9,233) = 18.95^{***} R^2 = .43^{***}$			$\Delta R^2 = .16^{***} F(7,235) = 17.77^{***} R^2 = .35^{***}$			$\Delta R^2 = .13^{***} F(8,236) = 20.11^{***} R^2 = .41^{***}$		

Note. Blank spaces indicate that the variable was not significant at the bivariate level and therefore not included in the model.

- * $p < .10$.
- ** $p < .05$.
- *** $p < .01$.
- **** $p < .001$.

4.2. QOL of women with SUD

Although QOL at T3 showed significant improvements relative to intake, all 4 QOL domains remained significantly below scores reported for non-substance dependent populations (Noerholm et al., 2004; Hawthorne et al., 2006). This suggests that women with SUD and/or dual disorders continue to experience poorer functioning than does the general population. These results are consistent with previous findings (Bizzarri et al., 2005) of lower QOL domain scores in substance abusing and dual disordered populations compared with the general population. However, it is difficult to draw meaningful comparisons of QOL due to the lack of U.S. norms for the WHOQOL-BREF and an appropriate control group of low income inner city women. In addition, whether lower QOL predicts greater vulnerability to relapse remains a question for future research. There is however, emerging evidence that QOL satisfaction at the end of outpatient treatment significantly predicts commitment to abstinence, a motivational construct that is a strong predictor of sustained abstinence (Laudet and Stanick, 2010) and prospectively predicts sustained abstinence up to two years later (Laudet et al., 2009).

In this study, low QOL scores at intake suggest that women may start treatment at a relative disadvantage in terms of their perceived quality of health status, social context and environmental conditions which may influence their response to treatment services in ways different than their substance use alone. It is important to point out that Environmental QOL was rated the poorest of all domains at all time points, as shown in Fig. 1. This may reflect the fact that many women in this study had low incomes and lived in poor neighborhoods, environmental factors that might complicate access to treatment and supportive services. We also observed a decrease in social QOL at the one month follow up interview. This may indicate a vulnerable time point for women in treatment during which they may have extricated themselves from some substance-involved social relationships but not replaced them with more appropriate social outlets; social support or network interventions might be timely and relevant at this point in time as well.

4.3. Predictors of QOL

Treatment process variables, including recent alcohol and drug use, whether or not women were in treatment, and number of 12-step meetings attended were mostly not statistically significant in the regression analysis of QOL domains at T3. Only the amount of alcohol used within the past 30 days was significant, and only for Environmental QOL. This finding suggests that the extent of substance use may not be the most salient factor in determining life satisfaction in this population, and implies the need for treatments and services focused on other areas of functioning in addition to sobriety or reduction of use, such as trauma symptoms, living conditions, and social support.

One area that appears to impact QOL significantly more than substance use as measured in this study is the degree of trauma symptoms. In this study, trauma symptoms were significant correlates of Physical and Psychological QOL domains. These results are supported by previous literature that has identified a high rate of trauma and histories of sexual violence among female substance users (Root, 1989; Singer et al., 1995, 1997). For this reason, previous researchers have endorsed the need for more trauma informed interventions and services for this population (Najavits et al., 1997; Harris and Falot, 2001), as well as integrated treatment models for trauma symptoms and substance abuse.

Recovery support and friends support for abstinence were significant contributors to QOL across all four domains. Regardless of substance use, 12 step meetings attended, and trauma symptoms,

social support remained a significant factor associated with higher of QOL. This suggests that enhancing social support for recovery/abstinence may contribute to improved QOL for women in substance abuse treatment.

4.3.1. Implications. The findings from this study have the potential to inform service development by identifying specific areas of functioning that are impaired for women in this population. Services and interventions may be developed or modified by taking into account the chronology of improvement in both QOL and recovery maintenance, and specific service needs at various stages of recovery, both during treatment and post treatment. The importance of trauma informed services for substance abusing women are supported by this study's findings. Additionally, the important role of social support, especially support related to recovery, is strongly supported by these data. This underscores the importance of targeted treatment interventions that help women to enhance support for recovery provided to them from their social networks.

4.3.2. Future research. This study reinforces the utility of the WHOQOL measure as a potentially useful indicator of functioning in substance abusing populations. However, more longitudinal studies are necessary to understand QOL and changes in QOL over time as risk or protective factors for individuals with SUD. Additionally, the relationship between substance use, sobriety maintenance, and QOL remains unclear. Whether substance use determines QOL, QOL determines substance use, or some other factor predicts both substance use and QOL remains unanswered. Future studies might use the WHOQOL to examine the causal processes in QOL and recovery maintenance over time. In addition, the relationship between different types of treatment interventions delivered (e.g., cognitive behavioral, skills building, psychoeducational) and quality of life domains could be examined. Continued research on QOL would increase our understanding of treatment outcomes in the broader context of a recovery oriented model of treatment.

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Contributors

Elizabeth Tracy is the principal investigator and Alexandre Laudet, Meeyoung Oh Min and Lynn Singer are co-investigators of the grant that supported this research. Elizabeth Tracy conceptualized the paper and wrote the initial and final drafts. HyunSoo Kim and MinKyoung Jun undertook the data analysis and literature searches. Alexandre Laudet wrote the background on QOL and measures and Sue Brown wrote the discussion section. All authors contributed to drafting and reviewing the manuscript and have read and approved the final manuscript.

Conflict of interest

The authors have no conflicts of interests.

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