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Changes in Personal Networks of Women in Residential and Outpatient Substance Abuse Treatment

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Abstract Changes in personal network composition, support and structure over 12 months were examined in 377 women from residential ($n=119$) and intensive outpatient substance abuse treatment ($n=258$) through face-to-face interviews utilizing computer based data collection. Personal networks of women who entered residential treatment had more substance users, more people with whom they had used alcohol and/or drugs, and fewer people from treatment programs or self-help groups than personal networks of women who entered intensive outpatient treatment. By 12 months post treatment intake, network composition improved for women in residential treatment; however, concrete support was still lower and substance users still more prevalent in their networks. Network composition of women in outpatient treatment remained largely the same over time. Both groups increased cohesiveness within the network over 12 months. Targeting interventions that support positive changes in personal networks may heighten positive long term outcomes for women entering treatment.

Keywords Women, Substance Abuse Treatment, Personal Networks, Treatment Modality

1. INTRODUCTION

Given the chronic nature of substance use disorders (Dennis, Foss, & Scott, 2007; McLellan, Lewis, O'Brien, & Kleber, 2000), maintaining treatment gains over time can be challenging and is often facilitated by various forms of ongoing social support. A number of studies have examined the process by which personal networks can either support or undermine treatment engagement (Joe, Broome, Rowan-Szal, & Simpson, 2002), treatment outcomes (Gregoire & Snively, 2001; Tucker, Wenzel, Golinelli, Zhou, & Green, 2011; Zywiak et al., 2009) and relapse prevention (Bond, Kaskutas, & Weisner, 2003; Zywiak, Longabaugh, & Wirtz, 2002). Personal network support has also been shown to mediate the relationship between 12 step attendance and lower substance use (Laudet, Magura, Vogel, & Knight, 2004), substance abuse treatment services and mental health and substance use outcomes (Warren, Stein, & Grella, 2007) and symptoms of depression and severity of substance use in women with dual disorders (Dodge & Potocky, 2000).

A personal network approach is useful in understanding the context in which substance use and substance abuse treatment occur. This approach examines the social context of a focal person by eliciting the set of people known to that person, collecting information on the characteristics of

those individuals and evaluating the ties or connections among them (Marsden, 1990; Wasserman & Faust, 1994). Personal networks consist of three dimensions (Marsella & Snyder, 1981): 1) network composition (characteristics of network members and how they are related to the focal person), 2) types of interactions and social support available through these relationships and 3) structural measures of how the network is organized, which include cohesiveness or density (the proportion of ties that exist out of all possible ties) and centralization (the degree to which a network is organized around or dominated by one or a few people) (McCarty, 2002). In a centralized network, ties are concentrated on one or a few people who play an influential role within the network. A decentralized network has more evenly distributed ties; likewise, a very cohesive (dense) network, where ties exist among all people, would be low on centralization, since no one person is dominant in the network.

1.1. Social Networks, Women and Substance Abuse

Establishing positive network resources is often a treatment goal and priority for women with substance use disorders (Covington, 2002). Creating changes in personal networks can be a challenge because women often enter treatment with family and psychological distress and trauma, limited personal network support and many substance

using network members, including spouses or partners who are substance users (Grella, 2008; Savage & Russell, 2005). Relationships with substance using spouses/partners negatively impact women's physical and psychological health over time (Dawson, Grant, Chou, & Stinson, 2007) and offer inconsistent support for sobriety and efforts toward recovery (Laudet, Magura, Furst, Kumar, & Whitney, 1999). Support (or non-support) from network relationships contributes to women's substance use and mental health status (Skaff, Finney, & Moos, 1999). Women are likely to have first used alcohol and/or drugs with family and friends (Center for Substance Abuse Treatment, 2009). Significant others in networks enhance treatment motivation (Simoneau & Bergeron, 2003), which has been associated with treatment retention and engagement (Joe, Simpson, & Broome, 1998; Simpson, Joe, Rowan-Szal, & Greener, 1997). Positive changes in social networks that result in more support for sobriety have been shown to have significant and positive impact on women's abstinence self efficacy (Davis & Jason, 2005). The presence of co-occurring substance use and mental disorders which occur in high proportions among women in substance abuse treatment (Wechsberg, Craddock, & Hubbard, 1998), also presents complications for their personal networks. Women who have a co-occurring substance use and mental disorder experience less social support and less reciprocity in their network relationships, as compared with women with a substance disorder only (Tracy & Johnson, 2007).

1.2. Research on Personal Networks and Treatment Modalities

1.2.1 Residential Treatment Samples Network size, frequency of contact, and network members' substance use or abstinence are important correlates of treatment outcome and recovery for women in residential treatment. Zywiak et al. (2009) found that women with a substance use disorder who had daily contact with many network members had better treatment outcomes as indicated by less drug use, less drinking and less relapse at six month follow up. Abstinence support from the network, however, was not predictive of outcome. Interestingly, in that study, there was no significant change in network size over time, but those who were successful in maintaining sobriety had increased the percentage of abstinent network members over time. Quality of family and peer group relationships post discharge has been shown to predict likelihood of relapse (Ellis, Bernichon, Yu, Roberts, & Herrell, 2004); women with positive family relationships post discharge were less likely to relapse, while those engaging in negative activities with friends and who had a spouse or partner who used drugs were more likely to relapse. Similarly, Falkin and Strauss (2003) found that the people women reported most likely to provide support post treatment were often the very same people who enabled substance use prior to treatment. Substance using network members also have a negative influence on treatment entry; Tucker et al.

(2011) found that women having a larger number of active substance users in their personal networks and greater network density were less likely to enter treatment.

1.2.2 Outpatient Treatment Samples Pretreatment network size and the percentage of drug/alcohol users in the network impacts women's entrance into outpatient treatment (Manuel et al. (2007) El-Bassel, Chen, and Cooper (1998) reported that network members who lived the closest were less likely to support abstinence and that network density was related to some types of social support but not others (financial support versus housing). McDonald, Griffin, Kolodziej, Fitzmaurice, & Weiss, 2011) found that women clients with 2 or more drug users (as compared with zero to one drug users) in their networks had significantly more days of drug use in the 15 months following treatment; those who reported multiple drug users in their networks considerably increased their drug use over time, although mood episodes did not seem related to the presence of drug using network members

1.2.3 Combined Samples Personal network studies which have utilized combined samples demonstrate the importance of AA involvement and abstinence based networks as contributors to sustained sobriety (Bond, Kaskutas, & Weisner., 2003; Weisner, Delucchi, Matzger, & Schmidt, 2003). Contacts with network members who had been in treatment and who do not use alcohol or drugs increase the likelihood of women entering drug treatment (Davey, Latkin, Hua, Tobin, & Strathdee, 2007). Networks with greater numbers of substance users predict poor treatment outcomes (Gregoire & Snively, 2001). Savage and Russell (2005) describe personal networks of women with co-occurring substance use and mental disorders as consisting primarily of family members; however, the high proportion of family members and drug use ties undermined the network's ability to offer emotional support and encouragement, particularly in the face of healing from trauma.

1.3. Aims of this Study

While research on personal networks and social support has contributed much to our understanding of the social context of substance abuse treatment and recovery, there are a number of notable gaps which are addressed in this study. First, research on personal networks has focused primarily on social support availability and/or network composition, with much less attention to the role of network structure (Bond, Kaskutas, & Weisner, 2003; Warren et al., 2007; Weisner et al., 2003). Second, the bulk of personal network research, particularly on women with co-occurring substance use and mental disorders (dual disorders), has been cross sectional (Falkin & Strauss, 2003; Savage & Russell, 2005). We are not aware of other longitudinal studies which focus on personal networks in treated, low income women with dual disorders. Finally, findings

are typically not analyzed by treatment modality (residential versus outpatient treatment settings). Therefore, little is known about how and whether or not personal networks change as women progress through treatment, and in particular how treatment modality might be related to personal network changes. This study aims to address those research gaps by examining longitudinal patterns of women's personal networks in both residential and intensive outpatient treatment to identify compositional, social support and structural changes over 12 months. Residential programs could be viewed as a network intervention, in that participants leave their usual networks and environment for some period of time and are required and helped to interact with a new set of people. While this appears to be an initial advantage, we need to know if network changes that occur within treatment eventually transfer to home environments outside of treatment. Intensive outpatient treatment programs also offer the opportunity for clients to learn to interact with a new network of other women in treatment, while at the same time the network outside of treatment remains available. We need information on how networks within and outside of outpatient treatment blend (or do not blend) over time. Therefore, understanding the impact of treatment modality on personal networks over time provides more detailed information for network interventions most appropriate to particular treatment settings or those who lack the resources to perform such studies.

2. METHODS

2.1. Participants and Procedure

The study sample consisted of 377 women recruited from three inner-city substance abuse treatment programs: two intensive outpatient programs (n=258) and one residential treatment program (n=119) in Ohio. All three programs provided specialized treatment for women only and were county-funded for financially disadvantaged consumers with little or no insurance. Placement for outpatient versus residential treatment had been determined at the time of the county level assessment just prior to treatment intake. Women in intensive outpatient received individual and group counseling for a minimum of 8 hours over at least 3 days during the week. Women in residential treatment participated in 24-hour services in a rehabilitation facility with structured activities for at least 30 hours per week. Services in both treatment modalities included assessment, individual and group counseling, crisis intervention, and case management.

Women were considered study eligible if they were 18 years of age or older, had been in treatment for at least one continuous week, and had a diagnosis of substance dependence defined as a DSM-IV diagnosed substance dependence within the past 12 months of entry into the study for at least one substance, including alcohol. Women with a known diagnosis of schizophrenia or taking medication prescribed for a major thought disorder were excluded.

Face to face interviews utilizing computer based data collection (on average 2 hours long) were conducted by trained interviewers at 1 week (T1), 1 month (T2), 6 months (T3), and 12 months (T4) post treatment intake between October 1, 2009 and May 30, 2012. Participants received a \$35 gift card for participation at each assessment, plus reimbursement for travel expenses. This study was approved by the Case Western Reserve University Institutional Review Board. Written, informed consent was obtained. A Certificate of Confidentiality was secured from the National Institute of Health. (See Tracy et al., 2012b for further information on the study design and goals). Overall retention in the study was 93% for T2 and 81% respectively for T3 and T4. Those lost to follow up were more likely to have been in residential treatment and to report higher trauma symptoms at T1; race, age, dual disorder status, homelessness, legal involvement, employment, number of substances of dependence, and duration of substance use disorder did not differ.

The present study utilizes data from all women enrolled in the study who had complete social network data. Of the total sample of 377, 338 (90%; 100 residential, 238 outpatient) completed T2 network data (the 1 month assessment); 299 (79%; 77 residential, 222 outpatient) completed T3 network data (the 6 month assessment); and 298 (79%; 83 residential, 215 outpatient) completed T4 network data (the 12-month assessment). Approximately 93% (88% residential, 96% outpatient) of the sample completed > 2 of the 4 possible assessments for the present longitudinal analysis.

2.2. Measures

2.2.1. Outcome measures Personal network variables including network composition, support, and structure were assessed at all four interviews using a social network software program, EgoNet (available from SourceForge.net; McCarty, 2002; McCarty, Molina, Aguilar, & Rota, 2007).

2.2.1.1. Social network composition Respondents were instructed to list 25 people (alters) with whom they had had any type of contact in the past six months, including "people who made them feel good, people who made them feel bad and others who played a part in their life". Respondents were then asked about their relationship with each alter (how they knew each person listed), whether or not each alter used alcohol and/or drugs and whether or not the alter was someone that they "had used alcohol and/or drugs with". Three personal network composition variables were used in this analysis 1) one alter relationship variable, "treatment related alters" (combining the number of professional helpers and the number of peers from treatment and 12-step programs) 2) number of alters using substances (alcohol, drugs or both), and 3) number of alters with whom the woman reported as having used alcohol and/or drugs.

2.2.1.2. Social network support Based on the alter list generated in EgoNet, network support characteristics were measured as the number of alters perceived as almost always (as opposed to the other response categories of hardly ever and sometimes) available for concrete (“giving you a ride or loaning you money”), emotional (“being there for you or listening to you”), informational (“give you information or advice”), and sobriety support (“give you support to stay clean”). Preliminary analyses indicated a high correlation ($r > .9$) between the number of alters providing emotional support and the number of alters providing informational support, and, thus, we only conducted analyses with emotional support.

2.2.1.3. Social network structure EgoNet also asked about connections between each unique pair of relationships: “What is the likelihood that alter 1 and alter 2 talk to each other independently of you?” Respondents rated each unique alter pair as not at all likely, somewhat likely, or very likely to interact. This question was repeated for each unique pair of alters. The personal network structural variables were calculated based on alter pairs very likely to interact and included 1) components, number of groups of at least three alters who are connected directly or indirectly; 2) isolates, number of alters not connected to any one else in the network; 3) density, a score between 0 and 1, measuring cohesiveness as computed by the proportion of ties in a network relative to the total of all possible ties; and 4) measures of centralization, scores between 0 and 1, indicating the extent to which a network is dominated by one or a few alters in terms of the number of ties (degree centralization) and bridging the most connections (betweenness centralization) (Tracy et al., 2012a) Since the two centralization measures were substantially correlated ($r \geq .6 \approx .7$) over time, we present betweenness centralization only in analyses for this paper.

2.2.2. Covariates

2.2.2.1. Covariates collected at one week post treatment intake (T1) The presence of co-occurring mental disorders was assessed at one week post treatment intake using the Computerized Diagnostic Interview Schedule IV (CDIS; (Helzer et al., 1985; Robins, Helzer, Croughan, & Ratcliff, 1981)), a structured interview based on the criteria in the Diagnostic and Statistical Manual of Mental Disorders, Revised Fourth Edition (American Psychiatric Association, 1994). The CDIS has demonstrated validity and reliability (Robins et al., 1999). Each participant was categorized as either dual disorder or substance use disorder only based on the past 12 month presence of mental disorders.

Trauma symptoms associated with childhood and/or adult traumatic experiences were assessed with the Trauma Symptom Checklist-40 (TSC-40; Elliott & Briere, 1992; Zlotnick et al., 1996), a 40-item self-report instrument assessing anxiety, depression, dissociation, sexual abuse

trauma, sexual problems, and sleep disturbance. Items are rated on a 4-point scale according to their frequency of occurrence over the prior two months (0=never to 3=often) with a range 0–120. Total trauma symptom score was used for this study, and its internal consistency measured by Cronbach’s alpha (α) was .93 for this administration.

Treatment motivation was assessed using the Treatment Motivation Scale (Joe, Simpson, Broome, 1998), a 24 item self-report questionnaire assessing problem recognition, desire for help and treatment readiness. Items are rated on a 5-point scale (1=Strongly Disagree to 5=Strongly Agree), producing a range 24–120. A total score was computed, with higher scores indicating greater levels of treatment motivation ($\alpha = .91$).

Previous substance abuse treatment history including either detoxification, drug maintenance, residential or outpatient treatment programs (1=yes, 0=no) was also assessed along with demographic variables including age at one week post treatment intake, race (African American vs. Non-African American), marital status (married; widowed, separated or divorced; never married), and education (less than high school vs. high school graduate).

2.2.2.2. Time-varying covariates Abstinence efficacy was assessed at all four interview time points using the Drug Abstinence Self Efficacy Scale, which was modified after the Alcohol Abstinence Self-Efficacy Scale (DiClemente, Carbonari, Montgomery, & Hughes, 1994). Each participant rated herself on a 5-point Likert scale of confidence to abstain from alcohol and drugs across 20 different high-risk situations (1=not at all confident to 5=extremely confident; range 20–100), with higher scores indicating greater confidence. Construct validity of this scale has been demonstrated (DiClemente et al., 2001). Overall a for the total score = .97 for this study.

The Treatment Services Review (TSR; (McLellan, Alterman, Cacciola, Metzger, & O'Brien, 1992) was used to assess treatment process variables at T2, T3, and T4. Two variables, treatment status (in a treatment program including on wait list vs. out of treatment) and current (in the past 30 days) alcohol or drug use, were derived for the current study. High test-retest reliability for TSR has been demonstrated for in-person interviews spaced 1 day a part (McLellan et al., 1992)

2.3. Data analysis

The two treatment modality groups (residential versus outpatient) were compared on demographic, clinical and treatment process related variables using t tests for continuous variables and Pearson χ^2 for categorical variables. The outcome variables (personal network composition, support, and structure) were examined for distributional characteristics, indicating no substantial deviation from normality to warrant a transformation or use of nonparametric statistical methods. Bivariate correlations were estimated to examine inter-relationships between variables.

Multicollinearity was also assessed using tolerance and variance inflation factor.

Changes in personal network composition, support and structure of residential treatment women (n=119) and intensive outpatient women (n=258) over 12 months were compared using a mixed linear model approach with maximum likelihood estimation procedures as implemented in SAS Proc Mixed (SAS v. 9.2; SAS institute Inc, Cary, NC). Since the dependent variables were repeated measures and correlated within a subject, we used unstructured covariance matrix to account for correlated responses within a subject. The unstructured covariance matrix estimates separate variances at each of the time points and allows for a general correlation between responses within a subject. We included an interaction term between treatment modality and time to test for the homogeneity of the effects of the treatment modality on personal network variables over time. Missing data were modeled using full-information maximum likelihood (FIML), which uses all available information from the observed data. Compared to mean-imputation, listwise, or pairwise models, FIML provides more statistically reliable standard errors (Wothke, 1998).

Demographic (age, race, marital status), clinical (dual disorder, trauma symptoms), and treatment process related (treatment history, treatment motivation, abstinence self-efficacy, treatment status, substance use) variables correlated with the given outcome at $p < .20$ for at least two assessments were entered in the longitudinal model (Mickey & Greenland, 1989). Thus, a different set of covariates were adjusted on each personal network outcome. Adjusted least squares means (Madj) and standard errors (SE) were calculated from the models. Differences for all tests were considered significant at $p < .05$.

3. RESULTS

Few differences between the residential and intensive outpatient groups in sociodemographic characteristics were observed, as presented in Table 1.

The mean age of the 377 study participants was 36.5 years old (SD=10.4), with 60% (n=225) identified as African American. 41% (n=154) completed less than high school education, with 73% (n=261) of the sample receiving welfare assistance. Only 7% (n=27) of the sample were currently married, 43% (n=163) had experienced homelessness at some time in their lives, and 45% (n=168) reported current legal involvement including being on parole, probation, or awaiting sentencing. Compared to intensive outpatient women, women in residential treatment reported having fewer birth children and tended to live alone in a temporary place.

Table 1. Socio-demographic Characteristics at Intake by Treatment Modality

| | Residential (n = 119) | Intensive Outpatient (n = 258) | χ^2/t | p |
|-----------------------------------|--------------------------|--------------------------------------|------------|-------|
| | n (%) | | | |
| Race, African American | 67 (56.8) | 158 (61.2) | 0.67 | 0.41 |
| Education, less than high school | 43 (36.4) | 111 (43.2) | 2.77 | 0.25 |
| Marital status | | | 1.36 | 0.51 |
| Married | 8 (6.8) | 19 (7.4) | | |
| Widowed/Separated/Divorced | 37 (31.4) | 66 (25.6) | | |
| Never married | 73 (61.9) | 171 (67.1) | | |
| Age, <i>M(SD)</i> | 36.55 (10.0) | 36.43 (10.5) | 0.11 | 0.91 |
| # of birth children, <i>M(SD)</i> | 2.25 (1.9) | 3.02 (2.2) | -3.27 | 0.001 |
| Employment | | | 0.27 | 0.87 |
| On Jobs | 13 (11.5) | 24 (9.7) | | |
| Welfare/Gov. Assistance | 81 (71.7) | 180 (72.9) | | |
| Other | 19 (16.8) | 43 (17.4) | | |
| Housing | | | 59.88 | <.001 |
| Own house | 19 (16.2) | 130 (50.6) | | |
| Shared/Double-up/Temporary | 53 (45.3) | 102 (39.7) | | |
| Institute/Group home/Street | 45 (38.5) | 25 (9.7) | | |
| Living with | | | 9.57 | 0.002 |
| Alone | 36 (30.3) | 42 (16.3) | | |
| Not alone | 83 (69.7) | 215 (83.7) | | |
| Legal involvement, yes | 52 (43.7) | 116 (45.1) | 0.07 | 0.79 |
| History of homelessness, yes | 51 (42.9) | 112 (43.6) | 0.02 | 0.89 |

Table 2 compares clinical and treatment process related characteristics between the two groups. More residential women were diagnosed with cocaine or/and opiates dependence and multiple substance dependence as compared with outpatient women; more outpatient women were diagnosed with manic episode than residential women. There were no group differences in dual diagnosis and previous substance treatment history prior to this current admission. Residential women reported greater trauma symptoms, higher levels of treatment motivation, and lower abstinence self-efficacy at one week post treatment intake. Compared to outpatient women, fewer residential women reported being in treatment (at the same or different program) at 1 month (T2; 79% residential vs. 91% outpatient) and 6 month (T3; 17% residential vs. 35% outpatient) assessments. However, no group differences were found at 12 months (T4). Fewer residential women (5% residential vs. 21% outpatient) reported substance use in past 30 days than outpatient women at T2; by T4 30% of women from residential treatment and 20% of women from outpatient treatment reported substance use.

Table 2. Clinical and Treatment Process Related Characteristics by Treatment Modality

| | Residential (n = 119) | Intensive Outpatient (n = 258) | χ^2 | p |
|--|--------------------------|--------------------------------------|----------|-------|
| | n (%) | | | |
| Substance dependence | | | | |
| Alcohol | 63 (54.3) | 112 (43.8) | 3.57 | 0.06 |
| Marijuana | 44 (37.9) | 105 (41.0) | 0.32 | 0.57 |
| Cocaine | 78 (67.2) | 135 (52.7) | 6.87 | 0.01 |
| Opiates | 35 (30.2) | 51 (19.9) | 4.72 | 0.03 |
| Multiple substance dependence | 74 (63.8) | 132 (51.8) | 4.67 | 0.03 |
| Mental disorder | | | | |
| Generalized anxiety | 21 (17.7) | 68 (26.5) | 3.45 | 0.06 |
| Posttraumatic disorder | 39 (31.7) | 108 (42.0) | 2.92 | 0.09 |
| Major depressive episode | 68 (57.2) | 149 (58.0) | 0.02 | 0.88 |
| Manic episode | 27 (22.7) | 91 (35.4) | 6.11 | 0.01 |
| Multiple mental disorders | 54 (45.4) | 137 (53.1) | 1.94 | 0.16 |
| Dual diagnosis | 89 (74.8) | 186 (72.7) | 0.19 | 0.66 |
| Previous treatment | 90 (75.6) | 185 (72.3) | 0.47 | 0.49 |
| Trauma symptoms, <i>M (SD)</i> | 49.4 (20.9) | 42.5 (21.3) | 2.93 | <.01 |
| Treatment motivation, <i>M (SD)</i> | 105.3 (11.1) | 96.3 (14.1) | 6.65 | <.001 |
| Abstinence self-efficacy, <i>M (SD)</i> | | | | |
| Abstinence self-efficacy at T1 | 70.4 (22.5) | 78.5 (18.0) | -3.47 | <.01 |
| Abstinence self-efficacy at T2 | 78.9 (16.4) | 80.0 (15.8) | -.57 | 0.57 |
| Abstinence self-efficacy at T3 | 80.4 (16.9) | 82.9 (15.3) | -1.20 | 0.23 |
| Abstinence self-efficacy at T4 | 78.8 (22.4) | 81.4 (16.8) | -.95 | 0.34 |
| Treatment status | | | | |
| In treatment at T2 | 78 (78.8) | 216 (90.8) | 9 | <.01 |
| In treatment at T3 | 13 (16.7) | 77 (34.8) | 9.05 | <.01 |
| In treatment at T4 | 9 (10.8) | 36 (16.6) | 1.56 | 0.21 |
| Substance use in past 30 days | | | | |
| in past 30 days at T2 | 5 (4.9) | 51 (21.1) | 13.98 | <.001 |
| in past 30 days at T3 | 20 (25.6) | 36 (16.3) | 3.31 | 0.07 |
| in past 30 days at T4 | 25 (30.1) | 43 (19.8) | 3.64 | 0.06 |

3.2. Changes in Personal Network over 12 Months

3.2.1. Personal social network composition Figure 1, Figure 2 and Figure 3 contain graphs illustrating changes in each personal network variable by treatment modality over time. Solid lines are used to indicate the residential treatment group and dashed lines for the intensive outpatient treatment group. Between group differences (residential vs. intensive outpatient treatment) are indicated by an asterisk at each time point where a statistically significant difference was observed; within group differences, noting significant changes over time, are noted to the side of each graph. Covariates (including time varying covariates) that were included in the longitudinal analysis for each outcome are noted to the side of the graph and those significantly related to the network variable are italicized.

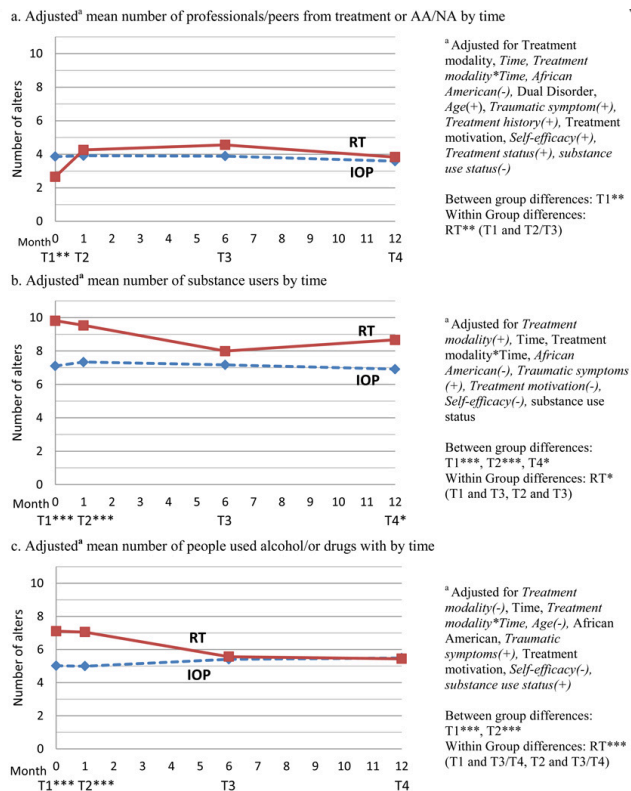


Figure 1. Social Network Composition by Treatment Modality (Note. Significant covariates are listed in italics. *p<.05, **p<.01, ***p<.001; RT=Residential Treatment, IOP=Intensive Outpatient Treatment)

Figure 1 presents adjusted mean number of alters (1a), number of substance using alters (1b), and number of alters with whom the woman used alcohol and/or drugs (1c) in the personal network of 25 alters over the 12 month period since one week post treatment intake. Women in residential treatment reported, on average, fewer treatment-related alters (*Madj*=2.7, *SE*=0.42) than women in outpatient treatment (*Madj*=3.9, *SE*=0.33) but only at the one week post treatment intake interview. Residential Treatment women also had significantly more substance using alters (between 8 to 10 representing 32%–40% of the network) in their personal network over the 12 month period than Intensive Outpatient treatment women who reported approximately 7 substance using alters (*F*=15.18, *p* <.001). Residential Treatment women also had more alters (7) on average with whom alcohol and/or drugs had been used at both T1 and T2 than Intensive Outpatient treatment women, who reported on average 5 alters (*F*=6.12, *p* <.01). A significant time effect in change (i.e., within group difference) in the three personal social network composition variables was noted for the Residential Treatment group only (no within-group change for Intensive Outpatient treatment). For example, there was significant increase from T1 to T2 and from T1 to T3 on the number of treatment-related alters (1a) among Residential Treatment women.

The inclusion of covariates in the analyses allowed us to determine correlates of social network changes over time. Being African American was related to fewer treatment-related alters and fewer substance using alters in the network; older age was related to a higher number of treatment related alters and fewer alters with whom alcohol and/or drugs were used. Both greater trauma symptoms and abstinence self-efficacy were related to all three network composition measures: more traumatic symptoms was associated with a greater number of treatment-related alters, substance using alters, and alters used alcohol and/or drugs with, and greater self-efficacy was related to a higher number of treatment-related alters but a lower number of substance using alters and with whom alcohol and/or drugs were used. Previous treatment history and being in treatment at the follow up assessments were related to an increased number of treatment-related alters; greater treatment motivation was related to fewer substance using alters; and substance use in past 30 days was related to increased number of treatment-related alters and alters with whom alcohol and/or drugs were used.

a significant time effect was noted for all three domains of support ($F=10.28, p < .0001$ for concrete; $F=4.65, p < .004$ for emotional; $F=3.32, p < .02$ for sobriety), indicating an increasing number of alters providing all three types of support over time. A significant main effect of treatment modality was found for concrete support only ($F=6.75, p < .01$), indicating Residential Treatment women having consistently fewer alters providing concrete support as compared with Intensive Outpatient Treatment women across the 12 months assessed. Both treatment modality groups reported on average increase of about 3 alters providing concrete support from T1 to T4. At T1 Residential Treatment women reported 10.6 (SE=0.62) alters providing concrete support compared to 12.8 (SE=0.41) alters of Intensive Outpatient Treatment women; at T4 Residential Treatment women reported 13.5 (SE=0.79) alters providing concrete support compared to 15.4 (SE=0.49) Intensive Outpatient Treatment women. Although Residential Treatment women reported fewer number of alters providing emotional support (Madj=14.7, SE=0.60 vs. Madj =16.2, SE=0.44) and sobriety support (Madj=19.2, SE=0.50 vs. Madj =20.5, SE=0.36) than Intensive Outpatient Treatment women at intake, those differences disappeared by T2.

Older age was related to a greater number of alters providing all three types of support (concrete, emotional, and sobriety support). Higher treatment motivation and abstinence self-efficacy scores were related to higher numbers of alters providing emotional support. Treatment history and higher abstinence self-efficacy were related to higher numbers of alters providing sobriety support; substance use in past 30 days was related to a lower number of alters providing sobriety support.

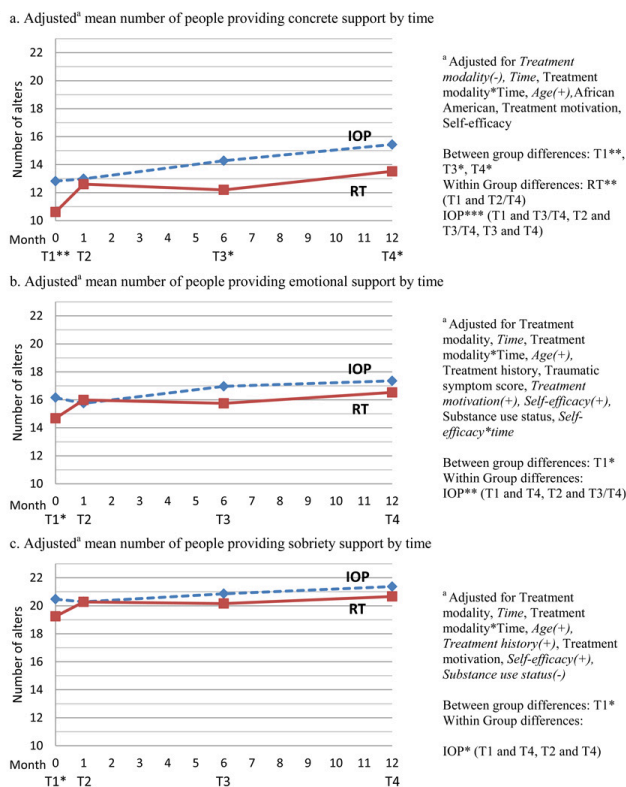


Figure 2. Social Network Support by Treatment Modality (Note. Significant covariates are listed in italics. *p<.05, **p<.01, *p<.001; RT=Residential Treatment, IOP=Intensive Outpatient Treatment)**

3.2.2. Personal social network support Figure 2 presents adjusted mean number of alters providing concrete (2a), emotional (2b), and sobriety (2c) support in the personal network over the 12 month follow up period. Overall,

3.2.3. Personal network structure Figure 3 presents adjusted mean density (3a), betweenness centralization (3b), and number of isolates (3c). Density did not differ by treatment modality, and both residential and intensive outpatient groups increased density over time ($F=15.8, p<.0001$). On average, 25% of ties among Residential Treatment women’s personal social network and 27% of ties among Intensive Outpatient Treatment women’s personal social network were connected at T1, which was increased to 39% for both groups by T4. Significant interactions between time and treatment modality were found on betweenness centralization ($F=2.94, p=.03$) and number of isolates ($F=3.92, p=.01$). At both T1 and T2, a significant group difference in betweenness centralization was found, indicating Residential Treatment women’s personal networks characterized by a higher degree of domination by one or a few alters in bridging the most connections (Madj=17.5, SE=1.36 vs. Madj =12.9, SE=0.91 at T1; Madj=18.1, SE=1.49 vs. Madj =14.3, SE=0.98 at T2) than Intensive Outpatient Treatment women’s. Although Residential Treatment women had fewer isolates (Madj =3.3, SE=0.56) than Intensive Outpatient Treatment women (Madj =5.0, SE=0.37) in their network at T2, significant

within group changes were noted for Intensive Outpatient Treatment women only. On average, the number of isolates among Intensive Outpatient Treatment women decreased from 5.2 (SE=0.34) at T1 to 3.2 (SE=0.34) at T4, compared to 4.7 (SE=0.51) to 3.9 (SE=0.54) among Residential Treatment women. Being African American was related to greater density. Dual disorder was related to greater betweenness centralization. Being married was related to greater betweenness centralization at T1 only.

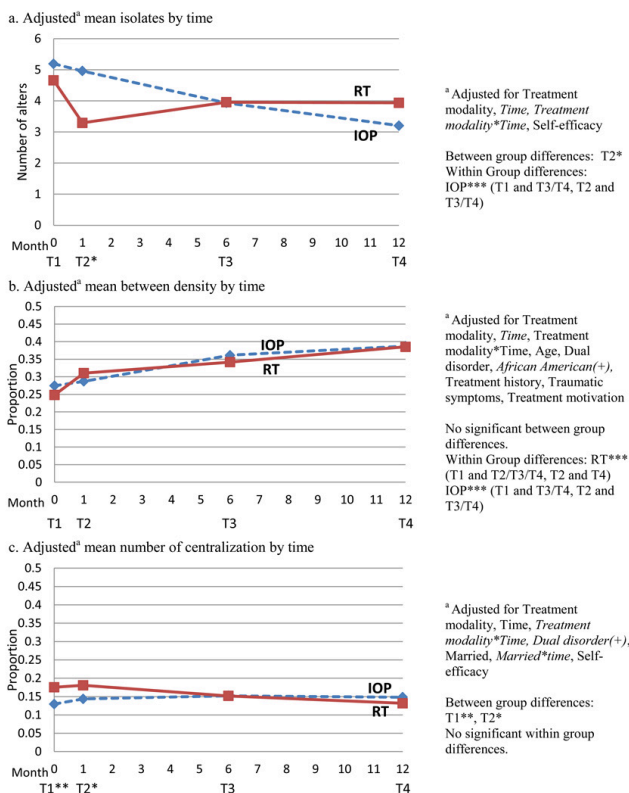


Figure 3. Social Network Structure by Treatment Modality (Note. Significant covariates are listed in italics. *p<.05, **p<.01, ***p<.001; RT=Residential Treatment, IOP=Intensive Outpatient Treatment)

4. DISCUSSION

4.1. Strengths and Limitations

This study examined changes in women’s personal networks from one week to 12 months post treatment intake. Strengths of this study include its detailed longitudinal approach to measuring network composition, support availability and structure among an understudied group of low income women, the majority of whom have dual disorders. Study findings can only be generalized to similar populations of low income women served in publicly funded treatment programs. A limitation of the data collection method, as analyzed in this paper, is that we have not determined who were the alters providing the various types

of support; for example, knowing if support is available from professionals, treatment peers, family or friends would likely yield helpful information for intervention development. This analysis also did not examine changes in people in the network. This would involve an examination over time of which people remained in the network, which people were eliminated, and who replaced lost network members. Future research is also needed to determine if and how the changes observed in personal networks over time are related to a range of treatment outcomes, including substance use/non-use, employment and quality of life. Qualitative research would also be helpful in discovering the reasons women attribute to changes in their networks and the process by which these changes occurred. Within this context, the major study findings and their implications are presented.

4.2. Differences in Personal Networks between Treatment Modalities

At one week post treatment intake, residential treatment women had more people they had “used alcohol and /or drugs with”, more substance users and fewer treatment related alters (either professionals or peers from treatment/AA), their networks were more centralized than outpatient treatment women and they reported consistently less social support availability across all three types of support examined. In short, they entered treatment with a more limited support system. However, these differences largely disappeared over time with the exception that concrete support and number of substance users did show group differences at T4. Some of the largest changes in network variables occurred between T1 and T2 for women in residential treatment, the early phase of treatment. These findings could be a byproduct or an artifact of the placement criteria which determines residential placement referrals. In general, women in an environment not supportive of recovery and considered to be at high risk of relapse were assessed as appropriate for community based non-medical residential treatment (American Society of Addictive Medicine, 2007). Our data do not allow us to say with certainty that treatment programming influenced one or more aspects of personal networks over time. However, as a natural consequence of residential placement, women are separated from “people, places and things” and exposed to a different social environment. This could account for the initial increases in treatment related alters and perceived support availability.

Some between group differences persisted over time, while other differences, including the network composition variables described above, disappeared over time. Among the more persistent differences were the number of concrete support providers, which was still significantly lower for residential treatment women at the 6 and 12 month follow up interview, and the number of substance using alters in the network which was significantly higher among the residential treatment women, at 12 months (but not at 6

months). This suggests that not only do women enter residential treatment with limited support networks but they continue to experience difficulty mobilizing a recovery oriented network post treatment.

In this study, we included a number of variables as covariates, characteristics of the women at one week post treatment intake in addition to time varying covariates, which were either empirically or theoretically related to personal network composition, support or structure. It is important to point out that we did examine the impact of treatment status (in or out of treatment) at each assessment time point as treatment status could likely influence some network variables, but we found a relationship only between being in or out of treatment and the number of treatment related peers. There were a number of other factors found to be related to network variables. The degree of trauma symptoms at one week post treatment intake was related to network composition, but neither network support nor structure; higher trauma symptoms were associated with greater numbers of treatment related alters, substance using alters and alters with whom alcohol and/or drugs were used. Higher treatment motivation at one week post treatment intake was associated with a lower number of substance users over time and greater numbers of emotional support providers. Abstinence self-efficacy was positively associated with number of treatment related alters, emotional support providers and sobriety support but negatively associated with number of substance users and alters with whom alcohol and/or drugs had been used. Older age was related to a higher number of treatment related alters, fewer alters with whom alcohol and/or drugs were used, and more alters providing concrete, emotional, and sobriety support; this could be related to older women having had more opportunities for previous treatment episodes. Being African American was related to fewer substance using alters, fewer treatment related alters, and greater network density/cohesiveness; the higher proportion of family members may account for the corresponding lower number of treatment related alters and also greater network density observed in the networks of African American women.

4.3. Personal Network Changes Over Time by Treatment Modality

In terms of the three network composition variables examined, residential treatment women in this study did show an increasing number of treatment related alters and a decreasing number of alters with whom they had used substances over time, and did show a significant reduction in numbers of substance users remaining in their networks by 6 months (but not 12 months). However, these changes were not observed for women in intensive outpatient treatment, whose networks remained largely the same over time in terms of treatment related alters, substance users and alters with whom they used alcohol and/or drugs. Previous research suggests that women often engage and/or

initiate substance use with family members or other relatives (MacDonald et al., 2004); these relationships tend to make up a large proportion of network membership among women and are unlikely to be completely eliminated from the network. In terms of support availability, over time in both groups women's social networks were viewed as providing higher levels of concrete, emotional and sobriety support, but residential treatment women reported significantly lower numbers of concrete support providers as compared with the outpatient group. In terms of network structure, women in both treatment modalities reported greater network density over time, indicating that their networks were more inter-connected and cohesive. The number of isolates (alters not connected to any other alters in the network) decreased over time only for women in intensive outpatient treatment programs.

In contrast to previous research, there were no differences observed in this study in network composition and support among women with dual disorders as compared with those with a substance use disorder only. We found no evidence that their networks were more limited in terms of support providers or network composition, at least for the variables included in this analysis. The one exception was "betweenness centralization"; women with dual disorders had more highly centralized networks, specifically betweenness centralization, as compared with those with a substance use disorder only. This indicates that women with dual disorders had one or more key influential people who served as a bridge to information and/or resources. This finding might be related to greater service use or service provision on the part of women with dual disorders. More connected and centralized networks tend to increase the flow of communication within the network and provide a more coordinated support system; on the other hand a closely knit network is not always beneficial and could trigger relapse (Lincoln 2000; Sun, 2007).

This study highlights the changing face of personal networks post treatment for women with substance use disorders. Findings suggest that network structure, along with composition and support, are important elements for practitioners to assess not only at initial treatment intake but ongoing during recovery. We end with a caution that not all network changes may be positive or ultimately related to generally accepted positive outcomes, but also the hope that a growing understanding of network changes over time will lead to network interventions geared to the needs of women served by differing treatment modalities.

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REFERENCES

1. American Society of Addictive Medicine. ASAM PPC-2R patient placement criteria for the treatment of substance-related disorders. Chevy Chase, MD: Author; 2007.
2. Bond J, Kaskutas LA, Weisner C. The persistent influence of social networks and alcoholics anonymous on abstinence. *Journal of Studies on Alcohol*. 2003;64(4):579–588.
3. Center for Substance Abuse Treatment. Substance abuse treatment: Addressing the specific needs of women. treatment improvement protocol (TIP) series 51. Rockville, MD: Substance Abuse and Mental Health Services Administration; 2009. (No. HHS Publication No. (SMA) 09-4426.)
4. Covington S. Helping women recover: Creating gender-responsive treatment. In: Strausser L, Brown S, editors. *Handbook of women's addictions treatment*. San Francisco, CA: Jossey-Bass; 2002. pp. 52–72.
5. Davey MA, Latkin CA, Hua W, Tobin KE, Strathdee S. Individual and social network factors that predict entry to drug treatment. *The American Journal on Addictions / American Academy of Psychiatrists in Alcoholism and Addictions*. 2007;16(1):38–45.
6. Davis MI, Jason LA. Sex differences in social support and self-efficacy within a recovery community. *American Journal of Community Psychology*. 2005;36(3–4):259–274.
7. Dawson DA, Grant BF, Chou SP, Stinson FS. The impact of partner alcohol problems on women's physical and mental health. *Journal of Studies on Alcohol and Drugs*. 2007;68(1):66–75.
8. Dennis ML, Foss MA, Scott CK. An eight-year perspective on the relationship between the duration of abstinence and other aspects of recovery. *Evaluation Review*. 2007;31(6):585–612.
9. DiClemente CC, Carbonari JP, Daniels JW, Donovan DM, Bellino LE, Neavins TM. Self-efficacy as a matching hypothesis: Causal chain analysis. In: Longabaugh R, Wirtz PW, editors. *Project MATCH: Hypotheses, results, and causal chain analysis*. Vol.8 ed. Bethesda, MD: 2001. pp. 239–257. NIH Publication No. 01-4238.
10. DiClemente CC, Carbonari JP, Montgomery RP, Hughes SO. The alcohol abstinence self-efficacy scale. *Journal of Studies on Alcohol*. 1994;55(2):141–148.
11. Dodge K, Potocky M. Female substance abuse: Characteristics and correlates in a sample of inpatient clients. *Journal of Substance Abuse Treatment*. 2000;18(1):59–64.
12. Ellis B, Bernichon T, Yu P, Roberts T, Herrell JM. Effect of social support on substance abuse relapse in a residential treatment setting for women. *Evaluation and Program Planning*. 2004;27:213–221.
13. El-Bassel N, Chen D, Cooper D. Social support and social network profiles among women on Methadone. *Social Service Review*. 1998;72(3):379–401.
14. Elliott DM, Briere J. Sexual abuse trauma among professional women: validating the Trauma Symptom Checklist-40 (TSC-40) Child Abuse Neglect. 1992;16:391–398.
15. Falkin GP, Strauss SM. Social supporters and drug use enablers: A dilemma for women in recovery. *Addictive Behaviors*. 2003;28(1):141–155.
16. Gregoire TK, Snively CA. The relationship of social support and economic self-sufficiency to substance abuse outcomes in a long-term recovery program for women. *Journal of Drug Education*. 2001;31(3):221–237.
17. Grella CE. From generic to gender-responsive treatment: Changes in social policies, treatment services, and outcomes of women in substance abuse treatment. *Journal of Psychoactive Drugs*. 2008;(Suppl 5):327–343.
18. Helzer JE, Robins LN, McEvoy LT, Spitznagel EL, Stoltzman RK, Farmer A, Brockington IF. A comparison of clinical and diagnostic interview schedule diagnoses. physician reexamination of lay-interviewed cases in the general population. *Archives of General Psychiatry*. 1985;42(7):657–666.
19. Joe GW, Broome KM, Rowan-Szal GA, Simpson DD. Measuring patient attributes and engagement in treatment. *Journal of Substance Abuse Treatment*. 2002;22(4):183–196.
20. Joe GW, Simpson DD, Broome KM. Effects of readiness for drug abuse treatment on client retention and assessment of process. *Addiction (Abingdon, England)* 1998;93(8):1177–1190.
21. Laudet AB, Magura S, Furst RT, Kumar N, Whitney S. Male partners of substance-abusing women in treatment: An exploratory study. *The American Journal of Drug and Alcohol Abuse*. 1999;25(4):607–627.
22. Laudet AB, Magura S, Vogel HS, Knight EL. Perceived reasons for substance misuse among persons with a psychiatric disorder. *The American Journal of Orthopsychiatry*. 2004;74(3):365–375.
23. Lincoln KD. Social support, negative social interactions, and psychological well-being. *Social Service Review*. 2000;74(2):231–252.
24. MacDonald EM, Luxmoore M, Pica S, Tanti C, Blackman JM, Catford N, Stockton P. Social networks of people with dual diagnosis: The quantity and quality of relationships at different stages of substance use treatment. *Community Mental Health Journal*. 2004;40(5):451–464.
25. Manuel JJ, McCrady BS, Epstein EE, Cook S, Tonigan JS. The pretreatment social networks of women with alcohol dependence. *Journal of Studies on Alcohol and Drugs*. 2007;68:871–878.
26. Marsden PV. Network data and measurement. *Annual Review of Sociology*. 1990;16(1):435–463.
27. Marsella AJ, Snyder KK. Stress, social supports, and schizophrenic disorders. *Schizophrenia Bulletin*. 1981;7(1):152–163.
28. McCarty C. Measuring structure in personal networks. *Journal of Social Structure*. 2002;3(1)
29. McCarty C, Molina J, Aguilar C, Rota L. A comparison of social network mapping and personal network visualization. *Field Methods*. 2007;19:145–162.
30. McDonald LJ, Griffin ML, Kolodziej ME, Fitzmaurice GM, Weiss RD. The impact of drug use in social networks of patients with substance use and bipolar disorders. *The American Journal on Addictions / American Academy of Psychiatrists in Alcoholism and Addictions*. 2011;20(2):100–105.
31. McLellan AT, Alterman AI, Cacciola J, Metzger D, O'Brien CP. A new measure of substance abuse treatment initial studies of the treatment services review. *The Journal of Nervous and Mental Disease*. 1992;180(2):101–110.
32. Mickey RM, Greenland S. The impact of confounder selection criteria on effect estimation. *American Journal of Epidemiology*. 1989;129:125–137.
33. Robins LN, Helzer JE, Croughan J, Ratcliff KS. National institute of mental health diagnostic interview schedule. its history, characteristics, and validity. *Archives of General Psychiatry*. 1981;38(4):381–389.
34. Robins G, Pattison P, Wasserman S. Logit models and logistic regressions for social networks: III. Valued relations. *Psychometrika*. 1999;64:371–394.
35. Savage A, Russell LA. Tangled in a web of affiliation: Social support networks of dually diagnosed women who are trauma survivors. *The Journal of Behavioral Health Services & Research*. 2005;32(2):199–214.
36. Simoneau H, Bergeron J. Factors affecting motivation during the first six weeks of treatment. *Addictive Behaviors*. 2003;28(7):1219–1241.
37. Simpson DD, Joe GW, Rowan-Szal GA, Greener JM. Drug abuse treatment process components that improve retention. *Journal of Substance Abuse Treatment*. 1997;14(6):565–572.
38. Skaff MM, Finney JW, Moos RH. Gender differences in problem drinking and depression: Different "vulnerabilities?". *American Journal of Community Psychology*. 1999;27(1):25–54.
39. Sun AP. Relapse among substance-abusing women: Components and processes. *Substance use & Misuse*. 2007;42(1):1–21.
40. Tracy EM, Johnson PJ. Personal social networks of women with co-occurring substance use and mental disorders. *Journal of Social Work Practice in the Addictions*. 2007;7(1):69–90.

41. Tracy EM, Kim H, Brown S, Min MO, Jun M, McCarty C. Substance abuse treatment stage and personal social networks among women in substance abuse treatment. *Journal of the Society for Social Work and Research*. 2012a;3(2):65–79.
42. Tracy EM, Laudet AB, Min MO, Kim H, Brown S, Jun MK, Singer L. Prospective patterns and correlates of quality of life among women in substance abuse treatment. *Drug and Alcohol Dependence*. 2012b;124(3):242–249.
43. Tucker JS, Wenzel SL, Golinelli D, Zhou A, Green HD., Jr Predictors of substance abuse treatment need and receipt among homeless women. *Journal of Substance Abuse Treatment*. 2011;40(3):287–294.
44. Warren JI, Stein JA, Grella CE. Role of social support and self-efficacy in treatment outcomes among clients with co-occurring disorders. *Drug and Alcohol Dependence*. 2007;89(2–3):267–274.
45. Wasserman S, Faust K. *Social network analysis: Methods and applications*. New York, NY: Cambridge University Press; 1994.
46. Wechsberg WM, Craddock SG, Hubbard RL. How are women who enter substance abuse treatment different than men?: A gender comparison from the drug abuse treatment outcome study (DATOS) *Drugs*. 1998;13(1–2):97–115.
47. Weisner C, Delucchi K, Matzger H, Schmidt L. The role of community services and informal support on five-year drinking trajectories of alcohol dependent and problem drinkers. *Journal of Studies on Alcohol*. 2003;64(6):862–873.
48. Wothke W. Longitudinal and multi-group modeling with missing data. In: Little TD, Schnabel KU, Baumert J, editors. *Modeling longitudinal and multiple group data: Practical issues, applied approaches and specific examples*. Mahwah, NJ: Lawrence Erlbaum Associates; 1998.
49. Zlotnick C, Shea MT, Begin A, Pearlstein T, Simpson E, Costello E. The validation of the Trauma Symptom Checklist-40 (TSC-40) in a sample of inpatients. *Child Abuse Neglect*. 1996;20:503–510.
50. Zywiak WH, Longabaugh R, Wirtz PW. Decomposing the relationships between pretreatment social network characteristics and alcohol treatment outcome. *Journal of Studies on Alcohol*. 2002;63(1):114–121.
51. Zywiak WH, Neighbors CJ, Martin RA, Johnson JE, Eaton CA, Rohsenow DJ. The important people drug and alcohol interview: Psychometric properties, predictive validity, and implications for treatment. *Journal of Substance Abuse Treatment*. 2009;36(3):321–330.