

Does Integrated Trauma-Informed Substance Abuse Treatment Increase Treatment Retention?

Hortensia Amaro and Miriam Chernoff

*Institute on Urban Health Research, Bouvé College of Health Sciences,
Northeastern University*

Vivian Brown

PROTOTYPES Systems Change Center

Sandra Arévalo

*Institute on Urban Health Research, Bouvé College of Health Sciences,
Northeastern University*

Margaret Gatz

University of Southern California

This article presents findings from a quasi-experimental, nonrandomized group design study that explored whether trauma-enhanced substance abuse treatment results in longer residential treatment stays and improved outcomes compared with treatment-as-usual. We used a subsample ($N = 461$) of participants in the Women, Co-Occurring Disorders and Violence Study, which was sponsored by the Substance Abuse and Mental Health Services Administration. The intervention group was 31% less likely to discontinue treatment within 4 months. Baseline mental health and trauma symptoms and alcohol and drug severity scores predicted neither overall length of time in treatment nor differences in retention between intervention and comparison groups. Substance abuse and mental health

This study was funded under Guidance for Applicants (GFA) No. TI 00-003 entitled *Cooperative Agreement to Study Women With Alcohol, Drug Abuse and Mental Health (ADM) Disorders Who Have Histories of Violence: Phase II* from the Department of Health and Human Services, Public Health Service, Substance Abuse and Mental Health Services Administration's three centers: Center for Substance Abuse Treatment, Center for Mental Health Services, and Center for Substance Abuse Prevention (U.S. Health and Human Services, March 2000). We would like to acknowledge the contributions of members of the clinical and research teams and the study participants, without whom this study would not have been possible.

Correspondence to: Hortensia Amaro, Bouvé College of Health Sciences, 360 Huntington Avenue, Stearns Suite 503, Boston, MA 02115. E-mail: h.amaro@neu.edu.

symptoms improved with increased duration of treatment, particularly for women with more severe baseline symptoms. © 2007 Wiley Periodicals, Inc.

Improving retention continues to be a major challenge in substance abuse treatment (Battjes, Onken, & Delaney, 1999; Dakof et al., 2003). Clients who complete drug treatment are more likely to remain alcohol and drug free and have lower unemployment, arrest, and relapse rates (Simpson & Brown, 1999; Simpson, Joe, & Brown, 1997). Specifically, clients have more favorable outcomes if they remain in treatment over 90 days (National Institute on Drug Abuse [NIDA], 1997; Simpson et al., 1997).

The Drug Abuse Treatment Outcome Study (DATOS) found that retention rates of 90 days or more for long-term residential treatment range from 21% to 75% across programs (Grella, Hser, Joshi, & Anglin, 1999). Other studies have reported retention rates that range from 41% to 56% (Amaro, Nieves, Johannes, & Cabeza, 1999; Donovan, Rosengren, Downey, Cox, & Sloan, 2001; Grella, et al., 1999; Knight, Logan, & Simpson, 2001; Rowan-Szal, Joe, & Simpson, 2000).

Factors related to retention in substance abuse treatment are generally classified as client factors or program factors. In general, studies have shown that risk of dropout is greater for clients who are younger (Scott-Lennox, Rose, Bohlig, & Lennox, 2000), who are female (Arfken, Klein, di Menza, & Schuster, 2001), who have fewer years of education (Knight et al., 2001), and whose race is other than White (King & Canada, 2004; Knight et al., 2001; Milligan, Nich, & Carroll, 2004). In addition, clients with more severe drug problems (Kelly, Blacksinn, & Mason, 2001), with no legal pressure (Joe, Simpson, Greener, & Rowan-Szal, 1999; Knight et al., 2001), with more psychological problems or problems of greater psychiatric severity (Ross, Cutler, & Sklar, 1997), with lower motivation for treatment (Joe et al., 1999; Simpson et al., 1997), and who lack social support are also at higher risk for dropout from treatment programs (Kelly et al., 2001).

Studies have shown equivocal results on the association of gender and retention; while some show that women are at greater risk for treatment discontinuation (Arfken et al., 2001), other studies have found either no association (Lundy, Gottheil, Serota, Weinstein, & Sterling, 1995) or lower dropout rates among women (Andersen & Berg, 2001). Environmental barriers—including inability to bring young children into treatment with them, inadequate childcare, lack of transportation, and lack of gender-sensitive services—are some factors contributing to treatment dropout among women (Howard & Beckwith, 1996; Lewis, Haller, Branch, & Ingersol, 1996; Szuster, Rich, Chung, & Bisconer, 1996).

Results are mixed on the relationship between retention and client psychological attributes, experiences with trauma, and/or comorbidity. Some studies have shown better retention among persons with comorbid disorders, especially depressive disorders (Martinez-Raga, et al., 2002) or social anxiety (Egelko & Galanter, 1998). However, others have reported higher dropout rates among women with Axis I comorbidity, especially those with severe mental illness (Brown, Melchior, & Huba, 1999). Higher dropout rates are also reported for persons with a history of physical or sexual abuse, or a history of childhood abuse or neglect (Claus & Kindleberger, 2002; Kang, Deren, & Goldstein, 2002). Amaro et al. (1999) reported that Latina women in a residential substance abuse program with a history of childhood abuse were more likely to drop out in the early stages of treatment. In another study, Thompson and Kingree (1998)

reported that treatment completion in a residential substance abuse treatment program for low-income pregnant women was related to posttraumatic stress disorder (PTSD).

Despite findings of low retention rates for women with co-occurring disorders, there has been a dearth of research on how interventions might be modified to improve treatment retention for this client population. For persons with co-occurring disorders, there is growing agreement that an integrated treatment approach, as opposed to treatments that address each disorder separately, is the most appropriate model (Barrowclough et al., 2001; Hellerstein, Rosenthal, & Miner, 2001; RachBeisel, Scott, & Dixon, 1999; Ziedonis & Stern, 2001). Some elements of successful integrated treatment models include stages-of-change components, motivational interviewing, and cognitive-behavioral interventions (Ouimette, Brown, & Najavits, 1998; Ziedonis & Stern). Screening for trauma and health problems and an approach that builds on safety and empowerment in the community are further recommended aspects of integrated models. Especially for persons with a substance use disorder and PTSD, it has been suggested that comprehensive treatment should simultaneously address substance use, PTSD symptoms, and quality-of-life concerns such as vocational issues and social support (Najavits, Weiss, & Shaw, 1997; Ouimette et al., 1998).

The question that remains unaddressed is whether an integrated treatment program improves retention. This study sought to answer the following questions: (a) Do integrated trauma services lead to longer retention in residential treatment among women with co-occurring disorders?; (b) Does the effect of the intervention on retention differ by severity in symptoms of addiction, mental health, or trauma?; and (c) Do longer treatment stays lead to better 6-month addiction, mental health, and trauma outcomes?

Data presented in this article reflect the experiences of 461 residential treatment participants at two research sites of the Women, Co-Occurring Disorders, and Violence Study (WCDVS), sponsored by the Substance Abuse and Mental Health Services Administration (SAMHSA). The WCDVS is the first large-scale federal initiative to address two major issues: the significant lack of appropriate services for women with co-occurring substance use and mental health disorders who have experienced trauma, and the general failure to include clients' children in the treatment setting. This federal initiative entailed a nine-site, multimodel intervention study with a quasi-experimental design. It included baseline, 6-month follow-up, and 12-month follow-up interviews with the women in the study. Each site contributed data from both an intervention group and a comparison group.

Intervention sites provided integrated, consumer-involved, trauma-informed, comprehensive services. (See Huntington, Moses, & Veysey, 2005, for more detail.) Services included outreach, assessment, crisis intervention, trauma-specific counseling, ongoing treatment, parent skills training, resource coordination and advocacy, and peer-run services. The present analyses included two of the nine WCDVS research sites with residential treatment programs that collected information on actual admission and discharge dates. Women participated in one of two manualized, trauma-specific group interventions: Seeking Safety, a 31-session, 4-month-long intervention (Najavits, Weiss, Shaw, & Muenz, 1988) at the Los Angeles site, and Trauma Recovery and Empowerment (TREM), a 25-session, 6-month-long intervention (Harris, 1998) at the Boston site. Both of these multisession trauma group interventions focused on helping women maintain personal safety, learn empowerment and coping skills, and understand the links among substance abuse, mental health problems, and trauma. The intervention's

comprehensive services included residential centers where women could live with their children, childcare, transportation, and other gender-sensitive services that had previously been shown to contribute to lower treatment dropout rates among women (Howard & Beckwith, 1996; Hughes et al., 1995; Lewis et al., 1996; Szuster et al., 1996). Intervention participants received treatment from five agencies: two 12-month residential treatment agencies at the Los Angeles site, and one 9-month and two 12-month residential treatment agencies at the Boston site. The comparison condition represented residential substance abuse treatment-as-usual in that site's region. Treatment-as-usual varied from site to site and sometimes included some of the same program elements offered by the integrated-services intervention. However, none of the treatment-as-usual agencies provided trauma-specific treatment (McHugo, et al., 2005). Comparison participants received treatment from seven residential treatment agencies. There were five agencies at the Los Angeles site, one with a 9-month program and four with a 6-month program, and two agencies at the Boston site, one with a 6-month program and one with a 9-month program.

METHODS

Sample

This article examines baseline and 6-month interview data from 461 ($n = 198$, intervention group; $n = 263$, comparison group) women in residential treatment enrolled at the Boston ($n = 92$) or Los Angeles ($n = 369$) sites of the WCDVS. (For a full description of the WCDVS study design, see McHugo et al., 2005, and Giard et al., 2005. For a full description of women's characteristics at baseline, see Becker et al., 2005.)

Study participants in this sample were recruited into the study and received baseline interviews within 60 days of admission to residential treatment: 35% of participants received baseline interview within two weeks, 52% within 30 days, and 12% within 31–60 days. About 29% of participants were in 6-month programs, 30% were in 9-month programs, and 41% were in 12-month programs. Mean age was 33 years in both the intervention and comparison groups. Average education (in years) was 11 for both groups. Across groups, the most common race/ethnicity identifications were Hispanic, Black non-Hispanic, and White non-Hispanic (33%, 24%, and 34%, respectively), with no differences between intervention and comparison groups.

Measures

Background Characteristics. Respondents were asked closed-ended questions about demographic information, employment status prior to program entry, history of homelessness, court-ordered treatment, jail experience, relationship status (married or partnered), number of children, custody status of children, and loss of parental rights.

Dependent Measures of Mental Health, Trauma, and Addiction Symptoms. We assessed mental health symptoms using the Global Severity Index (GSI) of the Brief Symptom Inventory, a 53-item symptom checklist (Derogatis, 1993). The GSI is a mean measure for perceived severity of 53 mental health symptoms in the past 7 days. (The symptom score range is 0–4, where 0 = *not at all* and 4 = *extremely*; higher scores therefore indicate more severe symptoms.) For the GSI ($n = 441$), Cronbach's alpha was 0.961.

In addition, we asked participants about the number of psychiatric hospitalizations they had had and their use of prescription psychotropic medications.

We measured trauma symptoms using the PTSD Symptom Scale (PSS; Foa, Cashman, Jaycox, & Perry, 1997). Respondents were asked how often in the past month they had experienced a list of problems that are sometimes experienced after a traumatic event. The response scale ranged from 0 (*not at all or only once*) to 3 (*five or more times or almost always*). For the PSS ($n = 443$), Cronbach's alpha was 0.896. Traumatic events were measured using an adaptation of the Life Stressor Checklist-Revised (LSC-R; Wolfe, Kimerling, Brown, Chrestman, & Levin, 1996). History of childhood physical and sexual abuse and history of adult physical and sexual abuse were derived from answers to the LSC-R, and a scale of lifetime exposure to stressful events (LESE) was constructed by summing across all events (McHugo, Caspi, et al. 2005). For the LESE ($n = 430$), Cronbach's alpha was 0.710.

We measured addiction severity using the Addiction Severity Index (ASI) Alcohol and Drug Composite scores (adapted from McLellan, Luborsky, Woody, & O'Brien, 1980). ASI composite scores, ranging from 0 to 1, are based on the amount of use, related problems (e.g., cravings, withdrawal, wanting to but being unable to stop, being bothered by these problems), and the perceived importance of treatment. For the ASI Alcohol Composite ($n = 461$), Cronbach's alpha was 0.895, based on weighted items used in computing the measure. For the ASI Drug Composite ($n = 458$), Cronbach's alpha was 0.695, based again on weighted items used in computing the measure. Women were also asked how many times in the past they had started substance abuse treatment.

Dependent Measure of Days in Treatment. We computed length of stay (LOS) in days from program-specific admission and discharge data. Women who were discharged and readmitted within 30 days were counted as having one treatment episode. Comparison and intervention programs were not matched for the LOS required for program completion. More participants in the intervention group were in longer programs; specifically, there were five programs of 6-months' duration and two programs of 9-months' duration in the comparison group, while there was one program of 9-months' duration and four programs of 12-months' duration in the intervention group. Therefore, in the analyses, the maximum number of days for LOS was capped at 120. This number was chosen because a substantial proportion of women in the 6-month treatment programs left after 5 months but had completed their programs successfully, and we wanted to be certain that women who left treatment before the maximum LOS did so because they were dropping out.

Statistical Methods

Error probabilities for all statistical tests were set at 5%, and the tests were two-sided. Events were defined as discharge from the substance abuse treatment program, censoring at 120 days (4 months).

To test for baseline differences, we used *t*-tests for normally distributed variables; nonparametric Wilcoxon rank sum tests for continuous, non-normally distributed variables (such as the ASI Composite Scores) and ordered, categorical variables (such as the number of substance abuse treatment starts); and chi-square tests for categorical variables.

To test treatment effect on LOS, we first estimated conditional probabilities of remaining in treatment using Kaplan Meier product-limit estimates with censoring at 120 days. Second, we used Cox proportional hazards models to test for treatment group differences in hazard rates for the risk of program discharge, controlling for client characteristics that differed at baseline (with $p < .05$) and for the interaction effect between jail experience and being mandated to treatment, two factors that were highly correlated (Hosmer & Lemeshow, 1999). To determine if there was a statistical association between symptom severity with time in treatment and whether the intervention worked better for certain subgroups of women, for example, those with higher or lower baseline mental health, trauma symptoms, or substance use, we used the final proportional hazards regression models, adding each symptom or severity measure and its interaction with treatment group and testing the null hypotheses that these parameters were equal to zero.

To assess the effect of longer treatment stay on addiction, mental health, and trauma outcomes at 6-month follow-up, we tested the relationship between time in treatment and 6-month outcomes using general linear models, including all pairs of two-way interactions among LOS, treatment group, and baseline symptom severity, as well as the three-way interaction among these variables. Retaining the interaction between treatment group and LOS, we excluded interaction effects sequentially, starting with the model effect with the least significant p -value, until we included all main effects and only interaction effects with p -values $< .15$ (Scheffe, 1959). We performed sensitivity analyses to better understand regression results, reanalyzing these data after excluding outlying observations that were more than three standard deviations from mean improvement. Because treatment engagement might affect outcome, we also included a measure of engagement in the final regression models, specifically, the percentage of trauma group sessions attended (Seeking Safety in Los Angeles sites and TREM in Boston sites). Because treatment group and engagement parameters were confounded (i.e., participants in the comparison group did not attend trauma sessions), we reanalyzed two datasets, the first including women in both treatment groups and the second including only women in the intervention groups, substituting in both models the engagement measure for the treatment group parameter.

RESULTS

Baseline Differences Between Groups

We allowed effects into the model if the baseline differences were significant at $p = .05$. However, unlike the analysis from the larger study that controlled for geographic population differences, the analysis for this study did not control for city population differences between Los Angeles and Boston.

Table 1 shows comparison of intervention and comparison groups at baseline. Treatment groups differed in history of homelessness ($p = .036$), mandated treatment ($p < .0001$), recent jail experience ($p < .0001$), number of substance abuse treatment starts ($p = .004$), and number of days from admission to baseline interview ($p < .0001$). There were no differences at baseline between comparison and intervention groups regarding use of medications for mental health problems or substance abuse: At baseline 34% of all participants were taking psychotropic medications and 4% were taking medications for substance abuse. However, intervention group participants who had not taken medications within the 3 months prior to the baseline interview were

Table 1. Baseline Characteristics of Women by Treatment Group (N = 461)

Characteristic	Intervention N = 198		Comparison N = 263		P-value ^a
Demographics					
Employed prior to treatment entry?					.0611
No	173	87.81%	214	81.36%	
Yes	24	12.18%	49	18.63%	
Individual income below poverty line?					.1907
No	26	13.40%	46	17.96%	
Yes	168	86.59%	210	82.03%	
History of homelessness					.0361*
Never homeless	46	23.46%	77	29.27%	
Homeless in past but not in last 6 months	56	28.57%	49	18.63%	
Homeless in last 6 months	94	47.95%	137	52.09%	
Criminal justice history					
Mandated treatment					<.0001*
Voluntary treatment	81	40.90%	162	61.83%	
Mandated, criminal court	89	44.94%	60	22.90%	
Mandated, civil	28	14.14%	40	15.26%	
Jail experience					<.0001*
Never in jail	24	12.30%	64	24.33%	
Past jail experience	44	22.56%	97	36.88%	
In jail in last 6 months	127	65.12%	102	38.78%	
Family characteristics					
Has partner/spouse?					.1618
No	133	67.17%	160	60.83%	
Yes	65	32.82%	103	39.16%	
Has children? (by age)					.6803
Never had children or none living	29	14.64%	37	14.06%	
Child/children < 18 yrs	153	77.27%	210	79.84%	
Child/children ≥ 18 yrs	16	8.08%	16	6.08%	
Has custody of children?					.4603
No	110	55.55%	137	52.09%	
Yes	88	44.44%	126	47.90%	
Ever lost parental rights?					.2620
No	154	78.57%	194	74.04%	
Yes	42	21.42%	68	25.95%	
Mental health					
Lifetime number of psychiatric hospitalizations					.8170
None	133	67.17%	176	67.17%	
1	25	12.62%	39	14.88%	
2–5	29	14.64%	38	14.50%	
More than 5	11	5.55%	9	3.43%	
Global Severity Index (GSI) <i>M (SD)</i>	198	1.13 (0.69)	263	1.20 (0.73)	.2941
Prescription medication in last 3 months for mental health problems?					.9078
No	128	65.64%	174	66.15%	
Yes	67	34.35%	89	33.84%	
Prescription medication in last 3 months for substance abuse problems?					.879
No	188	96%	253	96%	
Yes	8	4%	10	4%	
Trauma					
Lifetime Exposure to Stressful Events (LESE) <i>M (SD)</i>	198	16.0 (4.7)	263	15.8 (4.3)	.6021
PTSD Symptom Scale (PSS), total score, <i>M (SD)</i>	189	20.8 (10.8)	254	20.9 (12.1)	.9631
History of physical or sexual abuse as a child?					.3887
No	56	28.28%	65	24.71%	
Yes	142	71.71%	198	75.28%	
History of physical or sexual abuse as an adult?		.3526			
No	30	15.15%	32	12.16%	
Yes	168	84.84%	231	87.83%	

(Continued)

Table 1. Continued

Characteristic	Intervention N = 198		Comparison N = 263		P-value ^a
Alcohol and drug addiction					
Number of substance abuse treatment starts					.0043*
None	40	20.51%	24	9.30%	
1–2	52	26.66%	63	24.41%	
3–4	33	16.92%	60	23.25%	
5 or more	70	35.89%	111	43.02%	
Addiction Severity Index (ASI), Alcohol Composite Score, Mdn (Interquartile range)	198	0.02 (0, 0.30)	263	0.04 (0, 0.51)	.080
Addiction Severity Index (ASI), Drug Composite Score, Mdn (Interquartile range)	196	0.21 (0.04, 0.33)	262	0.25 (0.15, 0.34)	.056
Study enrollment					
Number of days from admission to baseline interview <i>M</i> (<i>SD</i>)	198	17.8 (10.9)	263	22 (11.3)	<.0001*
Completed substance abuse treatment program? ^b					<.05*
Yes	46	23.23%	87	33.08%	
No	152	76.77%	176	66.92%	

Note. ^aP-values are for two-sample, two-sided *t*-tests except for the following variables: Chi-square tests: race/ethnicity, employed, income below poverty line, living situation, mandated to treatment, jail experience, has partner, has children, has custody of children, ever lost parental rights, prescription medication, history of abuse in childhood, history of abuse in adulthood. Wilcoxon nonparametric rank sum tests, two-sided: lifetime history of psychiatric hospitalizations, ASI, substance abuse treatment history.

^bPrograms were not matched for LOS in the comparison and intervention groups; different lengths of stay were required for treatment completion in each group. More participants in the intervention group were in longer programs, and women in the intervention group were less likely to complete treatment (OR = 0.6122; 95% CI: 0.403, 0.930).

**p* < .05.

more than twice as likely as their peers in the comparison group to start taking psychotropic medications 3 months prior to the 6-month interview: OR (95% CI), 2.29, (1.16, 4.54). No differences in other variables were found between the intervention and comparison groups at baseline.

Table 1 also reports mental health (GSI), trauma (PSS and LESE), and addiction (ASI) severity measures. GSI scores are interpreted by comparison with normative data available for both clinical and nonclinical samples of adults; the following are means and standard deviations for different segments of the population: 1.32 (0.72) for psychiatric outpatients; 1.36 (0.86) for psychiatric inpatients; and 0.30 (0.31) for nonpatients (Derogatis & Melisaratos, 1983). GSI scores for both the intervention group, 1.13 (*SD* = 0.69), and comparison group, 1.20 (*SD* = 0.73), fell within the ranges for psychiatric outpatient and psychiatric inpatient normative scores. The LESE (which was based on the trauma history interview) has no established summary variables, so the ones we created for the WCDVS are without normative data (McHugo, Kammerer et al., 2005). For the PSS, both the intervention group score (20.8) and the comparison group score (20.9) fell into the moderate-to-severe category. (PSS scores less than or equal to 10 are considered mild, scores between 11–20 are considered moderate, scores between 21–35 are considered moderate-to-severe, and scores equal to or greater than 36 are considered severe [McHugo, Kammerer et al., 2005]). ASI composite scores, which range from 0 (*no problem*) to 1.0 (*extreme problem*), were 0.02 (CI: 0, 0.30) and 0.04 (CI: 0, 0.51) for the Alcohol Composite Score, respectively, for the intervention and comparison groups, and 0.21 (CI: 0.04, 0.33) and

0.25 (CI: 0.15, 0.34) for the Drug Composite Score, respectively, for the intervention and comparison groups.

Does the Intervention Increase Treatment Retention After We Control for Baseline Differences Between Treatment Groups?

By 4 months, 45% of the intervention group and 50% of the comparison group had left treatment. Crude difference in length of time in treatment was not statistically significant (Log rank $p = .203$, Wilcoxon $p = .163$; see Figure 1). In the intervention group, the 75th percentile (i.e., the time point at which the probability of still being in treatment was 0.75) was 63 days after admission (95% CI: 49, 80 days; $n = 198$ with 55% censored), compared with 49 days (95% CI: 41, 60 days; $n = 263$ with 50% censored) for the comparison group.

The first level model controlled for treatment group and for the variables that were significantly different between the two groups at baseline: homelessness in the past 6 months, jail experience in the past 6 months, history of mandated treatment, number of substance abuse treatment starts, and days from admission to baseline interview. Results are shown in Table 2. Proportional hazards model assumptions were met, with $p = .584$ for test of nonzero, time-dependent covariate. After controlling for baseline differences, the women in the intervention group were more likely to have longer treatment stays, with a 31% lower risk for dropout from treatment at any time than for the comparison group women ($N = 448$, $p = 0.021$, HR = 0.691; 53% censored observations). Table 2 shows other significant predictors for treatment program dropout. Women who were court-mandated tended to stay in treatment longer (HR = 0.65; the dropout risk was 35% lower for these women; $p < .007$). Women with no previous substance abuse treatment had a higher risk for dropout (HR = 2.5) than women with five or more previous substance treatment starts ($p < .0001$ for overall test), while women with a moderate number of treatment starts (1–2 or 3–4) tended to stay in treatment longer than did women with five or more starts (HR = 0.6 to 0.7, or a risk of 30% to 40% less).

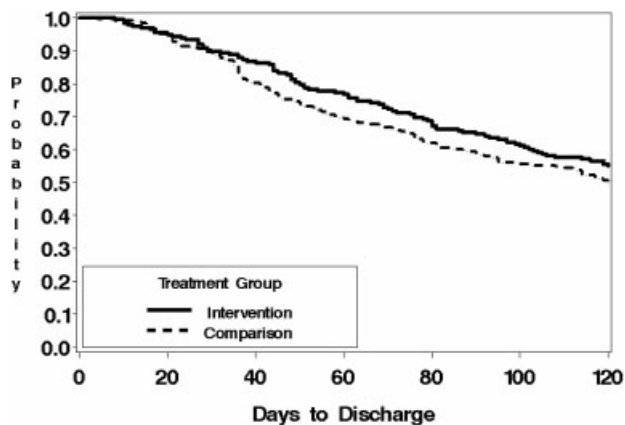


Figure 1. Probability of remaining in treatment.

Table 2. Cox Proportional Hazards Model of Time in Treatment^a (N = 448, 53% censored)

Variable	df	Parameter estimate	SE	Chi-square	Pr > ChiSq	Hazard ratio
Treatment group (intervention)	1	-.37009	0.16056	5.3127	.0212*	0.691
Mandated treatment	1	-.43366	0.16127	7.2305	.0072*	0.648
Jail experience (not in last 6 months)	1	-.04216	0.18907	0.0497	.8235	0.959
Recent jail experience (within last 6 months)	1	-.30076	0.19968	2.2686	.1320	0.740
Homeless (not in last 6 months)	1	-.03479	0.19631	0.0314	.8593	0.966
Homeless (within last 6 months)	1	-.16954	0.16511	1.0544	.3045	0.844
No previous substance abuse treatment starts	1	.89817	0.18615	23.2807	<.0001*	2.455
1-2 treatment starts	1	-.38063	0.19111	3.9668	.0464*	0.683
3-4 treatment starts	1	-.43659	0.20410	4.5755	.0324*	0.646
Days, admission to baseline interview	1	-.04219	0.00733	33.1421	<.0001*	0.959
Per 7 days +		-.29533	0.05131*			0.7443

^aControlling for client characteristics that differed at baseline between treatment groups.

In the proportional hazards regression model, referents are: treatment, the comparison group; living situation, never homeless; jail experience, none; substance abuse treatment starts, 5 or more.

Overall test of simultaneous equality to 0 for model effects: jail, $p = .224$; homelessness, $p = .538$; substance abuse treatment starts, $p < .0001$

+ 95% CI for hazard ratio for each additional week between admission and baseline interview: (0.673,0.823) indicates the effect is statistically significant, $p < .05$.

* $p < .05$.

Does the Intervention Effect on Retention Differ by Severity in Symptoms of Addiction, Mental Health, or Trauma?

Using proportional hazards regression, we tested each symptom scale individually to see if there was a differential intervention effect on retention. The risk of dropout did not differ for women with different severity levels of baseline symptoms (main effects p -values were greater than .19 for ASI, GSI, and PSS). In addition, there was no differential effect of treatment on retention by baseline symptom severity itself (interaction effect p -values between treatment and each of the ASI, GSI, PSS measures were all greater than .23).

Do Longer Treatment Stays Lead to Better 6-Month Mental Health, Addiction Severity, and Trauma Outcomes?

Longer LOS was associated with greater symptom improvement for the GSI (Table 3) and ASI measures (Tables 4 and 5) but not for the PSS measure. However, baseline symptom severity moderated the effect of LOS, generally with more improvement seen in women who started with more severe symptoms. As Table 3 shows, the positive effect of longer LOS on symptom outcome was greater for women with higher GSI scores at baseline ($p = .002$). However, this effect differed by treatment group, with greater strength in the intervention group (three-way interaction p -value = .022), especially for the participants with highest baseline GSI severities (graphical results, not shown). In fact, for those with average baseline severity, the intervention group participants improved marginally less than the comparison group participants with increased lengths of treatment (p -value = .043).

LOS affected symptom improvement through interaction with baseline ASI measures. Women with longer lengths of stay and higher baseline ASI drug and ASI

Table 3. Effect of Time in Treatment on Improvement in Mental Health Outcomes From Baseline To 6 Months

<i>Parameter</i>	<i>Estimate</i>	<i>SE</i>	<i>P-value for F-test^a</i>
LOS (days) ^b	.0001	0.0022	.0519
Treatment group (intervention)	.8751	0.4825	.0707
Treatment group X LOS (intervention)	-.0090	0.0044	.0433*
Baseline GSI	.2779	0.1756	.6479
Treatment group × baseline GSI (intervention)	-.7178	0.3479	.0399*
LOS × baseline GSI	.0013	0.0017	.0024*
Treatment group × LOS × baseline GSI (intervention)	.0075	0.0032	.0216*

Note. Tests of covariates: Living status ($p = .05$) was marginally significant with F -tests, suggesting women who had been homeless, but not in the last 6 months, had slightly less improvement (parameter estimate = $-.193$, $SE = 0.093$). All other tests of covariates had $p > .21$ for F -tests. A sensitivity analysis of these data after excluding values outside of the mean $\pm 3 SD$ ($n = 319$) showed similar results with decreased significance for model effects. Only the LOS X Baseline GSI interaction parameter had a p -value $< .05$. However, the trend in p -values and parameter estimates matched the analysis shown.

^a F -tests test the hypothesis that the average slope across treatment groups is zero.

^bLOS was censored at 120 days (see text for explanation).

* $p < .05$

alcohol measures showed greater improvement at 6 months ($p < .001$ and $p < .002$, respectively; Tables 4 and 5).

Sensitivity analyses after exclusion of outliers (for the GSI and the PSS measures; there were no outliers for the ASI measures) showed results similar to those noted above. For the GSI, only the interaction between LOS and baseline value remained significant at $p < .05$; however, the trend in the p -values and parameter estimates matched the analysis of the full dataset.

Seventy-two percent of intervention participants attended at least one trauma group session, with the mean number of sessions (13, $SD = 7$) representing an average of 42% of the targeted number of sessions. Analyses of PSS values that incorporated

Table 4. Effect of Time in Treatment on Improvement in Substance Use Outcomes from Baseline to 6 Months

<i>Parameter</i>	<i>Estimate</i>	<i>SE</i>	<i>P-value for F-test^a</i>
ASI drug, RSQ = 0.7340, $N = 319$			
LOS (days) ^b	-.0001	0.0003	.3008
Treatment group (intervention)	.0525	0.0297	.0787
LOS × treatment group (intervention)	-.0003	0.0003	.2643
Baseline ASI drug	.5558	0.0998	$< .0001^*$
LOS × baseline ASI drug	.0035	0.0010	.0003*

Note. Tests of covariates: Being mandated to treatment was marginally significant ($p = .049$), with women who were mandated having reduced improvement (parameter estimate = -0.022 , $SE = 0.011$). All other tests of covariates had $p > .57$ for F -tests. There were no outlying observations more than 3 SD from the mean improvement.

^a F -tests test the hypothesis that the average slope across treatment groups is zero.

^bLOS was censored at 120 days (see text for explanation).

* $p < .05$

Table 5. Effect of Time in Treatment on Improvement in Alcohol Use Outcomes From Baseline to 6 Months

Parameter	Estimate	SE	P-value for F-test ^a
ASI alcohol, RSQ = 0.7601, N = 322			
LOS (days) ^b	-.0001	0.0004	.7386
Treatment group (intervention)	-.0077	0.0518	.8821
LOS × treatment group (intervention)	.0004	0.0005	.4490
Baseline ASI alcohol	.5881	.0732	<.0001*
LOS × baseline ASI alcohol	.0023	0.0007	.0016*

Note. T-tests were marginally significant for the category of 1–2 substance abuse treatment starts ($p = .063$), with these women having slightly more improvement compared with the other categories (parameter estimate = 0.037; SE = 0.020). There were no other statistically significant relationships between covariates and symptom improvement for the ASI alcohol measure ($p > .135$ for F-tests). There were no outlying observations more than 3 SD from the mean improvement.

^aF-tests test the hypothesis that the average slope across treatment groups is zero.

^bLOS was censored at 120 days (see text for explanation).

* $p < .05$.

Note for Tables 3, 4, and 5.

Methods: Regression models controlled for variables with baseline differences with $p < .05$: (a) living situation (never homeless [referent], homeless but not in last 6 months, homeless in last 6 months); (b) voluntary (referent) or mandated treatment program; (c) jail experience (never in jail [referent], in jail but not in last 6 months, in jail during last 6 months); (d) Lifetime substance abuse treatment history (none, 1–2 starts, 3–4 starts, 5 or more starts [referent]); (e) days between admission to substance abuse program and baseline interview. The comparison treatment group was the reference. The basic model also included the interaction between LOS and treatment group, which tested a relationship of interest, and all other two- and three-way interactions among treatment group, symptom level at baseline, and LOS. Except for the interaction between treatment group and LOS, which was retained in the final models, higher-level interactions were excluded one by one until only interactions with $p < .15$ were included in the final model.

percent of treatment engagement led to results similar to what was found without including percent of treatment engagement and did not explain the lack of significance of effect of LOS on PSS outcome.

DISCUSSION

After controlling for baseline differences between the two groups, we found that integrated trauma intervention services led to better retention than treatment-as-usual. In the intervention group, 55% of women remained in treatment for more than 120 days, compared with 50% in the comparison group. Although the difference in crude rates was not statistically significant, higher retention in the intervention group was statistically significant after controlling for baseline differences between the two groups. While perhaps clinically modest, these findings compare favorably with 90-day retention rates reported in other studies of long-term residential substance abuse treatment (Amaro et al., 1999; DeLeon, Hawke, Jainchill, & Melnick, 2000; Donovan et al., 2001; Grella et al., 1999; Haller, Elswick, Dawson, & Schnoll, 1997; Hughes et al., 1995; Knight et al., 2001; Roberts & Nishimoto, 1996; Rowan-Szal et al., 2000; Strantz & Welch, 1995; Veach, Remley, Kippers, & Sorg, 2000). Although there are a number of recent studies on integrated treatment efficacy, we could not find any controlled studies that reported the effect of integrated services on retention in substance abuse treatment.

In contrast to studies (Broome, Flynn, & Simpson, 1999; Haller, Miles, & Dawson, 2002; Kelly et al., 2001) that reported that individuals with more complex psychiatric and addiction presentations have shorter lengths of stay in treatment, we found no association between baseline severity of symptoms and treatment retention. It is possible that our findings differ from those previously reported because women eligible for this study had to have a diagnosis of mental health and substance abuse disorders as well as a history of trauma, making this sample different from those previously studied.

We found that retention was higher among women who had been mandated to treatment and those with a moderate number of prior treatment episodes. We found no studies on individuals with co-occurring disorders that reported on the effect of legal pressure or number of prior treatment episodes on treatment retention. Previous studies on retention among women have reported that women who are mandated to treatment via the criminal justice system (especially by child protection services and the welfare system) remain in treatment longer (Nishimoto & Roberts, 2001). However, as Nishimoto & Roberts stated, the literature on the effect of legal pressure on retention is mixed, with some studies showing better retention for those who have been coerced into treatment and others showing negative outcomes associated with coercion. Women in this study with no previous substance abuse treatment episodes had shorter treatment stays. To be eligible for the current study, women had to have had at least two previous treatment episodes in either the mental health or substance abuse system. Women with no previous substance abuse treatment may have been those with a more substantial psychiatric treatment history; this suggests that mental health burden may be a risk factor for earlier dropout, a finding consistent with those of previous studies. On the other hand, we also found that women with many previous substance abuse treatment episodes were at greater risk of dropout; this finding is also consistent with those of previous studies (Nishimoto & Roberts).

The importance of treatment retention is shown by the finding that longer retention was associated with better 6-month outcomes on three of the four key symptom measures for women with more severe baseline symptoms. This finding is consistent with those reported from previous studies (NIDA, 1997; Simpson, 1979; Simpson, 1981; Simpson et al., 1997; Simpson et al., 1999;). Somewhat puzzling to us was the unexpected finding that the effect of LOS on 6-month outcome was not stronger for the intervention group than for the comparison group.

In the case of mental health symptoms, we saw evidence of improvement in intervention-group women compared with comparison-group women for those clients with worse baseline status. However, our results also suggest further questions. For example, given an average LOS, it seemed that improvement for women in the intervention group was not as dependent on baseline status as it was for women in the comparison group. At the same time, for mental health and trauma symptoms, our results also suggest a possibly nonlinear relationship between LOS and improvement, with intervention-group women who stayed in treatment for moderate lengths of time showing less improvement than expected (graphical analysis, not shown). We need to explore the mechanisms underlying the effect of LOS on outcomes and whether there may be critical time points during treatment that have an impact on treatment outcomes.

Participation in trauma-specific group treatment did not explain the lack of significance of effect of LOS on trauma symptoms; this result might be explained by the fact that the trauma groups were only one part of the intervention, which also included a “package” of trauma-relevant services to which all women in the treatment group

were exposed as part of a trauma-informed treatment milieu. Future studies are needed to assess the relative contribution of various treatment components in this intervention.

An interesting question that arises from the positive effect of LOS on mental health symptoms and the concomitant lack of effect on trauma symptoms is whether mental health and trauma-specific symptoms follow a different or similar course of improvement. For example, it is possible that general mental health symptoms may be more immediately responsive to intervention, whereas changes in trauma symptoms may take longer to manifest or be mediated through initial improvements in mental health. These questions need to be addressed in future studies.

Although this was one of the largest intervention studies to date on women with co-occurring mental health disorders, substance abuse disorders, and trauma histories, there are a number of study limitations that warrant consideration. The sample may not have been completely representative of women with co-occurring disorders and a history of exposure to trauma because it was drawn from only two cities and used publicly funded treatment programs. Women in publicly funded treatment programs may represent those with the most severe co-occurring disorders, conditions that interfere with social functioning and the ability to secure adequate private insurance coverage. There was no random assignment, and there were baseline differences in the sample. Although we adjusted for these factors in statistical analyses, there may have been other unmeasured differences. Bias may also have been introduced with self-reported drug and alcohol use: Underreporting is common. Also, a high proportion of cases were censored because of differences in the length of treatment programs. We used dropout as a proxy for unsuccessful treatment rather than using a direct measure of unsuccessful treatment. Still, it was virtually always the case that individuals who left treatment before the 4-month mark left with unsatisfactory progress. Furthermore, because of sample size limitations, we were not able to control for site although specific interventions differed between the Los Angeles and Boston sites. Statistical models exploring how LOS influenced outcomes assumed linear effects, and thus might not have detected other kinds of influences. Finally, secondary analysis of data reduces power.

In summary, women with co-occurring disorders and trauma histories respond to trauma-enhanced residential substance abuse treatment, regardless of problem severity, by remaining in treatment longer. Substance abuse and mental health symptoms improve with increased time in treatment in interaction with more severe baseline symptoms. These findings lend support to a growing consensus that for persons with co-occurring disorders, an integrated treatment approach is the most appropriate (Amaro et al., 2007a; Amaro et al., 2007b; Barrowclough, et al., 2001; Cocozza et al., 2005; Hellerstein et al., 2001; Morrissey, Ellis et al., 2005; Morrissey, Jackson et al., 2005; Ouimette et al., 1998; RachBeisel et al., 1999; Ziedonis & Stern, 2001).

REFERENCES

- Amaro, H., Dai, J., Arévalo, S., Acevedo, A., Matsumoto, A., Nieves, R., & Prado, G. (2007a). Effects of integrated trauma treatment on outcomes in a racially/ethnically diverse sample of women in urban community-based substance abuse treatment. *Journal of Urban Health*, 84. Retrieved March 14, 2007 from <http://www.springerlink.com/content/rn821q3222840755/>
- Amaro, H., Larson, M.J., Zhang, A., Acevedo, A., Dai, J., & Matsumoto, A. (2007b). Effects of trauma intervention on HIV sexual risk behaviors among women with co-occurring disorders in substance abuse treatment. *Journal of Community Psychology*, 35, 895–908.

- Amaro, H., Nieves, R., Johannes, S.W., & Cabeza, N.M.L. (1999). Substance abuse treatment: Critical issues and challenges in the treatment of Latina women. *Hispanic Journal of Behavioral Sciences*, 21, 266–282.
- Andersen, S., & Berg, J.E. (2001). The use of a sense of coherence test to predict dropout and mortality after residential treatment of substance abuse. *Addiction Research and Theory*, 9, 239–251.
- Arfken, C.L., Klein, C., di Menza, S., & Schuster, S.R. (2001). Gender differences in problem severity at assessment and treatment retention. *Journal of Substance Abuse Treatment*, 20, 53–57.
- Barrowclough, C., Haddock, G., Tarrier, N., Lewis, S.W., Moring, J., O'Brien, R., et al. (2001). Randomized controlled trial of motivational interviewing, cognitive behavior therapy, and family intervention for patients with comorbid schizophrenia and substance use disorders. *American Journal of Psychiatry*, 158, 1706–1713.
- Battjes, R.J., Onken, L.S., & Delany, P.J. (1999). Drug abuse treatment entry and engagement: Report of a meeting on treatment readiness. *Journal of Clinical Psychology*, 55, 643–57.
- Becker, M.A., Noether, C.D., Larson, M.J., Gatz, M., Brown, V., Heckman, J.P., et al. (2005). Characteristics of women engaged in treatment for trauma and co-occurring disorders: Findings from a national multisite study. *Journal of Community Psychology*, 33, 429–443.
- Broome, K.M., Flynn, P.M., & Simpson, D.D. (1999). Psychiatric comorbidity measures as predictors of retention in drug abuse treatment programs. *Health Services Research*, 34, 791–806.
- Brown, V.B., Melchior, L.A., & Huba, G.J. (1999). Level of burden among women diagnosed with severe mental illness and substance abuse. *Journal of Psychoactive Drugs*, 31, 30–40.
- Claus, R.E., & Kindleberger, L.R. (2002). Engaging substance abusers after centralized assessment: Predictors of treatment entry and dropout. *Journal of Psychoactive Drugs*, 34, 25–31.
- Cocozza, J.J., Jackson, E., Hennigan, K., Morrissey, J.P., Reed, B.G., Fallot, R., et al. (2005). Outcomes for women with co-occurring disorders and trauma: Program-level effects. *Journal of Substance Abuse Treatment*, 28, 109–119.
- Dakof, G.A., Quille, T.J., Tejada, M.J., Alberga, L.R., Bandstra, E., & Szapocznik, J. (2003). Enrolling and retaining mothers of substance-exposed infants in drug abuse treatment. *Journal of Consulting and Clinical Psychology*, 71, 764–772.
- DeLeon, G., Hawke, J., Jainchill, N., & Melnick, G. (2000). Therapeutic communities: Enhancing retention in treatment using “Senior Professor” staff. *Journal of Substance Abuse Treatment*, 19, 375–382.
- Derogatis, L.R. (1993). *Brief symptom inventory: Administration, scoring, and procedures manual* (4th ed.). Minneapolis, MN: NCS Pearson, Inc.
- Derogatis, L.R., & Melisaratos, N. (1983). The Brief Symptom Inventory: An introductory report. *Psychological Medicine*, 13, 595–605.
- Donovan, D.M., Rosengren, D.B., Downey, L., Cox, G.C., & Sloan, K.L. (2001). Attrition prevention with individuals awaiting publicly funded drug treatment. *Addiction*, 96, 1149–1160.
- Egelko, S., & Galanter, M. (1998). Impact of social anxiety in a “therapeutic community”—oriented cocaine treatment clinic. *American Journal on Addictions*, 7, 136–141.
- Foa, E.B., Cashman, L., Jaycox, L., & Perry, K. (1997). The validation of a self-report measure of posttraumatic stress disorder: The Posttraumatic Diagnostic Scale. *Psychological Assessment*, 9, 445–451.
- Giard, J., Hennigan, K., Huntington, N., Vogel, W., Rinehart, D., Mazelis, R., et al. (2005). Development and implementation of a multisite evaluation for the Women, Co-Occurring Disorders and Violence Study. *Journal of Community Psychology*, 33, 411–427.
- Grella, C.E., Hser, Y., Joshi, V., & Anglin, M.D. (1999). Patient histories, retention, and outcome models for younger and older adults in DATOS. *Drug and Alcohol Dependence*, 57, 151–166.

- Haller, D.L., Elswick, R.K., Dawson, K.S., & Schnoll, S.H. (1997). Perinatal substance abusers: Factors influencing treatment retention. *Journal of Substance Abuse Treatment*, 14, 513–519.
- Haller, D.L., Miles, D.R., & Dawson, K.S. (2002). Psychopathology influences treatment retention among drug-dependent women. *Journal of Substance Abuse Treatment*, 23, 431–436.
- Harris, M. (1998). *Trauma recovery and empowerment: A clinician's guide for working with women in groups*. New York: The Free Press.
- Hellerstein, D.J., Rosenthal, R.N., & Miner, C.R. (2001). Integrating services for schizophrenia and substance abuse. *Psychiatric Quarterly*, 72, 291–306.
- Hosmer, D.W., Jr., & Lemeshow, S. (1999) *Applied survival analysis: Regression modeling of time to event data*. New York: John Wiley and Sons, Inc.
- Howard, J., & Beckwith, L. (1996). Issues in subject recruitment and retention with pregnant and parenting substance-abusing women. In E.R. Rahdert (Ed.), *Treatment for drug-exposed women and their children: Advances in research methodology* (pp. 68–86). NIDA Research Monograph 166. Rockville, MD: National Institute on Drug Abuse.
- Hughes, P.C.S., Neri, R.L., Urmann, C.F., Stahl, S., Sicilian, D.M., & Anthony, J.C. (1995). Retaining cocaine-abusing women in therapeutic community: The effect of a child live-in program. *American Journal of Public Health*, 85, 1149–1152.
- Huntington, N., Moses, D.J., & Veysey, B.M. (2005). Developing and implementing a comprehensive approach to serving women with co-occurring disorders and histories of trauma. *Journal of Community Psychology*, 33, 395–410.
- Joe, G.W., Simpson, D.D., Greener, J.M., & Rowan-Szal, G.A. (1999). Integrative modeling of client engagement and outcomes during the first 6 months of methadone treatment. *Addictive Behaviors*, 24, 649–659.
- Kang, S.Y., Deren, S., & Goldstein, M.F. (2002). Relationships between childhood abuse and neglect experience and HIV risk behaviors among methadone treatment dropouts. *Child Abuse and Neglect*, 26, 1275–1289.
- Kelly, P.J., Blacksin, B., & Mason, E. (2001). Factors affecting substance abuse treatment completion for women. *Issues in Mental Health Nursing*, 22, 287–304.
- King, A.C., & Canada, S.A. (2004). Client-related predictors of early treatment dropout in a substance abuse clinic exclusively employing individual therapy. *Journal of Substance Abuse Treatment*, 26, 189–195.
- Knight, D.K., Logan, S.M., & Simpson, D.D. (2001). Predictors of program completion for women in residential substance abuse treatment. *American Journal of Drug and Alcohol Abuse*, 27, 1–18.
- Lewis, R.A., Haller, D.L., Branch, D., & Ingersol, K.S. (1996). Retention issues involving drug-abusing women in treatment research. In E.R. Rahdert (Ed.), *Treatment for drug-exposed women and their children: Advances in research methodology* (pp. 110–122). NIDA Research Monograph 166. Rockville, MD: National Institute on Drug Abuse.
- Lundy, A., Gottheil, E., Serota, R.D., Weinstein, S.P., & Sterling, R.C. (1995). Gender differences and similarities in African-American crack cocaine abusers. *Journal of Nervous and Mental Disease*, 183, 260–266.
- Martinez-Raga, J., Keaney, F., Marshall, E.J., Ball, D., Best, D., & Strang, J. (2002). Unplanned versus planned discharges from in-patient alcohol detoxification: Retrospective analyses of 470 first-episode admissions. *Alcohol and Alcoholism*, 37, 277–281.
- McHugo, G.J., Caspi, Y., Kammerer, N., Mazelis, R., Jackson, E.W., Russell, L., et al. (2005). The assessment of trauma history in women with co-occurring substance abuse and mental disorders and a history of interpersonal violence. *Journal of Behavioral Health Services & Research*, 32, 113–127.

- McHugo, G.J., Kammerer, N., Jackson, E.W., Markoff, L.S., Gatz, M., Larson, M.J., et al. (2005). Women, Co-occurring Disorders, and Violence Study: Evaluation design and study population. *Journal of Substance Abuse Treatment*, 28, 91–107.
- McLellan, A.T., Luborsky, L., Woody, G.E., & O'Brien, C.P. (1980). An improved diagnostic instrument for substance abuse patients: The Addiction Severity Index. *Journal of Nervous and Mental Disease*, 168, 26–33.
- Milligan, C.O., Nich, C., & Carroll, K.M. (2004). Ethnic differences in substance abuse treatment retention, compliance, and outcome from two clinical trials. *Psychiatric Services*, 55, 167–173.
- Morrissey, J.P., Ellis, A.R., Gatz, M., Amaro, H., Reed, B.G., Savage, A., et al. (2005). Outcomes for women with co-occurring disorders and trauma: Program and person-level effects. *Journal of Substance Abuse Treatment*, 28, 121–133.
- Morrissey, J.P., Jackson, E.W., Ellis, A.R., Amaro, H., Brown, V.B., & Najavits, L.M. (2005). 12-month outcomes of trauma-informed interventions for women with co-occurring disorders. *Psychiatric Services*, 56, 1213–1222.
- Najavits, L.M., Weiss, R.D., & Shaw, S.R. (1997). The link between substance abuse and post-traumatic stress disorder in women: A research review. *American Journal on Addictions*, 6, 273–283.
- Najavits, L.M., Weiss, R.D., Shaw, S.R., & Muenz, L.R. (1998). "Seeking safety": Outcome of a new cognitive-behavioral psychotherapy for women with posttraumatic stress disorder and substance dependence. *Journal of Traumatic Stress*, 11, 437–456.
- National Institute on Drug Abuse. (1997, September/October). Study sheds new light on the state of drug abuse treatment nationwide [Electronic Version]. *NIDA Notes*, 12, No. 5.
- Nishimoto, R.H., & Roberts, A.C. (2001). Coercion and drug treatment for postpartum women. *American Journal of Drug and Alcohol Use*, 21, 161–181.
- Ouimette, P.C., Brown, P.J., & Najavits, L.M. (1998). Course and treatment of patients with both substance use and posttraumatic stress disorders. *Addictive Behaviors*, 23, 785–795.
- RachBeisel, J., Scott, J., & Dixon, L. (1999). Co-occurring severe mental illness and substance use disorders: A review of recent research. *Psychiatric Services*, 50, 1427–1434.
- Roberts, A.C., & Nishimoto, R.H. (1996). Predicting treatment retention of women dependent on cocaine. *American Journal of Drug and Alcohol Abuse*, 22, 313–333.
- Ross, H.E., Cutler, M., & Sklar, S.M. (1997). Retention in substance abuse treatment: Role of psychiatric symptom severity. *American Journal on Addictions*, 6, 293–303.
- Rowan-Szal, G.A., Joe, G.W., & Simpson, D.D. (2000). Treatment retention of crack and cocaine users in a national sample of long term residential clients. *Addiction Research*, 8, 51–64.
- Scheffe, H. (1959). *The analysis of variance*. New York: John Wiley and Sons, Inc.
- Scott-Lennox, J., Rose, R., Bohlig, A., & Lennox, R. (2000). The impact of women's family status on completion of substance abuse treatment. *Journal of Behavioral Health Services & Research*, 27, 366–379.
- Simpson, D.D. (1979). The relation of time spent in drug abuse treatment to posttreatment outcomes. *American Journal of Psychiatry*, 136, 1449–1453.
- Simpson, D.D. (1981). Treatment for drug abuse: Follow-up outcomes and length of time spent. *Archives of General Psychiatry*, 38, 875–880.
- Simpson, D.D. & Brown, B. (Guest Eds.). (1999). Special issue: Treatment process and outcome studies from DATOS. *Drug and Alcohol Dependence*, 57, No. 2.
- Simpson, D.D., Joe, G.W., & Brown, B.S. (1997). Treatment retention and follow-up outcomes in the Drug Abuse Treatment Outcome Study. *Psychology of Addictive Behaviors*, 11, 294–307.
- Strantz, I., & Welch, S. (1995). Postpartum women in outpatient drug abuse treatment: Correlates of retention/completion. *Journal of Psychoactive Drugs*, 27, 357–373.

- Szuster, R.R., Rich, L.L., Chung, A., & Bisconer, S.W. (1996). Treatment retention in women's residential chemical dependency treatment: The effect of admission with children. *Substance Use & Misuse*, 31, 1001-1013.
- Thompson, M.P., & Kingree, J.B. (1998). The frequency and impact of violent trauma among pregnant substance abusers. *Addictive Behaviors*, 23, 257-262.
- Veach, L.J., Remley, T.P., Jr., Kippers, S.M., & Sorg, J.D. (2000). Retention predictors related to intensive outpatient programs for substance use disorders. *American Journal of Drug and Alcohol Abuse*, 26, 417-428.
- Wolfe, J., Kimerling, R., Brown, P.J., Chrestman, K.R., & Levin, K. (1996). The Life-Stressor Checklist-Revised. In B.H. Stamm (Ed.), *Instrumentation in stress, trauma, and adaptation* (pp. 198-200). Northbrook, IL: Sidran Press.
- Ziedonis, D.M., & Stern, R. (2001). Dual recovery therapy for schizophrenia and substance abuse. *Psychiatric Annals*, 31, 255-264.