Published in final edited form as:

J Subst Abuse Treat. 2013 January ; 44(1): 34–41. doi:10.1016/j.jsat.2012.02.002.

Comparison of the Addiction Severity Index (ASI) and the Global Appraisal of Individual Needs (GAIN) in Predicting the Effectiveness of Drug Treatment Programs for Pregnant and Postpartum Women

Victoria H. Coleman-Cowger, Ph.D.^{a,*}, Michael L. Dennis, Ph.D.^a, Rodney R. Funk, B.S.^a, Susan H. Godley, Rh.D.^a, and Richard D. Lennox, Ph.D.^b

^aChestnut Health Systems, Normal, IL

^bChestnut Global Partners, Bloomington, IL

Abstract

This study conducts a within-subject comparison of the Addiction Severity Index (ASI) and the Global Appraisal of Individual Needs (GAIN) to assess change in alcohol and other drug treatment outcomes for pregnant and postpartum women. Data are from 139 women who were pregnant or who had children under 11 months old and were admitted to residential drug treatment, then re-interviewed 6 months postdischarge (83% follow-up rate). The ASI and GAIN change measures were compared on their ability to detect changes in alcohol and drug use, medical and HIV risk issues, employment issues, legal problems, family and recovery environment characteristics, and psychological/emotional issues. The measures were similar in their ability to detect treatment outcomes, and ASI and GAIN change scores were moderately correlated with each other. The GAIN scales had equal or slightly higher coefficient alpha values than the ASI composite scores. The GAIN also includes an HIV risk scale, which is particularly important for pregnant and postpartum women. These results suggest that the GAIN is comparable with the ASI and can be used for treatment research with pregnant and postpartum women.

Keywords

Drug treatment; GAIN; ASI; Pregnant and postpartum women

1. Introduction

Measuring and comparing the effectiveness of new approaches to substance abuse treatment programs continue to be a common focus of the Center for Substance Abuse Treatment (CSAT, 2000), the National Institute on Alcohol Abuse and Alcoholism (1997; Perl, Dennis, & Huebner, 2000), and the National Institute on Drug Abuse (2010), particularly in light of the American Recovery and Reinvestment Act of 2009, and its dedication of \$1.1 billion for

comparative effectiveness research. Accomplishing comparative effectiveness research requires measures that are reliable and sensitive to change in the wide range of domains impacted by substance use (e.g., use, abuse, dependence, physical health, HIV risk behaviors, mental health, environment, legal, vocational, service utilization). There has been a growing interest in integrating outcome and clinical assessment to improve both services and reduce the burden on clients. This is particularly true with subgroups like pregnant and postpartum women (PPW) who often have specific circumstances (e.g., abuse history, mental health problems, poverty, legal issues) that may make substance use treatment more complex (Conners, Grant, Crone, & Whiteside-Mansell, 2006; Rayburn, 2007).

Pregnancy and the postpartum period can be a time of significant physical, psychological, and social stress (Huizink, Robles de Medina, Muldeer, Visser, & Buitelaar, 2003; Vesga-Lopez et al., 2008), and these stressors are often associated with substance use (Amaro, Fried, Cabral, & Zuckerman, 1990; Corse & Smith, 1998; Curry, 1998) and subsequent pregnancy complications (Kelly et al., 2002). Alcohol, cigarette, and illicit drug use during pregnancy have also been associated with poor pregnancy outcomes and early childhood behavioral and development problems (Substance Abuse and Mental Health Services Administration [SAMHSA], 2009). According to combined data from the 2002 to 2007 National Surveys on Drug Use and Health (SAMHSA, 2009), 19% of pregnant women in their first trimester report past-month alcohol use, 22% report past-month cigarette use, and 5% report past-month marijuana use. Substance use typically declines over the course of pregnancy but resumes among mothers in the first 3 months postpartum. Effective interventions for women to further reduce substance use during pregnancy and to prevent postpartum resumption of use could improve the overall health and well-being of mothers and infants (SAMHSA, 2009).

Pregnancy offers what some researchers consider a window of opportunity for substance abuse treatment to capitalize on women's natural motivation to stop using for the sake of having a healthy baby (Daley, Argeriou, & McCarty, 1998; Jones, 2004). At the same time, pregnancy may also present barriers to seeking, receiving, or completing treatment. For instance, 15 states consider substance use during pregnancy to be child abuse under civil child-welfare statutes, so some women may avoid treatment for fear of losing custody of their children (Guttmacher Institute, 2011). There may also be logistical difficulties associated with help-seeking, such as responsibility for children, limited access to child care services, and transportation (Brady & Ashley, 2005). If we can better identify and address these specific needs, we can make treatment more effective for this population. Studies have shown the effectiveness of residential substance abuse treatment programs for PPW in some areas such as drug and alcohol use, criminal involvement, and parenting success (e.g., Porowski, Burgdorf, & Herrell, 2004), but in order to fully assess the effectiveness of the treatment, we must identify outcome measures that take into account the many other facets of treatment needed (e.g., HIV risk).

One of the barriers to conducting comparative effectiveness research on substance abuse treatment programs for PPW is the variation in the types of measures used to evaluate them (Ashley, Marsden, & Brady, 2003). Perhaps the most widely used substance treatment outcome measure for a substance-using pregnant population is the Addiction Severity Index

(ASI) (e.g., Conners et al., 2006), one of the oldest semistructured interviews in the field of substance abuse treatment (McLellan, Cacciola, & Alterman, 2004; McLellan, Druley, O'Brien, & Kron, 1980; McLellan et al., 1992; McLellan, Luborsky, O'Brien, & Woody, 1980). The ASI focuses on frequency and quantity measures within fixed time windows that can be combined into "composite scores" for each domain. When used with PPW, the ASI has consistently demonstrated sensitivity to change in substance use and to a lesser extent to change in legal and psychiatric problems (Conners et al., 2006; Hohman, Shillington, & Baxter, 2001; Hser & Niv, 2006; Kissin, Svikis, Moyland, Haug, & Stitzler, 2004; Nair, Schuler, Black, Kettinger, & Harrington, 2003). In the past 40 years there has been a shift from focusing on "use" to formal substance use disorders (American Psychiatric Association [APA], 1987, 1994, 2000); HIV risks among drug users (Watkins et al., 1988); placement criteria related to intoxication and withdrawal; biomedical and psychological factors as well as treatment readiness, relapse potential, and recovery environment (American Society of Addiction Medicine, 1996, 2001); a greater emphasis on co-occurring disorders (Chan, Dennis, & Funk, 2008; Lennox, Scott-Lennox, & Bohlig, 1993); and specific issues important for subgroups (e.g., women, PPW, adolescents, people in the criminal justice system). There have also been further advances in measurement theory suggesting that even short composite measures can achieve high reliability and validity (Dennis, Chan, & Funk, 2006; Lennox, Dennis, Ives, & White, 2006; Lennox, Dennis, Scott, & Funk, 2006). Although a recent review of 37 separate examinations of the psychometric properties of the ASI (Makela, 2004) found a general pattern of support for the ASI, it also found that reliabilities ranged from excellent to unsatisfactory (alpha of .9 to under .7) and that some of the criterion-related validity coefficients were low. While the ASI's alcohol and drug composite scores are excellent at measuring the initial severity of and changes in use, they are in the satisfactory range (.85 sensitivity and .80 specificity) for measuring substance dependence, the actual disorder being treated (Rikoon, Cacciola, Carise, Alterman, & McLellan, 2006).

There is a need for an outcome monitoring tool with reliable content coverage appropriately matched to the complexity of concerns in a substance-using pregnant and postpartum population. The goal of this study is to compare the ASI with the Global Appraisal of Individual Needs (GAIN) in an effort to ascertain their comprehensiveness, reliability, sensitivity to change, and relationship to each other in an evaluation of a PPW treatment program that collected data at intake and 6 months postdischarge.

The GAIN is another comprehensive instrument that consists of over 100 scales, subscales, and indices directed at understanding drug abuse and all of its attendant complications and exacerbating factors as well as service utilization. The GAIN is a newer instrument than the ASI and has been found to be sensitive to change (Dennis, Foss, & Scott, 2007; Dennis, Scott, & Funk, 2003; Rush, Dennis, Scott, Castel, & Funk, 2008; Scott, Dennis, & Foss, 2005). While the GAIN builds on many of the same items and concepts as the ASI, it also includes additional formal measures of change related to substance use disorder severity, withdrawal, HIV risks, treatment readiness, relapse potential, and recovery environment, as well as more detailed measures of crime (versus just arrests), employment and training, and service utilization related to each of its core areas. The purpose of these measures is to inform diagnoses, placement in the appropriate level of care (e.g., outpatient, intensive

outpatient, residential), and treatment planning and to provide covariates for predicting change and specific measures of change. In this paper we are interested in specific measures of change and how they compare to the measures of change from the ASI. The time to complete the GAIN change measures is comparable to the time to complete the change measures of the ASI (the ASI Lite).

Table 1 describes the GAIN change scores and the ASI composite measures that are the primary outcome monitoring measures used to evaluate treatment in each instrument. Both measures provide multiple-item summary scores that are designed to operationalize many of the important constructs linked to treatment need, including exacerbating social and environmental factors that form the context within which the drug abuse exists and is treated.

To date, however, there have been no published findings that have compared how the GAIN change-scores perform relative to the ASI composite change-scores within the same-group target population. The main objective of this study is to conduct a within-subject comparison of the change measures from these two instruments in an effort to test the validity of a newer measure relative to a more established measure of substance use within the complex population of PPW.

2. Materials and methods

2.1. Data source

The ASI and GAIN data were collected as part of a program evaluation of the Mothers at the Crossroads project (MAC; Godley, Funk, Dennis, Oberg, & Passetti, 2004), which was part of the Pregnant and Postpartum Women Program funded by CSAT under SAMHSA. The data used for this study were collected between April 1999 and November 2002 from two residential treatment facilities housed within the same umbrella agency. The MAC program provided treatment enhancement services to PPW based on their service needs as assessed at intake, with treatment outcomes evaluated 6 months later (83% follow-up rate). Services included a central intake unit designed specifically for women, client support services (primarily transportation to the intake unit and other services while in treatment), child care services for infants and children up to 5 years of age in residence with their mothers, and a manual-guided parent training curriculum entitled the Nurturing Parenting Programs (NPP) curriculum (Kaplan & Bavolek, 2007). The goal of NPP was to prevent and treat child abuse and neglect by increasing the following: (1) parents' self-worth, personal empowerment, empathy, bonding, and attachment; (2) the use of alternative strategies to harsh disciplinary practices; and (3) parents' knowledge of age-appropriate developmental expectations. The curriculum was delivered in a group format through nine weekly sessions for 2 1/2 hours each time. Individual counseling and psycho-educational groups were also provided.

Typical of many such evaluations at that time, the original core measure proposed to examine change for treatment outcomes came from the ASI. When there was a change in the project's program evaluator to someone familiar with the GAIN, a decision was made to collect both the ASI and the GAIN from over 100 cases at intake and follow-up in order to have a sufficient sample size to make comparisons between the outcome measures from the

two instruments. Both the data to compute ASI composite scores and GAIN outcome measures were collected at intake and at 6 months postdischarge, thus providing the opportunity to compare how the ASI and GAIN measures of change compared within the same participants.

2.2. Participants

Any woman admitted to residential drug treatment as part of the MAC program between April 1999 and November 2002 who was pregnant or who had children less than 11 months old was eligible for participation ($N = 218$). Women who were in the residential program for less than 48 hours or left before being approached about the project were excluded from the study ($n = 44$). Ninety-six percent of the eligible patients agreed to the follow-up ($n = 167$), and 83% completed the follow-up ($n = 139$). A total of 139 participants met all criteria and were included in the analytic data set for this paper. These participants received \$20 for completion of a follow-up questionnaire 6 months after discharge. Of the completers, 69% completed a telephone interview ($n = 96$) and 31% completed a face-to-face interview ($n = 43$). An attrition analysis revealed no differences between those who completed a follow-up and those who did not.

2.2.1. Demographic characteristics—Table 2 presents the demographic information of the PPW in the study. These characteristics were obtained from intake records and GAIN data. The table shows that the majority of the sample was Caucasian (58%) or African American (39%), between 20 and 29 years old (54%), recently postpartum (56%), and had two or more children at intake (60%).

The pregnant and postpartum participants in this study were complex in their presentation, and many reported mental illness, weekly alcohol or other drug (AOD) use, previous substance abuse treatments, and participation in some illegal activity (see Table 3).

2.2.2. Substance use characteristics—Specifically, 90% reported symptoms that were diagnostic of past-year drug dependence, 64% reported symptoms that met the criteria for past-year cocaine dependence, and 64% reported weekly AOD use, with the most common substances being cocaine (37%), alcohol (19%), and marijuana (19%). Fifty-three percent reported first use before the age of 15, and 62% had at least two prior substance abuse treatments. Participants reported an average of 13 years of substance use prior to intake (range=1–31, $SD=6.5$), with 87% reporting more than 5 years of use. Most (92%) believed they had a problem related to AOD use.

2.2.3. Psychiatric, victimization, HIV risk, and crime characteristics—The majority of participants (81%) reported symptoms of mental illness suggestive of a psychiatric diagnosis on the GAIN, which was based on the *Diagnostic and Statistical Manual of Mental Disorders* (4th edition, *DSM-IV*) criteria (APA, 2000). Of the symptoms reported, 79% were related to internalizing disorders such as depression (64%), traumatic distress disorders (53%), suicidal thoughts or actions (28%), or generalized anxiety disorders (58%) and 43% were related to externalizing disorders such as ADHD (33%). Forty-four percent reported prior mental health treatment.

Mental health issues are often tied to the presence of victimization. Seventy-eight percent of the participants in this sample reported being victimized (physically, sexually, or emotionally) in their lifetime, with almost 71% reporting high levels of victimization (multiple types of victimization, multiple times or people involved, people they trusted involved, physical harm, fear of death, no one believed them when they sought help, ongoing concerns about it happening again). A smaller percentage (19%) reported recent victimization in the 90 days prior to their intake assessment. Crime was common in this sample: illegal activity was reported by 90% of participants.

All respondents reported two or more substance-related problems (count across substance disorders and mental health disorders), with 77% reporting five or more. Thus multiple co-occurring problems do seem to be the norm for PPW entering residential treatment.

2.2.4. Measures—Data were collected at intake by clinicians who were trained, certified, and monitored by research staff, and 6-month follow-up data were collected by independent research staff (to reduce the possibility of demand characteristics). As noted earlier, all women were interviewed with the ASI and the GAIN.

2.2.5. Statistical analysis—Because of the structured-interview nature of the data collection procedures, missing data were generally less than 4% on any given change measure. Analysis of missing data failed to detect a large amount of missing data or any evidence that data were systematically missing. Missing data appeared to be completely at random and the result of simple mistakes in the administration of the survey; therefore, missing data were accommodated through the use of pairwise deletion, which meant that the participant was not included in a particular calculation if she was missing one of the measures (Allison, 2001; Schafer & Graham, 2002).

2.3. Instrument comparisons through correlation analysis

Means, standard deviations, and correlation analysis were used to compare the responses to the ASI and GAIN scales in terms of their ability to consistently classify severity of individuals or amount of services on each construct. This was done at intake, at 6 months postdischarge, and for the change scores (6 month minus intake). While the first two may potentially be slightly underestimated because of skewness, the latter should be more normally distributed (Dennis, Lennox & Foss, 1997).

2.4. Sensitivity to change—effect size calculations

Although important from a measurement perspective, differences in distributions do not necessarily translate into differences in performance. That is, different variances do not necessarily threaten validity; however, differences in variance do have the potential to confound comparison of measures in their ability to detect change. We used Cohen's *d* score (Cohen, 1988) as a standardized power statistic that corrected for differences in variance in order to assess the potential impact of different psychometric characteristics on the ability of the GAIN and ASI to detect meaningful change from baseline to follow-up. This was calculated within scale over time as: $d = (\text{mean at 6 months} - \text{mean at baseline}) / (\text{standard$

deviation at baseline). We generally interpret $d = .2$ as small, $d = .4$ as medium, and $d = .8$ (or higher) as large.

3. Results

3.1. Reliability

In scales constructed under the traditional effect–indicator model (Bollen & Lennox, 1991) in which the individual indicators are considered to be interchangeable with one another rather than part of a linear composite, it is possible to use the intercorrelation patterns among the items of a scale as an index reliability. Therefore, when appropriate we used Cronbach's coefficient alpha to assess the internal consistency of the scales (Cronbach, 1960). The alphas for the ASI scores and GAIN scales are reported in Table 1. The ASI composite scores had good internal consistency except for the Drug Use Composite score with baseline alpha = .52 and follow-up = .66. The ASI's alcohol use, employment status, and family–social relations composite scores dropped to the .60 to .68 range at follow-up. The GAIN scales all had alphas greater than .70 except for the Illegal Activity Scale at follow-up (.66), also suggesting good internal consistency.

3.2. Sensitivity to change

Table 4 presents a comparison of the ASI and the GAIN summary measures for the pregnant and postpartum participants. Because the scales are not parallel in structure, there are not equal comparisons across both instruments. The first section of the table compares the ASI and GAIN in terms of drug use-related constructs. The ASI's alcohol use composite, drug use composite, and average alcohol drug composites scales all show the predicted decrease in average scores across treatment, with the drug composite showing the largest standardized change of -1.49 ($p < .001$) for the drug use-related constructs. The GAIN Substance Frequency Scale, Substance Problem Scale, and Current Withdrawal Scale also show the same statistically significant decrease in average scores across the three scales, with the largest standardized decrease seen in the Substance Problem Scale ($d = 1.18$, $p < .001$). The ASI's Medical Status composite scale failed to show a significant decrease after treatment, but neither did the GAIN's Health Problem Scale or Physical Health Treatment Scale. The GAIN did, however, detect a decrease in the HIV Risk Behavior Index ($d = -.38$, $p < .001$), an important target area for an intervention with PPW. The ASI does not measure this aspect of the treatment outcome. Both the ASI and GAIN showed virtually the same level of support for the increase in employment for the population (ASI, $d = -.054$, $p < .001$; GAIN $d = -.052$, $p < .001$); however, the GAIN also detected an increase in training-related activities ($d = 0.70$, $p < .01$) that was not measured by the ASI. Both scales produced the same level of statistical support for a decrease in illegal activity (ASI, $d = -.053$, $p < .001$; GAIN $d = -.051$, $p < .001$). The GAIN did not detect any change in use of the criminal justice system in this population. The ASI's Family–Social Relations scale did detect a decrease from pretreatment to posttreatment ($d = -.043$, $p < .001$), suggesting fewer problems with family and peers, but it was not as large a decrease in this area as was evident with the change in the GAIN Recovery Environment Scale ($d = -.053$, $p < .001$). Finally, both the ASI and GAIN detected a significant change in psychological health (ASI, $d = -.048$, $p < .001$; GAIN $d = -.024$, $p < .01$), but the ASI produced a larger effect size. The

GAIN's Mental Health Treatment Index did not produce any evidence of change in the use of mental health treatment.

3.3. Correlation of ASI and GAIN change measures

The results of the comparison of the ASI and GAIN in the treatment study suggest that they perform similarly in a variety of domains. This raises the question of the degree to which the two measures measure the same constructs. Table 5 presents the bivariate correlations between selected scales of the two instruments. Rather than constructing an entire intercorrelation matrix, we chose to compare the scales that were similar if not parallel in content. We made comparisons of the two instruments based on intake scores, 6-month follow-up scores, and the change scores across all subscale scores. Comparison of the two measures' approach to assessing drug and alcohol use shows a strong pattern of positive correlations ranging from a low of .10 for current withdrawal at intake to a high of .71 for substance abuse frequency at follow-up. There is a strong pattern of statistically significant correlations in the two instruments' alcohol and drug use, health problem, employment activity, and family, social, and recovery environment measures. In fact, the pattern of positive correlation mirrors the pattern of differences seen in the treatment pre-post score calculations. There is a well-defined lack of correlation with all the treatment scales, again suggesting a difference between the two scales in measuring what treatment services have been received. Overall, there does not appear to be a systematic pattern of differences in correlation associated with the time of assessment or the change scores.

4. Discussion

The results of this study suggest that the GAIN is capable of detecting treatment-related differences in the pregnant and postpartum population at least as well as the ASI. The majority of the overlapping scales showed a level of similarity both in terms of the absolute averages at intake and follow-up and the change scores. In some cases the effect sizes were nearly identical, indicating that the differences in the reliabilities do not affect their abilities to detect treatment differences. Although the calculation of the correlations between similar ASI and GAIN scales show them to be generally high, they are far from perfect, and some of them are in the low range, suggesting that they are measuring different constructs. The reliabilities (coefficient alpha) of the GAIN change measures appear to be equal to or just slightly better than the ASI change measures. It is important to note, however, that there is no evidence in the treatment comparison suggesting that reliabilities inhibit the ASI from detecting treatment-related change (further suggesting that alpha is low for reasons other than reliability).

These results suggest that scientists involved in research on the effects of drug use and treatment with PPW may find utility in the GAIN and know that it will be effective in capturing important individual differences. Although the ASI measures many of the same constructs as the GAIN, it does not have composite score measures of substance abuse treatment, mental health treatment, and physical health treatment (though it does have items related to treatment), as well as HIV risk behaviors, which are highly relevant in treating this population. The GAIN's substance abuse treatment measure provides important information

on the urgency of the need for treatment and the likelihood of successfully completing the current treatment. The physical and mental health treatment measures also provide important proxy measures of health status that bear directly on the treatment needs of PPW.

4.1. Limitations

This study is not without limitations. First, the use of a nonprobabilistic sample from only two treatment sites limits the generalizability of the results, though all women entering residential treatment at the two sites during the data collection period were approached to participate. Second, urine tests were not administered to study participants, thus results could not be compared with the ASI and GAIN as a third objective measure. Finally, though the time burden to complete the ASI and GAIN change-score items is comparable, the time to complete the full assessments varies significantly. Though the GAIN is comprehensive, there is a tradeoff with the time burden to complete the full measure. That said, an empirical strategy was used to create a 20-item version of the GAIN (GAIN Short Screener) that captures nearly all the systematic variance in the total scale and also retains the relevant information for identifying cost-related risk in a working population. Recent research developments have shown the advantages of a shorter version of the GAIN for use as a health status measure in primary care settings (Dennis et al., 2006), which may be particularly relevant for a pregnant and postpartum population and may be more comparable to the ASI in terms of the time burden. Further research is needed to validate the shorter version of the GAIN within substance-using PPW, to determine the incremental validity of the GAIN's additional scales, and to address the other limitations of this research.

4.2. Implications

The results suggest that both the ASI and the GAIN provide important information on treatment outcome in a pregnant and postpartum population and that there may be some advantages for using the GAIN in drug abuse research and treatment with PPW. For example, the broader range of treatment constructs may provide a better understanding of the need for treatment in epidemiologic research and in practice. More detailed treatment-history measures give insight into the extent of multiple treatment episodes that may be useful for a population not currently in treatment. The results also suggest that the GAIN may have some advantages over other measures for prevention research, where a particularly comprehensive and sensitive measure is needed to detect extremely small effect sizes.

Given that substance-abusing women in their reproductive years have relatively high HIV seroprevalence rates and that perinatal transmission of HIV accounts for 79% of pediatric HIV infection (Centers for Disease Control and Prevention, 2011), reaching drug-dependent pregnant women to provide HIV-risk reduction interventions is particularly important. The ASI does not contain an HIV risk score, and only the legal ASI composite has been found to predict HIV-related sexual and drug-risk behaviors among a pregnant population (Chaudhury et al., 2010); therefore, the GAIN may be particularly useful in providing HIV risk behavior information that may be useful in tailoring interventions for PPW both during and after substance abuse treatment. Further research is needed to determine more specific advantages to assessing PPW in treatment with the GAIN versus the ASI.

In summary, the GAIN does well when compared with the widely used ASI on its ability to measure change across a wide variety of domains that are highly relevant to substance-using PPW. Its use would be beneficial in both treatment and prevention research as well as with providers who may be able to tailor certain intervention components such as those focused on HIV risk behaviors during substance abuse treatment. The complexity of this population demands outcome measures that appropriately assess the wide range of issues that affect them, their fetuses, and their newborns—whether that be the ASI or the GAIN.

Acknowledgments

This article was supported by CSAT Contract 270-2007-0191 utilizing data collected earlier under CSAT Grant T100567, which was conducted in collaboration with Fayette Companies.

The authors would like to thank Joan Unsicker, Tim Feeney, and Leanne Welch for assistance in preparing the manuscript. They also want to recognize the incredible generosity of Dr. Tom McLellan in sharing his knowledge and experience implementing the ASI, which was a key cornerstone of subsequent work with the GAIN.

The opinions are those of the authors and do not reflect official positions of the government. Of note, the instrument developers of the GAIN were involved with this analysis.

References

- Allison, PD. Missing data. Thousand Oaks, CA: Sage; 2001.
- Amaro H, Fried LE, Cabral H, Zuckerman B. Violence during pregnancy and substance use. *American Journal of Public Health*. 1990; 80:575–579. [PubMed: 2327535]
- American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 3rd ed. rev. Washington, DC: Author; 1987.
- American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 4th ed.. Washington, DC: Author; 1994.
- American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 4th ed. text rev. Washington, DC: Author; 2000.
- American Society of Addiction Medicine. Patient placement criteria for the treatment of psychoactive substance disorders. 2nd ed.. Chevy Chase, MD: Author; 1996.
- American Society of Addiction Medicine. Patient placement criteria for the treatment of psychoactive substance disorders. 2nd ed. rev.. Chevy Chase, MD: Author; 2001.
- Ashley OS, Marsden ME, Brady TM. Effectiveness of substance abuse treatment programming for women: A review. *The American Journal of Drug and Alcohol Abuse*. 2003; 29:19–53. [PubMed: 12731680]
- Bollen KA, Lennox R. Conventional wisdom on measurement: A structural equation perspective. *Psychological Bulletin*. 1991; 100:305–314.
- Brady, TM.; Ashley, OS., editors. Women in substance abuse treatment: Results from the Alcohol and Drug Services Study (ADSS) (DHHS Publication No. SMA 04-3968, Analytic Series A-26). Rockville, MD: Substance Abuse and Mental Health Services Administration, Office of Applied Studies; 2005.
- Center for Substance Abuse Treatment. Changing the conversation: The National Treatment Plan initiative. Rockville, MD: U.S. Department of Health and Human Services; 2000.
- Centers for Disease Control and Prevention. HIV surveillance report, 2009. 2011; 21 Retrieved from <http://www.cdc.gov/hiv/topics/surveillance/resources/reports/>.
- Chan Y-F, Dennis ML, Funk RR. Prevalence and comorbidity of major internalizing and externalizing problems among adolescents and adults presenting to substance abuse treatment. *Journal of Substance Abuse Treatment*. 2008; 34:14–24. [PubMed: 17574804]
- Chaudhury R, Jones HE, Wechsberg W, O'Grady K, Tuten M, Chisolm M. Addiction Severity Index composite scores as predictors for sexual-risk behaviors and drug-use behaviors in drug-dependent

- pregnant patients. *American Journal of Drug and Alcohol Abuse*. 2010; 36:25–30. [PubMed: 20141393]
- Cohen, J. *Statistical power analysis for the behavioral sciences*. Hillsdale, NJ: Lawrence Erlbaum; 1988.
- Conners NA, Grant A, Crone CC, Whiteside-Mansell L. Substance abuse treatment for mothers: Treatment outcomes and the impact of length of stay. *Journal of Substance Abuse Treatment*. 2006; 31:447–456. [PubMed: 17084800]
- Corse SJ, Smith M. Reducing substance abuse during pregnancy: Discriminating among levels of response in a prenatal setting. *Journal of Substance Abuse Treatment*. 1998; 15:457–467. [PubMed: 9751005]
- Cronbach, LJ. *Essentials of psychological testing*. New York: Harper & Row; 1960.
- Curry MA. The interrelationships between abuse, substance use, psychosocial stress during pregnancy. *Journal of Obstetric, Gynecologic & Neonatal Nursing*. 1998; 27:692–699.
- Daley M, Argeriou M, McCarty D. Substance abuse treatment for pregnant women: A window of opportunity? *Addictive Behaviors*. 1998; 23:239–249. [PubMed: 9573427]
- Dennis ML, Chan Y-F, Funk RR. Development and validation of the GAIN Short Screener (GSS) for internalizing, externalizing and substance use disorders and crime/violence problems among adolescents and adults. *The American Journal on Addictions*. 2006; 15:S80–S91.
- 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; 31:585–612. [PubMed: 17986709]
- Dennis, ML.; Lennox, RD.; Foss, M. *The science of prevention: Methodological advances from alcohol and substance abuse research*. Washington, DC: American Psychological Association; 1997. *Practical power analysis for substance abuse health services research*; p. 367-404.
- Dennis ML, Scott CK, Funk R. An experimental evaluation of Recovery Management Checkups (RMC) for people with chronic substance use disorders. *Evaluation and Program Planning*. 2003; 26:339–352.
- Godley SH, Funk RR, Dennis ML, Oberg D, Passetti LL. Predicting response to substance abuse treatment among pregnant and postpartum women. *Evaluation and Program Planning*. 2004; 27:223–231.
- Guttman Institute. Substance abuse during pregnancy. *State Policies in Brief*. 2011 Retrieved from http://www.guttman.org/statecenter/spibs/spib_SADP.pdf.
- Hohman MM, Shillington AM, Baxter HG. A comparison of pregnant women presenting for alcohol and other drug treatment by CPS status. *Child Abuse and Neglect*. 2001; 27:303–317. [PubMed: 12654327]
- Hser Y, Niv N. Pregnant women and women-only and mixed gender substance abuse treatment programs of client characteristics and program services. *Journal of Behavioral Health Services and Research*. 2006; 33:431–442. [PubMed: 16688389]
- Huizink AC, Robles de Medina PG, Mulder EJH, Visser GHA, Buitelaar JK. Stress during pregnancy is associated with developmental outcome in infancy. *Journal of Child Psychology and Psychiatry*. 2003; 44:810–818. [PubMed: 12959490]
- Jones, H. Drug-treatment issues in drug-dependent, pregnant women. Program and abstracts of the American Psychiatric Association 2004 Annual Meeting; New York, NY Symposium 85E. 2004.
- Kaplan, FB.; Bavolek, SJ. *Nurturing Parenting Programs: Program implementation manual & resource guide*. Park City, UT: Family Development Resources; 2007.
- Kelly R, Russo J, Holt VL, Danielsen BH, Zatzick DF, Walker E, Katon W. Psychiatric and substance use disorders as risk factors for low birth weight and preterm delivery. *Obstetrics & Gynecology*. 2002; 100:297–304. [PubMed: 12151153]
- Kissin WB, Svikis DS, Moyland P, Haug NA, Stitzer ML. Identifying pregnant women at risk for early attrition from substance abuse treatment. *Journal of Substance Abuse Treatment*. 2004; 27:31–38. [PubMed: 15223091]
- Lennox R, Dennis ML, Ives M, White MK. The constructive and predictive validity of different approaches to combining urine and self-reported drug use measures among older adolescents after

substance abuse treatment. *American Journal on Addictions*. 2006; 15:92–101. [PubMed: 17182424]

Lennox RD, Dennis ML, Scott CK, Funk RR. Combining psychometric and biometric measures of substance use. *Drug and Alcohol Dependence*. 2006; 83:95–103. [PubMed: 16368199]

Lennox RD, Scott-Lennox JA, Bohlig EM. The cost of depression-complicated alcoholism: Health-care utilization and treatment effectiveness. *Journal of Mental Health Administration*. 1993; 20:138–152. [PubMed: 10128444]

Makela K. Studies of the reliability and validity of the addiction severity index. *Addiction*. 2004; 99:398–410. [PubMed: 15049734]

McLellan AT, Cacciola JS, Alterman AI. The ASI as a still developing instrument: Response to Mäkelä. *Addiction*. 2004; 99:411–412.

McLellan AT, Druley KA, O'Brien CP, Kron R. Matching substance abuse patients to appropriate treatments: A conceptual and methodological approach. *Drug and Alcohol Dependence*. 1980; 5:189–193. [PubMed: 6766376]

McLellan AT, Kushner H, Metzger D, Peters R, Smith I, Grissom G, et al. The fifth edition of the Addiction Severity Index. *Journal of Substance Abuse Treatment*. 1992; 9:199–213. [PubMed: 1334156]

McLellan AT, Luborsky L, O'Brien CP, Woody GE. An improved diagnostic instrument for substance abuse patients: The Addiction Severity Index. *Journal of Nervous & Mental Diseases*. 1980; 168:26–33.

Nair P, Schuler ME, Black MM, Kettinger L, Harrington D. Cumulative environmental risk in substance abusing women: Early intervention, parenting stress, and child abuse potential and child development. *Child Abuse and Neglect*. 2003; 27:997–1017. [PubMed: 14550328]

National Institute on Alcohol Abuse and Alcoholism. Ninth special report to the U.S. Congress on alcohol and health. Washington, DC: U.S. Department of Health and Human Services; 1997.

National Institute on Drug Abuse. Bethesda, MD: Author; 2010. Strategic plan. Retrieved from <http://www.drugabuse.gov/PDF/StratPlan.pdf>.

Perl HI, Dennis ML, Huebner RB. State-of-the-art methodologies in alcohol-related health services research. *Addiction*. 2000; 95:S275–S280. [PubMed: 11132358]

Porowski AW, Burgdorf K, Herrell JM. Effectiveness and sustainability of residential substance abuse treatment programs for pregnant and parenting women. *Evaluation and Program Planning*. 2004; 27:191–198.

Rayburn WF. Maternal and fetal effects from substance use. *Clinics in Perinatology*. 2007; 34:559–571. [PubMed: 18063105]

Rikoon SH, Cacciola JS, Carise D, Alterman AI, McLellan AT. Predicting *DSM-IV* dependence diagnoses from Addiction Severity Index composite scores. *Journal of Substance Abuse Treatment*. 2006; 31:17–24. [PubMed: 16814007]

Rush BR, Dennis ML, Scott CK, Castel S, Funk R. The interaction of co-occurring mental disorders and recovery management checkups on substance abuse treatment participation and recovery. *Evaluation Review*. 2008; 32:7–38. [PubMed: 18198169]

Schafer JL, Graham JW. Missing data: Our view of the state of the art. *Psychological Methods*. 2002; 7:147–177. [PubMed: 12090408]

Scott CK, Dennis ML, Foss MA. Utilizing recovery management checkups to shorten the cycle of relapse, treatment reentry, and recovery. *Drug and Alcohol Dependence*. 2005; 78:325–338. [PubMed: 15893164]

Substance Abuse and Mental Health Services Administration, Office of Applied Studies. The NSDUH Report: Substance use among women during pregnancy and following childbirth. Rockville, MD: Author; 2009 May 21.

Vesga-Lopez O, Blanco C, Keyes K, Olfson M, Grant BF, Haslin DS. Psychiatric disorders in pregnant and postpartum women in the United States. *Archives of General Psychiatry*. 2008; 65:805–815. [PubMed: 18606953]

Watkins, JD.; Conway-Welch, C.; Creedon, JJ.; Crenshaw, TL.; DeVos, RM.; Gebbie, KM., et al. Report of the Presidential Commission on the Human Immunodeficiency Virus Epidemic. Washington, DC: U.S. GPO; 1988. (Submitted to the President of the United States).

Table 1

Description of the ASI and GAIN measures.

ASI composite scores

Alcohol Use Composite Score (6 items, baseline $\alpha = .78$, follow-up $\alpha = .61$): Created from days of alcohol use, days of alcohol use to intoxication, days bothered by alcohol problems, how troubled participant is by alcohol problems, the importance of treating these problems, and amount spent on alcohol.

Drug Use Composite Score (13 items, baseline $\alpha = .52$, follow-up $\alpha = .66$): Created from days of heroin, methadone, other opiates, barbiturates, other sedatives, cocaine, amphetamines, cannabis, and hallucinogen use; days of using more than one substance in a day; days of problems from drug use; how troubled by these problems; and how important to get treatment for these problems.

Medical Status Composite Score (3 items, baseline $\alpha = .93$, follow-up $\alpha = .69$): Created from days of medical problems, how bothered by these problems, and the importance of treating these problems.

Employment Status Composite Score (4 items, baseline $\alpha = .66$, follow-up $\alpha = .66$): Created from items about having a valid driver's license, having a car available, days paid for working, and income from employment.

Legal Status Composite Score (6 items, baseline $\alpha = .72$, follow-up $\alpha = .74$): Created from currently awaiting charges, trial, or sentence; days engaged in illegal activity for profit; how serious the participant's legal problems are; importance of counseling for these problems; and money received from illegal sources.

Family-Social Relations Composite Score (5 items, baseline $\alpha = .73$, follow-up $\alpha = .68$): Created from being satisfied with marital situation, days had conflict with family, days bothered by family problems, importance of treatment for these problems, and proportion of family or friends experienced serious problems with.

Psychiatric Status Composite Score (11 items, baseline $\alpha = .79$, follow-up $\alpha = .83$): Created from the average of seven past-month types of psychological problems; whether the participant took prescribed medication in the past month; days experienced these problems divided by 30 days; a 0–4 rating of how bothered the participant was by these problems; and how important treatment was for these problems.

GAIN change scores

Substance Frequency Scale (7 items, baseline $\alpha = .82$, follow-up $\alpha = .87$): Created from days of any AOD use, days of heavy use (five or more uses in a day), days used interfering with responsibilities, and days of alcohol, marijuana, cocaine, and opiate use.

Substance Problems Scale (16 items, baseline $\alpha = .95$, follow-up $\alpha = .95$): Count of the number of various types of problems related to substance use that a client reports having in the past month and ranging from 0 to 16. Includes 7 items corresponding to *DSM-IV* criteria for dependence, 4 for abuse, 2 for substance-induced health and psychological problems, and 3 on lower-severity symptoms of use (hiding use, people complaining about use, weekly use).

Current Withdrawal Scale (22 items, baseline $\alpha = .95$, follow-up $\alpha = .98$): Ranges from 0 to 22 and consists of sum psychological and physiological withdrawal symptoms reported in the past week.

Substance Abuse Treatment Index (6 items, formative index): Sum of days in various substance abuse treatment, capped at 90 days and divided by its range.

Health Problem Scale (3 items, baseline $\alpha = .76$, follow-up $\alpha = .66$): Created from recency of medical problems, days of medical problems, and days these problems interfered with responsibilities.

HIV Risk Behavior Index (6 items, formative index): Sum of past-90-day HIV risk behaviors: any needle use, any sexual activity, any unprotected sex, multiple sexual partners, past-90-day victimization, and current worry about being victimized.

Physical Health Treatment Index (5 items, formative index): Sum of days in treatment for physical health issues capped at 90 and divided by the range.

Employment In-Activity Scale (5 items, baseline $\alpha = .93$, follow-up $\alpha = .94$): Created from days employed, days employed full time, days missed work, days in trouble at work, and days suspended from work.

Training Activity Scale (5 items, baseline $\alpha = .91$, follow-up $\alpha = .89$): Proportional scale (divided by range) consisting of days in school or training, days full time, reversed days in trouble, days missed, and days suspended.

Illegal Activity Scale (3 items, baseline $\alpha = .80$, follow-up $\alpha = .66$): Created from recency of illegal activity, days of illegal activity, and illegal activity for profit.

Criminal Justice System Index (4 items, formative index): Count of days (maxed at 90) involved in the criminal justice system and divided by the range.

Recovery Environment Risk Index (12 items, formative index): Created from days attended self-help groups (reversed), recency of homelessness, days homeless, days of alcohol use where participant lived, days of drug use where participant lived, days of family problems, recency of arguing or fighting, days of arguing or fighting, recency of victimization (physical, sexual, or emotional), days of victimization, days of structured activity without drug use (reversed), and days of structured activity with drug use.

Emotional Problem Scale (7 items, baseline $\alpha = .89$, follow-up $\alpha = .76$): Created from recency of psychological problems, days of psychological problems, days these problems interfered with the participant's responsibilities, recency of life disturbed by memories (traumatic stress), days disturbed by memories, recency of problems paying attention or controlling behavior, and days of problems paying attention or controlling behavior.

Mental Health Treatment Index (4 items, formative index): Sum of the nights or times of visiting the emergency room, staying in the hospital, or visiting an outpatient facility for mental health problems, divided by the range of 90 days.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Table 2

Demographic composition of the sample.

Race/Ethnicity	
Caucasian	58%
African American	39%
Hispanic	1%
Other	3%
Age	
Between 18 and 20 years	16%
Between 21 and 29 years	54%
More than 29 years	31%
No. of children younger than 21 years	
0	9%
1	31%
2+	60%
Custody of children younger than 21 years	
Mixed	38%
Welfare	28%
Self	23%
Other	11%
Pregnant at the time of admission	40%
Pregnant with first child	9%
Had child during 90 days prior to intake ^a	56%

^aBased on those with child younger than 21 years.

Table 3

Clinical characteristics of the sample.

Any past-year AOD dependence	90%
Alcohol dependence	40%
Cannabis dependence	29%
Cocaine dependence	64%
Opioid dependence	11%
Other drug dependence	8%
Any weekly AOD use	64%
Weekly alcohol use	19%
Weekly cocaine use	37%
Weekly marijuana use	19%
Weekly heroin use	8%
Weekly other drug use	4%
Reported first use before the age of 15 years	53%
Any prior substance abuse treatment:	79%
1 prior substance abuse treatment	17%
2+ prior substance abuse treatments	62%
5+ years of substance use	87%
Any mental health disorder*	81%
Any internal disorder	79%
Major depressive disorder	64%
Traumatic distress	53%
Suicidal thoughts	28%
Generalized anxiety	58%
Any external disorder	43%
ADHD	33%
Conduct disorder	34%
Any physical violence	54%
Ever been victimized	78%
High victimization	71%
Victimized in past 90 days	19%
Ever been homeless	46%
Homeless in the past month	16%
Any prior mental health treatment	44%
Any illegal activity	90%
Any prior arrests	93%
1 prior arrest	19%
2+ prior arrests	74%
Total problems	
0–1 problems	0%
2 problems	5%

3 problems	8%
4 problems	10%
5+ problems	77%

* Symptoms meet *DSM-IV* criteria for psychiatric disorders based on self-report on the GAIN.

Table 4

Comparison of ASI and GAIN change-scores in the PPW sample^a.

Change measure	GAIN, mean (standard deviation)			Change measure			ASI, mean (SD)		
	Pre	Post	Pre-Post Cohen's <i>d</i> ^b				Pre	Post	Pre-Post Cohen's <i>d</i> ^b
Substance Frequency Scale	0.20 (0.20)	0.05 (0.13)	−0.74***	Alcohol composite score			0.21 (0.23)	0.06 (0.11)	−0.66***
Substance Problem Scale	8.39 (5.86)	1.47 (3.55)	−1.18***	Drug composite score			0.16 (0.08)	0.04 (0.07)	−1.49***
Current Withdrawal Scale	5.19 (6.19)	0.64 (3.05)	−0.74***	Average of alcohol/drug composite scores			0.19 (0.13)	0.05 (0.08)	−1.04***
Substance Abuse Treatment Index	0.12 (0.24)	0.21 (0.28)	0.39**	Medical composite score			0.21 (0.34)	0.16 (0.24)	−0.14
Health Problem Scale	0.18 (0.24)	0.24 (0.21)	0.22						
HIV Risk Behavior Index	2.22 (1.29)	1.73 (1.25)	−0.38**	Employment composite score			0.78 (0.26)	0.64 (0.32)	−0.54***
Physical Health Treatment Index	0.03 (0.04)	0.04 (0.06)	0.32						
Employment In-Activity Scale	0.80 (0.32)	0.64 (0.37)	−0.52***	Legal composite score			0.29 (0.26)	0.15 (0.22)	−0.53***
Training Activity Scale	0.03 (0.12)	0.11 (0.25)	0.70**	Family-Social composite score			0.29 (0.26)	0.18 (0.21)	−0.43***
Illegal Activity Scale	0.20 (0.22)	0.09 (0.10)	−0.51***	Psychological composite score			0.25 (0.25)	0.13 (0.19)	−0.48***
Criminal Justice System Index	0.49 (0.49)	0.49 (0.48)	0.00						
Recovery Environment Risk Index	0.29 (0.10)	0.23 (0.08)	−0.53***						
Emotional Problem Scale	0.32 (0.27)	0.25 (0.20)	−0.24*						
Mental Health Treatment Index	0.01 (0.05)	0.01 (0.03)	0.08						

Note.

Probability that there is no change (i.e., postmean = premean) marked as **p* < .05,**
p < .01,***
p < .001.^aWhere higher score is “worse” for all ASI composite scores and GAIN scales; for treatment, training, and criminal justice systems indices, higher is more involvement.^bWhere *d* = (postmean − premean) / (pre-SD).

Table 5

Correlations between the ASI and GAIN subscales.

GAIN scale	ASI composite ^a	Intake	6 months postdischarge	Change scores ^d
Substance frequency ^b	Alcohol	0.36	0.50	0.46
Substance frequency ^b	Drugs	0.50	0.71	0.51
Substance frequency ^b	Alcohol/Drugs	0.48	0.66	0.54
Substance problems ^a	Alcohol/Drugs	0.33	0.60	0.45
Current withdrawal ^c	Alcohol/Drugs	0.10	0.52	0.20
Substance abuse treatment ^b	Alcohol/Drugs	-0.08	-0.10	-0.11
Health problems ^b	Medical	0.51	0.58	0.52
Risk behavior index ^b	Medical	0.00	0.20	0.05
Physical health treatment ^b	Medical	0.07	0.05	-0.03
Employment In-activity ^b	Employment	0.52	0.56	0.29
Training activity ^b	Employment	-0.06	0.07	0.06
Illegal activity ^b	Legal	0.58	0.14	0.36
Criminal justice system ^b	Legal	0.11	0.27	-0.02
Recovery environment risk index ^b	Family-Social	0.25	0.44	0.36
Emotional problems ^b	Psychological	0.71	0.71	0.62
Mental health treatment ^b	Psychological	0.09	0.10	0.02

Note. Bold indicates correlations are significantly different from zero at $p < .05$.

^a Past month,

^b Past 90 days,

^c Past week and

^d postmean-premean.