Psychological Distress, Social Support and Substance Use in Women with HIV in Substance Use Recovery

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PSYCHOLOGICAL DISTRESS, SOCIAL SUPPORT AND SUBSTANCE USE IN WOMEN WITH HIV IN SUBSTANCE USE RECOVERY

By

Brian E. McCabe

A DISSERTATION

Submitted to the Faculty of the University of Miami in partial fulfillment of the requirements for the degree of Doctor of Philosophy

Coral Gables, Florida

December 2011
UNIVERSITY OF MIAMI

A dissertation submitted in partial fulfillment of
the requirements for the degree of
Doctor of Philosophy

PSYCHOLOGICAL DISTRESS, SOCIAL SUPPORT AND SUBSTANCE USE IN WOMEN WITH HIV IN SUBSTANCE USE RECOVERY

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The purpose of this study was to investigate concurrent and prospective relationships between psychological distress and social support and substance abuse in a convenience sample of predominantly minority women with HIV in substance use recovery. This study involved a secondary analysis of data from a randomized controlled trial comparing a family therapy intervention and a group health intervention. Participants completed the Hamilton Depression and Anxiety Scales (psychological distress) and the Social Support Questionnaire (social support) at baseline and 4 months, 8 months, and 12 months post-baseline. Substance use over a 30-day period was measured by the Addiction Severity Index Lite, which was completed at baseline and at 2-month intervals post-baseline. A series of path analyses was used to test hypotheses generated from theory and empirical research. Results of the current investigation failed to reject the null hypothesis for the 6 hypotheses, and found only partial support for 2 hypotheses. Psychological distress was concurrently related to change in substance use only at 12 months (Hypotheses 1 and 2). Psychological distress was not related to social support, so there was no mediation of concurrent relationships (Hypothesis 3). Psychological distress was prospectively related to change in substance use that was measured 2 months after psychological distress was measured, but not change in substance use that was measured 4 months after psychological distress was measured (Hypothesis 4). Social support was not
prospectively related to change in substance use that was measured either 2 months or 4 months after social support (Hypothesis 5). There was no evidence of mediation of prospective relationships (Hypothesis 6). These results were discussed within the context of relevant literature.
ACKNOWLEDGMENTS

I would like to express my gratitude to my chair and mentor, Dr. Robert C. McMahon. This has been a long process; I appreciate his support and patience. I would also like to thank the members of my committee, Dr. Kent Burnett, Dr. Daniel Feaster, and Dr. Robert Halberstein. I could not have finished without feedback, editing, and encouragement from several colleagues: Ms Ahnalee Brincks, Dr. Marcel de Dios, Dr. Stephanie Diamond, and Dr. Indira Abraham-Pratt. My family, particularly my wife Kristina Torre-Verdejo, also deserves my gratitude for support, encouragement, and tolerance over the years. Finally, this project would not have been possible without the participation of the women and efforts multiple staff members of the study.

Data for this project was from a study funded by the National Institute on Drug Abuse grants R01 DA15004 (Daniel Feaster, Principle Investigator) and R01 DA16543 (Victoria Mitrani, Principle Investigator). The National Institutes of Health Office of Research on Women’s Health and the University of Miami, General Clinical Center Research Grant M01 RR16587 also supported this research.
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Chapter 1

Introduction

HIV/AIDS is a health crisis for women, particularly minority women, in the United States. Of the incidence (i.e., the number of new cases relative to number of HIV+ individuals in the population) of AIDS, the share of women increased from 7% in 1985 to 27% in 2007. In 2004, HIV/AIDS was one of the leading causes of death for African American women age 25 to 54 years, the leading cause of death for African American women age 25 to 34 years, and the 4th most common cause of death for Latinas age 35 – 44 years (Centers for Disease Control [CDC], 2008). Although African Americans made up about 12% of the population of the U.S. in 2000, this group accounted for half of the estimated 38,730 new HIV/AIDS diagnoses (CDC, 2008). For people under the age of 25 diagnosed with HIV/AIDS during 2001–2004 in the 33 states reporting data, over half (61%) were African American and 14% were Hispanic, despite being only 28% of the population (CDC, 2008). Among women, over two-thirds (68%) of the new cases of HIV/AIDS in the U.S. were in African Americans. The rate of new AIDS diagnoses for African American women was 23 times the rate for white women (CDC, 2008). There continues to be a strong need for prevention/treatment efforts focusing on minority women. In the current era of effective pharmaceutical treatments for HIV/AIDS, the medical community has seen an increase in longevity for HIV+ individuals. Increased longevity and factors have shifted health care priorities/providers from coping with imminent death to a chronic illness perspective focused on maintaining the health of individuals with HIV while decreasing transmission in the larger population (Beaudin &
Chambre, 1996). One avenue for improving health, from a chronic disease perspective, is terminating/reducing substance use, a common issue of individuals with HIV/AIDS.

Although opinions on the relationship between substance use and health of individuals with HIV are mixed, from a public health perspective substance use deserves attention for several reasons. First, use of intoxicating substances increases the likelihood of an individual engaging in risky sexual behaviors, and transmitting HIV (Leigh & Stall, 1993) to non-infected persons and other STIs to infected persons. Second, substance use has been found to decrease the likelihood of adherence to antiretroviral medications (Lucas, Cheever, Chaisson, & Moore, 2001). Decreased adherence may in turn lead to increased viral load and the likelihood of transmission to others. Third, many substances (particularly those metabolized by the liver) may have adverse interactions with antiretrovirals (e.g., Antoniou & Tseng, 2002). Poor medication adherence is of particular concern as non-adherence is linked with increased replication of medication-resistant HIV, with consequent adverse effects for both the individual and larger society (Bartlett, Cheever, Johnson, & Paauw, 2004). Substance use is an acutely salient topic for women with HIV/AIDS, as risky heterosexual contact and substance use (particularly injection drug use) are the leading routes of HIV transmission (CDC, 2008).

There is evidence that substance use is common in individuals with HIV. In a recent national survey, 40% of people with HIV reported using illicit drugs in the past year (Bing et al., 2001). Similarly, 53% of this group reported alcohol consumption in the past month, with 15% drinking heavily (five or more drinks at one sitting) at some point during the month (Galvan et al., 2002). Although these numbers are troubling, the adverse consequences of substance use are typically found for active users, not for
individuals in recovery (e.g., Lucas et al., 2001). Substance use disorders have been described as chronic, relapsing conditions (Dimeff & Marlatt, 2006). Research findings indicate that many users relapse after limited periods of abstinence (Havassy, Wasserman, & Hall, 1993). Understanding relapse for women with HIV in recovery is the focus of the current study.

Relapse and recovery from substance use disorders are complex processes (Maisto & Connors, 2006). The Betty Ford Institute Consensus Panel (McLellan, 2010) defined recovery as “a voluntarily maintained lifestyle comprised of sobriety, personal health, and citizenship.” However, this definition is not without controversy, and to date there has been little agreement on how to define relapse or the appropriate methods for studying relapse (Maisto & Connors, 2006). In one review, McKay (1999) identified three broad methods for studying relapse: retrospective, prospective, and near real-time. In another influential review, Brownell, Marlatt, Lichtenstein, and Wilson (1986) attempted to differentiate between lapse, relapse, and prolapse, although these terms have not been widely adopted. Maisto and Connors (2006) recommend that given the lack of consensus on this issue, researchers provide a rationale for the selection of a particular operational definition of relapse in a particular study.

Although the rates of relapse depend to some degree on the definition of relapse that is used, evidence suggests that, as with other chronic conditions, many individuals leaving substance use treatment will experience some return to use or problems associated with use. One commonly cited estimate of the percentage of individuals relapsing after treatment for addiction was between 40 and 60% (National Institute of Drug Abuse [NIDA], 2009), with others reporting 75 to 92% relapsing to drug and
alcohol use in a single year (Brandon, Vidrine, & Litvin, 2007). Although women in substance abuse treatment relapse less frequently than men (NIDA, 2009), women with substance use disorders are more likely than men with similar disorders to have a substance-using partner, which may increase the risk of relapse for women in the presence of a drug-abusing partner (e.g., Rubin, Stout, & Longabaugh, 1996). In order to understand a return to substance use after completion of treatment and to improve the probability of continued abstinence, one tradition of research has focused on identifying predictors of relapse. A recent review (Walitzer & Dearing, 2006) of gender and relapse suggested that although predictors of relapse are similar for those with alcohol and drug use disorders, women appear to have greater risk than men for relapse associated with increased psychological distress and limited social support. As such, one tradition of research has examined these two factors as predictors of substance use and/or relapse.

Several theories have been offered in attempts to explain the link between substance use and psychological distress (e.g., West, 2006). One is that withdrawal from substances is often accompanied by unpleasant emotions that may be similar to symptoms of anxiety or depression, e.g., sadness, anger, irritability, dysphoria, and restlessness. Other theories include the self-medication and instrumental conditioning models. Substance use from the self-medicating hypothesis (Khantzian, 1985) is conceptualized as a choice, either conscious or unconscious, of particular substances to ease unpleasant emotions. Substance use from the perspective of instrumental conditioning is a learned behavior maintained by negative reinforcement (Brando et al., 2007). Although the self-medicating hypothesis and instrumental condition are derived
from separate theoretical traditions, the predictions made about substance use for
individuals with psychological distress are very similar.

Several theories have also attempted to explain the link between substance use
and social support (Moos, 2007). Social control and behavioral choice theory center on
how social bonds discourage substance use. Social learning theory describes the
influence of modeling on substance use. Furthermore, it is possible that in addition to
independent relationships, social support and psychological distress have mediating links
with relapse to substance use. One widely used model is stress and coping theory
(Shiffman & Wills, 1985; Wills, 1990). This theory posits that social support could have
either a 1) buffering effect, i.e., social support is beneficial only in the context of high
stress; or 2) direct effect, i.e., social support is beneficial independent of level of stress.
Other theorists have proposed that individuals with high psychological distress could
have poor or disrupted social relationships, and a lack of positive social relationships
leads to a greater likelihood of relapse (e.g., Hunter-Reel, et al., 2009; Widiger & Smith,
2008). These theories describe person-environment transactions in which an individual
with psychological distress might have a smaller number of positive social relationships
or a greater number of conflicted social relationships.

The purpose of the proposed study is to investigate the links between substance
use, social support, and psychological distress in a convenience sample of women with
HIV who completed treatment for a substance use disorder. The specific research
questions of the proposed study are: 1) Does psychological distress predict substance use
for women in substance use recovery?; 2) Does social support predict substance use?; and
3) Does social support mediate the relationship between psychological distress and substance use?

The next sections review the available research on psychological distress and social support as predictors of substance use in more detail. In order to focus on substance use for similar participants as the population of interest, only studies that included participants who had completed treatment for substance use disorders and had at least one measure of substance use over a period of time after treatment completion will be reviewed. Most studies assess either psychological distress or social support as independent predictors of relapse, although a few studies have assessed both types of construct simultaneously. The following review of the theoretical and empirical literature includes an overview of 1) the relationship between psychological distress and substance use, 2) the relationship between social support and substance use, and 3) the relationships between psychological distress, social support, and substance use. A description of the specific hypotheses advanced in the proposed study will also follow the review of the literature.

Review of the Literature

Psychological Distress

Multiple concepts of psychological distress have been used in the past, but a widely-used framework for conceptualizing mental disorders was described in the Diagnostic and Statistical Manual, 4th edition text revision (DSM-IV-tr; American Psychiatric Association [APA]; 2000). The DSM-IV definition (p. xxi) of mental disorder is

… a clinically significant behavioral or psychological syndrome or pattern that occurs in an individual and that is associated with present distress
(e.g., a painful symptom) or disability (i.e., impairment in one or more important areas of functioning) or with a significantly increased risk of suffering death, pain, disability, or an important loss of freedom. In addition, this syndrome or pattern must not be merely an expectable and culturally sanctioned response to a particular event, for example, the death of a loved one. Whatever its original cause, it must currently be considered a manifestation of a behavioral, psychological, or biological dysfunction in the individual. Neither deviant behavior (e.g., political, religious, or sexual) nor conflicts that are primarily between the individual and society are mental disorders unless the deviance or conflict is a symptom of a dysfunction in the individual, as described above.

Researchers have measured psychological distress (or dysfunction) using various instruments based on, or similar to, this DSM-IV definition of mental disorder (e.g., Kendall, Hollon, Beck, Hammen, & Ingram, 1987; Clark & Watson, 1991). Before discussing relationships between psychological distress and relapse, some issues relevant to measurement of psychological distress are described in more detail. Mood refers to a relatively enduring emotional state. A symptom is an expression of individual experience, where the presence of a collection of symptoms may indicate the presence of a syndrome. A syndrome is a collection of symptoms that group together. A disorder is a classification of non-normal behavior, in the form of associated symptoms, which may cause distress. These symptoms generally have a number of dimensions, such as onset, duration, and severity. Although a full discussion of this issue is beyond the scope of the current review, Solomon, Haaga, & Arnow (2001) described two dominant approaches to the measurement of mental disorder: the continuity and categorical. The categorical approach suggests that a discrete disorder is qualitatively distinct from that which is reflected in a measure of level of symptoms. In contrast, the continuity perspective suggests that symptoms lie on a continuum, with disorders reflecting the severe end of the continuum. In a recent review, Solomon et al. (2001) found that the majority of
studies showed that individuals with depressive symptoms that did not meet diagnostic criteria for a major depressive disorder were very similar to individuals who did meet criteria for major depressive disorder in terms of functional impairment, health, and heritability, suggesting some support for the continuity perspective with depression. That is, cases on the border of meeting diagnostic criteria were very similar. However, the authors noted that the body of research does not allow for definitive conclusions about the comparative validity or utility of these perspectives. In the review that follows, studies adopting both categorical diagnostic and symptom continuity perspectives that have relevance to relapse among substance abusers will be reviewed.

**Psychological Distress and Post-treatment Substance Use**

Empirical support for the association between mental disorders and substance abuse is available in the literature, demonstrating reliable linkage between co-occurring substance use and mental health disorders. Results from the Epidemiological Catchment Area study (Regier, Narrow, Rae, Manderscheid, Locke, & Goodwin, 1993) showed a greater than average prevalence of anxiety and mood disorders for people diagnosed with alcohol disorders (19% and 13%, respectively) and drug use disorders (28% and 26%, respectively). Women with substance use disorders appear to be at higher risk of depression than men with similar disorders. For example, in the National Comorbidity Survey (Kessler et al., 1994) over half of women with an alcohol dependence disorder, compared to just over a quarter of men, also were diagnosed with a mood disorder. These findings have been shown in a variety of populations.

Over the years multiple theories have been proposed that attempt to explain the link between substance use and mental disorders (e.g., West, 2006). The first notion
concerns the effects of withdrawal. Symptoms of withdrawal often include unpleasant emotions, such as anxiety, sadness, anger, irritability, dysphoria, and restlessness. However, withdrawal symptoms are likely different than mental disorders. Schuckit (1983) recommended the use of extended assessment periods to differentiate between symptoms induced by withdrawal and more relatively long-lasting mental disorders. Withdrawal typically only lasts for a period of days to weeks after cessation of use (e.g., Wills, 1990), and relapses are known to occur outside of this time frame. Thus, the following paragraphs cover several explanations of the relationship between relapse and psychological distress beyond that of seeking relief from withdrawal symptoms.

The self-medication and instrumental conditioning models have described how substance use may be related to psychological distress. The *self-medicating hypothesis* (Khantzian, 1985) suggests that individuals choose to use substances to alleviate unpleasant emotional states, and that these individuals choose particular substances based on pharmacological effects that are believed to achieve these ends. That is, individuals choose substances with effects that will oppose the unpleasant emotional states they are attempting to escape. For example, an individual might choose heroin to calm inner rage, but might choose cocaine to counter depression. From this perspective, substance use is more likely in situations in which an individual experiences strong, unwanted emotions. Empirical support for this hypothesis is mixed, and differs based on what predictions are made (Henwood & Padgett, 2007). If predictions are made about specific substances being used to counter specific symptoms, there is relatively little supporting evidence. However, if the prediction is that individuals use substances to counter unpleasant affective states, there is a stronger base of evidentiary support.
Substance use from the perspective of *instrumental conditioning* is conceptualized as a learned behavior (Brandon, Vidrine, & Litvin, 2007). This behavior is likely maintained by both positive and negative reinforcement. Pleasurable effects of substances would obviously reinforce use. Negative reinforcement is the process whereby an increase in the probability of a behavior follows the removal of a noxious or unpleasant stimulus (e.g., Baker, Piper, Fiore, McCarthy, & Majeskie, 2004). Initially, relief from the unpleasant effects of withdrawal symptoms reinforces substance use. However, after a period of abstinence lasting more than two weeks, physical withdrawal symptoms are relatively weak. At this point, any unpleasant emotional state may trigger the learned substance-using behavior. More recently, learning theories of substance use were extended using a social learning perspective. From this perspective, the actual physiological effects of substance use on emotional states may be less important in some situations than an individual’s expectations about the effects. That is, if an individual believes that substance use will relieve unpleasant emotional states, then the individual is more likely to use substances.

The self-medication hypothesis and instrumental conditioning perspectives also suggest links between negative affect and relapse to substance use. That is, relapse is believed to be more likely in situations when an individual experiences unwanted or negative emotions. Although an individual has been abstinent for a period of time, substance use behavior continues to exist as part of a behavioral repertoire for emotional relief. Relevant to the proposed study, psychological distress or negative affect is often identified as a precursor to relapse by individuals who have relapsed, and has been examined as a predictor of relapse in multiple studies (See Connors, Longabaugh, &
Miller, 1996 for a brief review of both types of studies). Individuals with mental health disorders such as anxiety or depression experience frequent negative emotions, and thus have greater likelihood of substance use.

The following review of empirical literature focuses on studies that have examined whether anxiety or depression directly predicts substance use in post-treatment populations. Specifically, the following section includes a review of studies that 1) have samples of individuals in recovery who received substance use treatment; 2) assessed substance use, or a return to use, for individuals in recovery; 3) measured depression or anxiety as a predictor of substance use; and 4) had a longitudinal design. Additionally, although a variety of substances of abuse have been assessed in the literature, the following sections include only studies that assessed alcohol or cocaine, the most frequently used substances of participants sampled for the proposed study.

There are a number of methods of measuring psychological distress that have been used in the substance use and psychological distress literature. Most common in the following studies are self-report symptoms scales. This type of measure asks respondents to rate their own experience of a collection of symptoms, from a single disorder, (e.g., Major Depressive Disorder), or group of disorders (e.g., anxiety disorders). In one such study, Glenn & Parsons (1991) examined whether depression measured at treatment intake predicted relapse for patients (56% male; 88% white) from a 4 to 5 week inpatient 12-step based alcohol treatment program. Depressive symptoms were measured with the BDI (Beck, Ward, & Mendelson, 1961), along with a psychosocial maladjustment scale, drawn from a pre-treatment assessment. Monthly telephone calls were made to participants to assess drinking. Participants were grouped into two categories: relapsed,
defined as more than ten ounces of alcohol (approximately 17 drinks) consumed over the six-month period prior to the follow-up assessment (one-year post-discharge); or abstinent, which included all other participants. After controlling for childhood attention deficit disorder, depressive symptoms did predict relapse at 14-months post-treatment. Specifically, relapsed participants had greater depression scores (BDI $M = 11.5, SD = 7.61$) than abstainers (BDI $M = 5.75, SD = 5.12$). As the scores below 13 are generally considered ‘minimal depression’ both groups could be described as having minimal depression. This suggested that even “subclinical depression” may be relevant to relapse.

Bobo, McIlvain, and Leed-Kelly (1998) performed a secondary analysis of data from 288 daily smokers with co-occurring alcohol, marijuana, and cocaine use who were recruited from 12 residential substance use treatment programs for a smoking cessation program and analyzed relapse during 6-months post-treatment and 1-year post-treatment. About two-thirds (67%) of the participants were men, and a similar proportion were white. Psychological distress was measured with the CES-D (Radloff, 1977) 15 days after treatment admission. Participants were classified as distressed (score equal to or above 16 on CES-D) or non-distressed (score below 16). Participants also reported their use of substances over a full year post-treatment. Relapse was coded as use vs. no use separately for alcohol, cocaine, and marijuana. At 6-months post-treatment participants in the distressed range early in treatment had increased risks of relapse to alcohol, cocaine, and marijuana during that six-month period, controlling for previous treatment history. At 12-months post-treatment, distressed participants had a significantly increased risk of relapse only to alcohol and marijuana over the full-year post-treatment period. There was no significant prediction of cocaine relapse, although the estimated risk ratios for cocaine
were of similar magnitude. It is difficult to say how similar the patients from these
treatment centers would be to non-smokers, or if the results are skewed by a few
participants using all three substances.

Curran, Flynn, Kirchner, & Booth (2000) examined whether depressive symptoms
measured at treatment intake or 3-months post-treatment predicted relapse to drinking
one year after 21-day inpatient treatment for a sample of 298 veterans (89% white).
Individuals were placed into three mutually exclusive categories based on their BDI
(Beck et al., 1961) scores: low (0 – 13), mild (14 – 20), and severe (over 20) symptoms of
depression. Relapse was defined strictly as any self-reported drinking during four
separate three-month intervals: treatment discharge to three-months, three to six-months
post-treatment, six to nine-months post-treatment, and nine to 12-months post-treatment.
Group membership based on level of depressive symptoms at intake did not predict
relapse, but membership at three-months post-treatment did predict relapse. Specifically
compared to participants in the low symptoms group, individuals categorized as having
mild depressive symptoms at three-months post-treatment had three times the odds of
relapse both three-months and six-months later (three-months, \(OR = 2.8\); six-months, \(OR
= 2.5\)). The relationship was not statistically significant at 12-months. Similarly,
individuals categorized as having severe depressive symptoms at three-months post-
treatment had over four times the odds of relapse at later time points (six-months, \(OR
= 6.9\); nine-months, \(OR = 4.5\); 12-months, \(OR = 4.1\)), compared to the low symptoms
group.

Miller, Westerberg, Harris, & Tonigan (1996) used several measures of
psychological distress to predict relapse in a sample of 122 individuals (51% non-
Hispanic white, 69% male) with alcohol problems, recruited from outpatient and inpatient alcohol treatment programs. The authors adopted a definition of post-treatment use that had five levels: abstinent, slipped (any drinking), relapsed (any day of heavy drinking), continuous drinking (no period greater than four days without heavy drinking), and unknown. These outcomes were considered over a two month period (four to six months post-treatment). Negative affect was measured with three scales, the BDI (Beck et al., 1961), BAI (Beck & Steer, 1990), and STAXI (Speilberger, Jacobs, Russle, & Crane, 1983), at four-months post-treatment. Controlling for the amount of pretreatment alcohol use, negative life events, cognitive appraisal variables (e.g., self-efficacy, alcohol expectancies, and motivation), coping resources, and craving, symptoms of depression from the BDI evaluated at treatment intake was a significant predictor of use consistent with the above definition, and explained 16% of the variance beyond the control variables.

In all four studies reviewed above, psychological distress measured with self-reported symptoms of depression was predictive of substance use relapse. A single study measured psychological distress with a self-report symptom scale that was not limited to the symptoms of a single disorder (e.g., major depression), or subgroup of disorders (e.g., anxiety disorders), and instead assessing symptoms of multiple disorders. In the following study, the Symptom Checklist-90-R (SCL-90-R; Derogatis, 1994) was used; the instrument assesses psychiatric symptoms in nine dimensions (somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism).
Hall, Havassy, & Wasserman (1991) assessed 141 cocaine users (73.1% male, 48.1% African American) who completed a 21 to 28 day inpatient or intensive outpatient 12-step treatment program. Psychological distress was measured at treatment intake with the general severity index from the SCL-90-R (Derogatis, 1994) and the negative affect score from the Mood Questionnaire (Ryman, Biersner, & LaRocco, 1974). Stress was controlled statistically by including abbreviated versions of the Life Events Questionnaire (Billings & Moos, 1982) and Hassles scale (Kanner, Coyne, Schaefer, & Lazarus, 1981) administered at intake in the analysis. Withdrawal symptoms at intake were controlled statistically. Cocaine use was assessed at weekly intervals for six months post-treatment discharge. No significant relationships were found between psychological distress and cocaine use.

Witkiewitz & Villarroel (2009), in a study involving predominantly white, male participants in Project Match, derived a latent construct from depression (BDI) and anger measures (STAXI) to predict relapse to drinking using latent transition analysis (LTA). Indicators of latent drinking relapse were consequences of drinking (classed as low, medium, or high), drinking intensity (the average number of drinks per drinking day), and the frequency of drinking (% drinking days) at three one-month intervals (0 – 1, 2 – 3, and 5 – 6 months post-discharge). Latent transition analysis, an extension of latent class analysis, was used to model change in the discrete latent variables. Controlling for gender, pre-treatment distress and drinking, results suggested that negative affect has small- to medium-sized predictive relationships with drinking relapse.

Results of the two studies with multiple continuous measures of psychological distress were mixed, with one study showing a relationship between psychological
distress and relapse and the other not finding the relationship. An alternate method of gauging psychological distress is to assess for a psychiatric diagnosis, such as of Major Depressive Disorder. As described previously, most diagnostic measures have a particular set of criteria or rules to categorize the diagnosis as present or absent. Many diagnostic instruments follow the DSM-IV (APA, 2000) criteria for diagnoses, as was the cases for the studies described that follow.

In one such study, McKay, Alterman, Cacciola, Rutherford, O’Brien, & Koppenhaver (1997) examined whether Major Depressive Disorder or Anxiety Disorders, controlling for the presence of substance use and Antisocial Personality Disorder, predicted abstinence in a sample of 98 male (85% African American) veterans with cocaine dependence that had completed a four-week 12-step-based intensive outpatient treatment program and entered one of two aftercare programs. A structured clinical interview for psychological distress was administered on completion of intensive outpatient treatment; participants were categorized as having lifetime or current depressive disorder or anxiety disorder. Cocaine use was measured using a Timeline Followback (Sobell & Sobell, 1992) procedure evaluating the six-months after completion of treatment. Relapse to cocaine use was defined in two ways: first as 15% or more days of use during the six month period and second as any use during the same period. Interestingly, participants with a lifetime anxiety disorder reported more cocaine use (as defined by the percent days using cocaine) in the follow-up period than participants with no lifetime anxiety disorders. However, participants with a lifetime history of a depressive disorder were more likely to relapse (defined by any use of cocaine), than participants with no such history.
Other studies have combined both self-report symptom scales and psychiatric disorder measures. Greenfield and colleagues (1998) followed a group of 101 individuals (59% men; 94% white) with alcohol dependence for one year after discharge from an inpatient treatment program. Participants were evaluated for both depressive symptoms (BDI; Beck et al., 1961) and for the presence of major depressive disorder. Drinking was assessed monthly for the full year post-treatment follow-up with the Timeline Followback procedure (Sobell & Sobell, 1992) as well as with a breath test. Definitions of relapse were based on gender. Three or more standard drinks (13.6g absolute alcohol) for women and five or more drinks for men in a single month were defined as a relapse. Depressive symptoms were not related to the overall probability of relapse; however, a diagnosis of major depressive disorder predicted a shorter time to the first drink after treatment.

Alterman and colleagues (2000) followed male veterans, most of whom were African American, diagnosed with cocaine dependence for seven months after a one-month inpatient or intensive outpatient treatment. Cocaine use was assessed by self-report and urine drug screen (UDS). In separate analyses, the authors used two definitions of abstinence, one conservative and one liberal, for past 30-day cocaine use at seven-months post-discharge. The liberal definition of abstinence considered any report of non-use to be accurate, if no UDS result was available to confirm. The more conservative definition considered any report of non-use that was not confirmed by a UDS result to actually represent use. Psychological distress was assessed at treatment application with both the SCL-90 (Derogatis, 1994) total score and a structured interview for lifetime psychiatric diagnoses. Psychological distress (as reflected in self-reported symptoms or lifetime
psychiatric diagnostic status) was not related to relapse defined in conservative or liberal terms, after controlling for baseline substance use severity.

In a study of 93 men (91% European descent) from a three-week abstinence-focused alcohol treatment program (either a two-week residential or one-week day treatment) in New Zealand, Sellman & Joyce (1996) attempted to predict alcohol relapse six months post-admission with two measures of psychological distress administered at baseline: the SCL-90 (Derogatis, 1994) and a structured interview for psychiatric diagnoses. Relapse was defined as any problem drinking over a six-month period after discharge. Problem drinking was defined as either 1) 10 standard drinks on at least one occasion, 2) more than five standard drinks on more than five occasions, or 3) a physical problem associated with alcohol abuse, e.g., blackouts and liver dysfunction. After controlling for age of onset of alcohol problems, neither a lifetime diagnosis of major depressive disorder nor the total number of depressive symptoms at treatment intake predicted membership in the relapsed group (58%) or the non-relapsed group (42%). Lack of significant findings was not due to low power, as a chi-square test would have power of .82 to detect a difference, and a logistic regression would have power of .89 to detect a difference (OR = 1.92).

A third method to measure psychological distress is a symptom rating scale. As with self-report symptom scales, these measures assess symptoms of a particular disorder or related group of disorders, but instead of having individuals note their own experiences, a trained rater assigns values to the experience of the individual after a structured or semi-structured interview. Past research has identified depression ratings scales, even when administered by non-clinicians, to be superior to self-report scales for
identifying need for treatment (e.g., Taylor, DeBusk, Davidson, Houston, & Burnett, 1981). Only one study could be located that used a symptom rating scale, the Hamilton Rating Scale for Depression (HRSD; Hamilton, 1959), in this case, along with a psychiatric diagnostic measure. In this study, Brown, Monti, Myers, Martin, Rivinus, Dubreuil, and Rohsenow (1998) administered two measures of psychological distress at the end of a two-week 12-step program to a group of 89 predominantly male (73%), white (88%) cocaine users (69.8% also used alcohol). The measures of clinical depression were a structured clinical interview for Major Depressive Disorder and the HRSD (Hamilton, 1959). Cocaine use was assessed using a Timeline Followback method (Sobell & Sobell, 1992) for the 90-day period prior to three-months post-treatment. Although higher levels of depressive symptoms were related to greater urges for cocaine, neither a depressive disorder nor depressive symptoms predicted relapse to cocaine use after controlling for baseline use severity.

Overall, the studies showed mixed evidence for the proposition that higher psychological distress predicts a greater likelihood of relapse. The majority of studies that assessed psychological distress using only a measure of symptoms showed a statistically significant relationship between psychological distress and relapse. However, no study gauging psychological distress with psychiatric diagnosis predicted relapse. It is possible that studies using a psychiatric diagnosis were underpowered statistically due to the lack of continuous measurement or that the diagnostic assessment procedure misclassified a number of cases on the border. About half the studies reviewed assessed psychological distress at a point in time when psychological distress was likely not due to withdrawal symptoms. Relevant to the proposed investigation, no studies reviewed mentioned the
incidence of HIV/AIDS among participants. The majority of studies sampled from inpatient or residential treatment programs, and with few exceptions, contained samples that were composed predominantly of non-Hispanic whites and/or men.

Social Support and Post-treatment Substance Use

Recently, Moos (2007) summarized four theories that have been adapted to explain the links between social support and substance use: social control theory, behavioral choice theory (also called behavioral economics), social learning theory, and stress and coping theory. Social control theory focuses on the strength of social bonds to institutions where deviant behavior is discouraged -- e.g., family, employment, and religious groups -- as the primary determinant of substance use. From this perspective, weak (or absent) bonds to prosocial (i.e., non-using) groups or institutions increase the probability that individuals will engage in various types of unwanted behavior, including substance use. Strong bonds include guidance toward acceptable behaviors as well as monitoring of behavior. Behavioral choice theory expands the focus from the strength of social bonds, to explain why these bonds might decrease the probability of substance use. From this perspective, social interaction with non-using individuals provides rewards for activities that do not involve substance use, and protects against temptations to use. Social learning theory suggests that modeling may explain how individual behavior (substance use or abstinence) may be influenced by the behavior of others in close proximity. In brief, modeling describes a process of learning through observation and imitation of the behavior of others (Bandura, 1977). Observation may lead to expectations for rewards as well as strategies for reproduction of behavior. With respect to substance use, the probability of use is lower when an individual is involved in social
interactions in which non-using others model alternative behaviors. *Stress and coping* theory views substance use as a coping strategy. From this perspective, an individual confronted with a situation that provokes negative emotions may choose from his or her available coping resources, one of which is substance use. Instead of substance use, which may be problematic for individuals in recovery from a substance use disorder, an individual could choose one or more strategies from a range of alternate coping strategies to reduce negative emotions. Substance use is thus more likely for individuals who are unable for whatever reason to utilize alternate coping strategies. In the stress and coping framework, social support is one such coping resource (Thoits, 1995; Shiffman & Wills, 1985).

Cohen (2004) recently summarized two possible mechanisms of the beneficial effects of social support: direct effects and stress buffering. The *direct effects* or main effects model suggests that social support positively influences mental health because relatively large and satisfying social networks allow individuals to maintain regular positive social interactions, perceptions of stability and predictability, and feelings of self-esteem. Stable and predictable relationships are thought to promote positive emotions while limiting negative emotions. With direct effects, the benefits of social support are theorized to occur regardless of an individual’s level of stress. In contrast, in the *stress buffering* or interaction model, social support is theorized to provide protective benefits in the context of high stress, or in the presence of various generally stressful events. Conversely, in the context of low stress, social support is theorized to have no relationship to health outcomes. Individuals without social support are hypothesized to
be less able to cope with stressful events and to display a range of adverse adaptation responses.

The common thread in the above conceptualizations is a description of how aspects of social relationships may protect against substance use. These relationship aspects include a context for social bonding; a moderate level of structure, monitoring, and goal-directedness; activities that provide alternatives to substance use, such as engagement in work, active leisure, and spiritual pursuits; abstinence-oriented norms and models; and an emphasis on building self-efficacy and socially-assisted coping skills.

Multiple measures of social support have been utilized in studies that explore factors that might influence substance use recovery. What follows is a review of studies that assessed the relationship between social support and substance use relapse. These studies are restricted to those that have: 1) had a longitudinal design, 2) measured relapse or substance use following treatment for substance use, and 3) reported the predictive relationship of support to substance use. As will be seen, far fewer studies have examined social support, compared to psychological distress, as a predictor of substance use.

Gordon & Zrull (1991) evaluated the relationship between social support and relapse among 156 patients (70% white, 54% male) from an inpatient alcohol treatment program at 2-3 weeks into their treatment stay and again one-year post treatment discharge. Two measures of social support were investigated: the number of family, friends, and co-workers whom the patient nominated as supportive in general, as well as the perception of their supportiveness. Relapse was defined as a report of drinking during a full year at one-year post-treatment with four levels: abstinence (no drinking at
all), a slip (less than three days of drinking), reduced drinking (from treatment intake level), and no change in drinking (from treatment intake). After controlling for the drinking status of individuals in the social network, more supportive others and greater perceived support predicted less relapse after one year. Social support jointly explained about 14% of the variance in relapse.

Havassy, Hall, & Wasserman (1991) followed a group of 225 patients (60% male, 80% white) in treatment for alcohol, opiates or tobacco for twelve weeks post-treatment. Relapse was monitored weekly through the follow-up period by self-report regarding use of alcohol and opiates, with an added CO₂ test for smokers. Social support was measured with two indicators: perception of network members providing social support and presence of supportive network members at the first follow-up. Results showed that higher levels of both indicators of social support predicted lower risk of relapse to the participant’s primary substance, after controlling for primary substance use by members of the social network.

In a secondary analysis of data from DATOS, a national study of treatment program outcomes (Broome, Simpson, & Joe, 2002), cocaine users (68% male, 54% African American) were followed for one year post-treatment and provided self-reports of cocaine or alcohol use. Relapse was defined as self-reported use of alcohol three or more times during a week or use of cocaine one or more times per week at follow-up. Social support was measured by the number of people living with the participant who were supportive of continued abstinence. Controlling for intake substance use severity, length of treatment, substance use in the social network, and the amount of aftercare, the number of people supportive of abstinence predicted decreased odds of relapse ($OR =$
0.6). That is, each additional supportive person was associated with nearly twice the odds of continued sobriety.

Another study of primary cocaine users tested whether social support and psychological distress predicted relapse. McMahon (2001) followed male participants (47% African American, 13% Hispanic) over a 12-month period following treatment at three residential therapeutic communities. Using the alcohol and drug use sections of the Addiction Severity Index (ASI; McGahan, Griffith, Parente, & McLellan, 1986), relapse was coded as a binary variable. The authors attempted to differentiate between a clinically-meaningful relapse and a slip by dividing subjects into groups based upon whether they reported greater than six days of cocaine use versus less than three days of cocaine use (participants using between three and six days of cocaine were omitted). A conservative approach was applied to participants lost to follow-up: they were included in the relapsed group. At treatment intake (T1) and three-months before the measurement of relapse (T2), social support was measured with indices reflecting number of supportive others and quality of perceived support with the Perceived Social Network Inventory (PSNI; Oritt, Paul, & Behrman, 1985). At treatment intake (T1), personality constructs and stress were measured. Personality constructs were defined with three derived factors from the MCMI-II (Millon, 1983): antisocial, detached, and dependent personality styles. The antisocial, aggressive, and narcissistic MCMI subscales loaded on a latent antisocial factor. The schizoid, avoidant, dysthymic, and depression MCMI subscales loaded on a latent detached factor. The dependent, anxiety, somatoform, and dysthymic MCMI subscales loaded on a latent dependent factor. Stress was defined by the negative impact score from the Life Experience-Survey (Sarason, Johnson, & Siegle, 1978). Results
showed that after controlling for personality and stress measured at baseline, both indices of social support predicted relapse. All of the relationships were in the expected direction, except that participants with higher perceived social support at T1 were more likely to relapse.

In summary, social support has been found to predict post-treatment substance use in a series of studies. A number of measures were used to assess social support, including: the reported number of supportive social contacts, the perceived supportiveness of members of the social network, and the number of cohabitants supportive of continued abstinence. These positive findings were consistent across several operational definitions of relapse, although most defined relapse as any to little self-reported alcohol, opiate, or cocaine use. Further, relevant to the proposed investigation, none of the above studies described the HIV status of participants. Although it is probable that a number of participants were HIV+, it is difficult to say how the results would generalize to HIV+ individuals in recovery without this information.

The theories and studies reviewed to this point have focused on the independent prediction of post-treatment substance use by social support and psychological distress. However, it is possible that, in addition to independent relationships, social support and psychological distress have mediating links with relapse to substance use. Various authors have theorized how social support and psychological distress might be related. One commonly used model is stress and coping theory (Shiffman & Wills, 1985; Wills, 1990). Social support might influence psychological distress in at least two ways. First, social support could have a buffering effect, i.e., social support is beneficial only in the context of high stress, or second, direct effect, i.e., social support is beneficial
independent of level of stress. There is evidence supporting both of these models for a variety of mental and physical health outcomes (Cohen, 2004). However, other theorists have proposed that individuals with high psychological distress could have poor or disrupted social relationships, and a lack of positive social relationships leads to a greater likelihood of relapse (e.g., Hunter-Reel, McCrady, & Hildebrandt, 2009). Thus, the relationship between distress and relapse could be a function of limited social support. Widiger & Smith (2008) described several types of person-environment transactions that could lead an individual with one or more mental disorders to have a lower number of positive social relationships, or a greater number of conflicted social relationships.

Although no studies were located that reported a direct test of whether social support mediated the relationship between psychological distress and relapse, two studies that included both social support and psychological distress as predictors of relapse were found. First, Moos & Moos (2006) followed 362 drinkers (50% women; 80% white) who received help to quit drinking from a range of treatment programs and self-help groups over a 13-year period. Psychological distress was defined with nine self-reported symptoms of depression. Two measures of social support were the reported number of friends and the reported resources provided by a romantic partner and/or other family members. Relapse was defined as meeting any of three criteria in the six months before the follow-up assessment: more than ‘moderate’ drinking in any one of six months before a follow-up assessment, problems due to drinking during the six-month period, or intoxication (i.e., drinking more than three oz. of alcohol in any single day during any one of the six months prior to follow-up). Neither psychological distress nor social
support predicted relapse at follow-up, controlling for education, employment status, lifetime drinking problems, and level of drinking before remission.

Second, in a study with primary cocaine users, Havassy, Wasserman, & Hall (1995) followed 141 patients (52% white; 73% male) for a six-month period following treatment at either 21 to 28 day inpatient or intensive outpatient programs. Relapse was defined as any use of cocaine, by self-report or detection on a urine drug screen between treatment discharge and follow-up assessment three months later. Psychological distress was assessed at treatment intake using the SLC-90-R global severity scale (Derogatis, 1994). Social support was measured in two ways: the perceived level of social support and the reported presence of a range of social contacts. Results showed that both social support constructs predicted relapse for white, but not African American, participants. Psychological distress did not predict relapse, after controlling for social support.

In one of the two studies reviewed above, social support predicted relapse, but psychological distress did not predict relapse after controlling for the link between social support and relapse. In contrast, evidence from studies reviewed that did not concurrently assess the relationship between social support and relapse suggested that psychological distress was predictive of relapse. The evidence from Havassy, Wasserman, & Hall (1995) is at least partially consistent with the notion that the relationship between psychological distress and relapse is mediated by social support. That is, limitations in social support may explain the relationship between psychological distress and relapse. However, the authors did not report whether there was a distress-relapse link in this study without controlling for social support, or if distress was related to social support. No longitudinal studies could be located that directly tested whether
social support mediated the relationship between psychological distress and relapse. Also relevant to the proposed project, none of the studies reported the prevalence of HIV/AIDS among participants. As such, it is unclear how these findings may be related to populations of women living with HIV/AIDS.

**Summary**

Given the disproportionate risks of adverse medical outcomes (poor adherence, decreased immunological suppression, etc.) associated with substance use for women with HIV, it is vital to understand this process. Despite the apparent lack of consensus on operational definitions of relapse and/or substance use, the conclusion of most studies was that social support directly predicts substance use for individuals in substance use recovery. With respect to psychological distress, the studies showed mixed evidence for a direct predictive relationship. None of the reviewed studies examined these predictors in a population characterized in terms of HIV/AIDS serostatus.

Although women with HIV/AIDS who are in substance abuse recovery are 1) at high risk for relapse to substance use and 2) have additional risks to their health from substance use, no studies were identified that addressed predictors of post-treatment substance use in this population. Further, no studies were identified that mentioned the incidence of HIV/AIDS of participants. Little is known regarding whether individuals with HIV/AIDS have fundamentally different routes to substance use than HIV-individuals. Investigating whether the links found in previous literature between support, psychological distress, and post-treatment substance use exist in a sample of women with HIV/AIDS in recovery may provide some information to address this information gap, and thus extend the literature.
Findings of studies reviewed provided mixed support for the notion that more psychological distress predicts a greater risk of post-treatment substance use. It is possible that dichotomous measurement, which is typical of psychiatric diagnostic procedures, led to decreased statistical power to detect differences. In the studies where continuous measures (e.g., the continuous distribution of scores on a diagnostic instrument) were used in studies with the same sample different findings, i.e., statistically significant relationships between distress and substance use, have emerged. Although fewer studies have addressed the relationship between social support and substance use, these studies provided generally consistent support for the proposition that more support predicts a lowered risk of substance use. No studies identified have tested social support as a mediator of the relationship between distress and substance use. However, two studies have examined the relationships between both distress and social support and substance use. The results of one of these studies were consistent with the notion that social support mediates the relationship between psychological distress and substance use, but the necessary relationships to conclude if a mediation effect was present were not tested or reported.

**Study Purpose and Hypotheses**

Given the lack of studies addressing 1) women in recovery with HIV/AIDS and 2) the possibility that distress and social support might predict relapse and further that social support might mediate the relationship between psychological distress and post-treatment substance use, it seems clear that an investigation of this type is warranted. The proposed study aims to address limitations in most available studies by directly testing hypotheses involving relationships between social support, psychological distress, and substance use.
using a longitudinal, prospective design with women in substance use recovery who are HIV+. The variables in the current investigation were selected both because of their theoretical significance and because there is some evidence that they have predicted substance use in previous analyses with individuals in recovery, although not necessarily with individuals with HIV/AIDS. Gaining understanding of whether these predictors are important for women with HIV in recovery may aid in the development or refinement of relapse prevention/recovery assistance programs in use by a range of professionals that serve this vulnerable group, as well as provide some picture of risks for the women as they enter recovery. The following hypotheses will be tested in the current investigation: 1) psychological distress will be concurrently related to substance use for women in substance abuse recovery; 2) social support will be inversely concurrently related to substance use for women in substance abuse recovery; 3) social support will concurrently mediate the relationship between psychological distress and substance use for women in substance abuse recovery; 4) psychological distress will prospectively predict change in substance use for women in substance abuse recovery; 5) social support will prospectively predict change in substance use for women in substance abuse recovery; and 6) social support will concurrently mediate the prospective relationship/s between psychological distress and change in substance use for women in substance abuse recovery.
Chapter 2
Methods

Participants

The proposed study is a secondary analysis of data from a randomized trial comparing family therapy and a health education group for women with HIV/AIDS in substance use recovery (Feaster, et al., 2010). Participants were 126 women with substance use disorders who had left a substance use treatment program within one year. Women had been HIV+ for an average of 9.9 (SD = 5.7) years. At baseline, the mean CD4-cell count of participants was 496 (SD = 298) and log HIV viral load of participants was 2.98 (SD = 1.33). Mean age of the women was 42.6 years (SD = 7.5). The majority of the women (79%) were African American, 12% were Hispanic, 6% were white, and 2% were of other/indeterminate ethnicities. (Due to rounding, percentages for ethnicity do not add to 100 %.) Almost half of the women (48%) had not completed high school. Median annual family income was $7,236 (25th percentile $900, 75th percentile $11,730), 86% of the women were unemployed, and 75% were on public assistance. All women had to have at least one family member available for a companion study of family therapy mechanisms to enter the original randomized trial.

A large majority of the women had at least one DSM–IV (APA, 2000) cocaine use disorder: 119 (94%) were diagnosed with cocaine dependence and five (4%) were diagnosed with cocaine abuse. Most of the women (n = 100, 79%) were dependent on more than one substance, and fifteen (12%) were diagnosed with abuse of more than one substance. Other than cocaine, 92 (73%) had alcohol dependence, 53 (42%) cannabis dependence, 28 (22%) opioid dependence, 21 (17%) sedative dependence, six (5%)
dependent on other substances, 23 (18%) cannabis abuse, 12 (10%) alcohol abuse, 12 (10%) sedative abuse, five (4%) opioid abuse, and seven (6%) abuse of another substance. At baseline 26 women (21%) reported alcohol or drug use in the previous 30 days. Of all substances assessed, lifetime use (as measured by self-reported years) was greatest for cocaine ($M = 15.62, SD = 9.11$), alcohol to intoxication ($M = 12.81, SD = 11.33$), and cannabis ($M = 11.74, SD = 11.77$). In comparison, women reported less than two years of use of any other substances.

**Procedures**

Women were randomized to treatment condition at the baseline assessment. Substance use of participants was assessed at baseline and two-month follow-up intervals: two-months, four-months, six-months, eight-months, 10-months, and 12-months post-baseline. Social support and psychological distress were assessed at baseline and four-month follow-up intervals: four-months, eight-months, and 12-months post-baseline. Demographic measures are all from the baseline assessment. The primary study was approved by the university Institutional Review Board; all women gave informed consent for participation. For assessments, women received $40 at baseline, $15 at 2-months, $55 at 4-months, $20 at 6-months, $75 at 8-months, $25 at 10-months, and $100 at 12-months.

*Structural Ecosystems Therapy*

Structural Ecosystems Therapy (SET; Mitrani, Szapocznik, & Robinson-Batista, 2000) is a family-ecosystemic intervention based on Brief Strategic Family Therapy (Szapocznik & Kurtines, 1989). SET was adapted for the needs of HIV+ minority women (Boyd-Franklin, Steiner, & Boland, 1995; Landau-Stanton & Clements, 1993).
Therapists in SET target the social environment of the woman with HIV/AIDS by building on existing adaptive interactions as well as reducing maladaptive interactions within the family and between the woman, family and other systems (e.g., health care, substance abuse treatment, religious institutions, neighbors) to improve the woman’s psychosocial functioning and health. The main processes in SET are joining, diagnosing, and restructuring. *Joining* refers to the process of establishing a therapeutic system that includes the therapist, woman, her family, and representatives from other relevant systems (e.g., friends, health care providers) who will be involved in the therapeutic process. *Diagnosing* refers to the identification of interactional patterns (structures) that contribute to the problems experienced by the woman, and thus will need to be changed, as well as those that are sources of support and thus should be reinforced. *Restructuring* involves orchestrating opportunities for individuals within the therapeutic system to interact in ways that reinforce strengths and change maladaptive interactional patterns. Restructuring includes three broad categories of techniques: working in the present (also known as *enactment*), reframing, and shifting boundaries. SET sessions were completed in the home, therapist's offices, or other locations based on client choice. Sessions were scheduled flexibly, but in general SET sessions were scheduled for weekly meetings at the woman’s home or study offices for 50 minutes for up to four months after randomization.

*HIV Health Group*

The HIV health group was incorporated in the study to control for common factors in therapy such as level of attention, therapist qualities and enthusiasm, or client expectancies (Szapocznik, Rio, et al., 1989). This psychoeducational group intervention
was adapted from the Wellness Manual developed by Hartfield (Baker et al., 2003). It was designed to replicate a popular program available in the HIV clinics at Jackson Memorial Hospital in Miami, FL. The topics included information about HIV adherence and HIV transmission risk reduction. Sessions were as follows: Introduction to anatomy, STDs, HIV basics and women, Communicating with partner, Alcohol and drugs, Safer sex/pregnancy, Your baby/child and violence against women, HIV medication adherence, Wrap-up. The health group condition met bi-weekly at the study offices over a four-month time period for an average of 1.5 hours per session. All HIV health group sessions were conducted biweekly at the offices of the study for a total of eight sessions, each lasting 90 minutes.

**Interventionists**

Different interventionists implemented each condition. In the HIV health group condition, facilitators were one African American female certified addiction counselor with five years of experience and one Hispanic female master’s-level social worker with 14 years of experience. In the SET condition, therapists were two master’s-level African American women, one with 28 years of experience and one with five years of experience.

**Measures**

**Demographics.** Women provided their date of birth; *age* was calculated by subtracting their birth date from the data collection date at baseline. Women also provided their date of first positive HIV result on ELISA, Western Blot, or other HIV test; *years with HIV diagnosis* was calculated by subtracting the earliest positive test date from the baseline data collection date.
Substance Use. All women had completed treatment for substance use within the year before the baseline assessment. Substance use of participants at baseline and two-month follow-up intervals (two months, four months, six months, eight months, 10 months, and 12 months post-) was measured with the Addiction Severity Index (ASI; McGahan, Griffith, Parente, & McLellan, 1986). Appendix A shows the days of use portion of the instrument administered at baseline; a shortened version with only substance use questions was administered at follow-up assessments. Past 30 day use of alcohol to intoxication, heroin, illicit methadone, other opiates, barbiturates, other sedatives/tranquilizers/hypnotics, cocaine, amphetamines, cannabis, hallucinogens, and inhalants were assessed. Self-reports of all these substances was combined into a single substance use variable in the proposed study. Due to extreme positive skew (i.e., most women reporting little or no use and a few women reporting high levels of use), this variable will be dichotomized (0 = no use, 1 = any use) for the proposed analyses. Table 1 depicts substance use, as well as psychological distress and social support, at all assessment points.

The definition of substance use relapse described in the previous paragraph was chosen for several reasons. Given the multiple risks of substance use for individuals with HIV/AIDS described in Chapter 1, and the pattern of longstanding use of multiple substances of this sample, a conservative definition of substance use that encompasses small levels of multiple types of substance use is appropriate. Urine drug screen results are not affected by deception or problems with recall as self-report. However, urine drug screens can only detect use of many substances within a small window of time (three to five days for cocaine and opioids, but possibly up to 30 days for marijuana) compared to
self-report which can assess a longer window (in this study, 30 days). For alcohol, the
detection window is likely a matter of hours with a urine drug screen, and in fact, the
screen used in this trial did not measure alcohol.

**Psychological Distress.** The *Hamilton Anxiety and Depression Subscales* (HAD; Williams, 1988), a semi-structured interview that combines items from the 14-item Hamilton Anxiety Rating Scale (HARS; Hamilton, 1959) and the 17-item Hamilton Rating Scale for Depression (HRSD; Hamilton, 1960) was used to measure symptoms of anxiety and depression in the past seven days. In the current sample reliability (Cronbach’s Alpha) coefficients were above .81 for depression and above .83 for anxiety at each timepoint. Anxiety and depression were highly correlated at each timepoint, average $r = .87$, $p < .001$, and thus will be combined into a single psychological distress composite. The average of the standardized (Z-score across all assessments) anxiety and depression scores was used to create the psychological distress composite. This psychological distress composite was positively skewed, so a square root transformation will be used for analyses. Appendix B shows the items from the instrument that was administered across all assessment points (baseline, four months, eight months, and 12 months).

**Social Support.** The *Social Support Questionnaire – Short Form* (SSQ; Sarason, Sarason, Shearin, & Pierce, 1987) was administered at each timepoint. The SSQ asks the respondent to list the number of people she can count on for six different aspects of support (e.g., “Who can you count on when you need help? Who accepts you totally, including both your worst and your best points?”). Items on this instrument as administered at baseline and follow-ups (four months, eight months, and 12 months) are
shown in Appendix C. These items may be combined into two scales: the number of people available to provide support in the network (average number across six items) and the average perceived satisfaction with support provided by these people (rated on a Likert scale from 1 very dissatisfied to 6 very satisfied). In the current sample reliability (Cronbach’s Alpha) coefficients were above .92 at each timepoint for the number subscale and .73 - .81 for the satisfaction subscale. For the proposed study, social support was operationalized with the number subscale because the satisfaction subscale was extremely positively skewed with little variability (i.e., most women reported very high satisfaction) and had lower reliability. More specifically, over two-thirds of women (67 – 76%) who responded at each assessment endorsed the very highest level of satisfaction for each item. The number scale was positively skewed, so a square root transformation was used in analyses.

_Treatment Condition._ To control for possible intervention effects on substance use over time, treatment condition was a time-invariant covariate in the analyses, as a dummy-coded variable (SET = 0 and the Health Group = 1). Women were randomly assigned to treatment condition at the baseline assessment using computerized urn randomization (Wei & Lachin, 1988).

**Analysis Plan**

The analysis tested hypotheses in series of path analyses using Mplus 6 (Muthen & Muthen, 2010). The Mplus software was chosen for several reasons. Mplus is a structural equations modeling (SEM) software system that may be used with a range of statistical procedures, including path analysis and tests of mediation. Mplus uses full information maximum likelihood estimation to account for missing data and allows for
multiple distributions of variables (e.g., dichotomous variables). Binary logistic (binomial distribution) regression analyses were used for analyses involving the dichotomous substance use variable (Atkins & Gallop, 2007). A drawback of using Mplus is the lack of conventional fit indices for analyses with a categorical or binary outcome variable.

Testing Mediation

Little et al. (2007) described methods that have been used to test mediation, including causal steps, distribution of the product, and resampling (bootstrapping). *Causal steps* is the classic test of mediation as described by Baron & Kenny (1986). MacKinnon, Lockwood, Hoffman, West, and Sheets (2004) showed that this test is low-powered compared to other tests of mediation. The *product of coefficients* links the relationships between the predictor and mediator ($a$) and the mediator and the outcome ($b$) with a product $ab$. A problem with this method is that variables are assumed to be normally distributed for significance testing. The most powerful method for testing mediation combines the *distribution of the product* and *bootstrapping* approaches. This method is not limited by assumptions of normal distributions. Bootstrapping (or resampling) draws multiple smaller samples (with replacement) from the original sample. In each smaller sample, estimates of coefficients and their product ($a*b$) are computed allowing the construction of confidence intervals (CI). A bias-corrected bootstrapping method has the greatest statistical power (MacKinnon et al., 2004). The bias-corrected bootstrap method creates standard errors based on the empirical distribution of the model estimates by resampling and corrects for bias in the central tendency of the estimate. This method produces a coefficient, confidence interval and $p$-statistic associated with the
product of the paths to (a) and from (b) the mediators. This product (ab) is the mediation
effect, or indirect effect. A 95% CI that does not contain zero indicates statistically
significant mediation.

Preliminary Analyses

The longitudinal path models used to test hypotheses 4 through 6 had three types
of paths: autoregressive, concurrent, and lagged. Autoregressive (or stability) paths
describe relationships of a single observed variable over time. Concurrent (also called
within-wave or synchronous) paths describe relationships between two variables that
were assessed at the same time, similar to a cross-sectional regression path. In this study,
psychological distress, social support, and substance use were measured concurrently at
four times: baseline, four-months post-baseline, eight-months post-baseline, and twelve-
months post-baseline. The lagged paths describe the prospective predictive link between
one variable and another variable later in time. In this study, the relationships of interest
were between predictor variables (psychological distress and social support) and
substance use measured two-months and four-months later. That is, between baseline
psychological distress and/or social support and substance use at 1) two months and 2)
four months; between psychological distress and/or social support at four-months and
substance use at 1) six months and 2) eight months; and between psychological distress
and/or social support at eight-months and substance use at 1) 10 months and 2) 12
months.

A stationary process (also called stationarity) describes a group of relationships
with values that do not change over time (Kenny, 1979). In a path analysis model,
assuming stationary relationships across time tends to increase parsimony and statistical
power (Kenny, 1979; Cole & Maxwell, 2003) and improve model identification when multiple paths are estimated (Kessler & Greenberg, 1981). In the current analyses, assumptions of stationarity in the autoregressive relationships of the substance use outcome were tested. Assumptions of stationarity were also tested for the lagged relationships between psychological distress and substance use and between social support and substance use (when the time period, either two months or four months, between assessment of the predictor and assessment of the outcome was equal). Stationarity was not expected between concurrent relationships at different timepoints because at baseline, unlike at the follow-up assessments, previous levels of the substance use outcome could not be controlled statistically. That is, change could only be assessed post-baseline. Each of these assumptions of stationarity was tested by comparing the models with stationary relationships to models without the stationary relationships using chi-square difference tests. If no significant differences were found (i.e., the assumption of equality was not rejected), path models with stationary relationships were reported in the results. Further, the sample-size adjusted Bayesian Information Criterion (BIC; Raftery, 1995) was examined to determine which model provided better fit to the data (smaller values meaning better fit). Cohen’s (1992) guidelines were used to interpret effect sizes as follows: $d$: small = .20, medium = .50, large = .80; $r$: small = .10, medium = .30, large = .50.

**Hypothesis Tests**

Hypotheses were tested with two series of path analysis models. The first series of analyses tested concurrent relationships using baseline and follow-up measurements (four months, eight months, and 12 months) of psychological
distress, social support, and substance use. The second series of analyses tested prospective predictive relationships of psychological distress and social support to change in substance use from multiple assessments over a one-year period. In the second (longitudinal) series, the analyses tested predictive relationships between the two hypothesized predictors variables (psychological distress and/or social support) and change in substance use at two time lags (two-months and four-months); change in substance use was examined by controlling for the relationship with substance use at the previous assessment point (i.e., autoregression). For example, baseline psychological distress could have predicted 1) substance use at two months, controlling for baseline substance use and 2) substance use at four months, controlling for substance use at two months. In all analyses a time-invariant covariate, treatment condition, was used to control for possible significant intervention effects on substance use, psychological distress, and social support.

Series 1

**Hypothesis 1:** Psychological distress will be concurrently related to substance use for women in substance abuse recovery.

**Analysis:** Substance use at baseline was regressed on psychological distress with path analysis. Figure 1 shows the path analysis model for testing concurrent relationships between psychological distress and substance use. The diagramming convention used for path analysis with a SEM framework in this study is that latent variables were represented with ovals, observed variables with
rectangles, regression paths with single-headed arrows, and correlation paths as double-headed arrows.

**Hypothesis 2:** Social support will be inversely concurrently related to substance use for women in substance abuse recovery.

**Analysis:** Substance use at baseline was regressed on social support with path analysis. Figure 2 shows the path analysis model for testing concurrent relationships between social support and substance use.

**Hypothesis 3:** Social support will mediate the concurrent relationship between psychological distress and substance use for women in substance abuse recovery.

**Analysis:** Mediation was tested using the bias-corrected bootstrap method (MacKinnon et al., 2004) that was described above with path analysis. Figure 3 shows the path analysis model, with psychological distress predicting social support ($a$), and social support predicting substance use ($b$), as well as mediating the relationship between psychological distress and substance use ($c$); the link between psychological distress and substance use will be explained in terms of its link with social support.

**Series 2**

**Hypothesis 4:** Psychological distress will prospectively predict change in substance use for women in substance abuse recovery.

**Analysis:** Path analysis was used to test these relationships. Psychological distress will predict substance use after two-month and four-month lags between assessments, after controlling for the level of use at the previous assessment. That is, psychological distress at baseline will predict substance use at the two-month
assessments, after controlling for substance use at baseline; and psychological distress at baseline will predict substance use at the four-month assessment, after controlling for substance use at two months. Similarly, psychological distress at four months will predict substance use at the six-month assessment, after controlling for substance use at four months; and psychological distress at four months will predict substance use at the eight-month assessment, after controlling for substance use at six months. Next, psychological distress at eight months will predict substance use at the 10-month assessment, after controlling for substance use at eight months; and psychological distress at eight months will predict substance use at the 12-month assessment, after controlling for substance use at 10 months. Psychological distress and social support at 12 months will not be predictors. Figure 4 shows the path analysis model.

**Hypothesis 5:** Social support will prospectively predict change in substance use for women in substance abuse recovery.

**Analysis:** Path analysis was used to test these relationships. Social support will predict substance use at 2-month and 4-month lags between assessments, after controlling for the level of use at the previous assessment. That is, social support at baseline will predict substance use at the two-month assessment, after controlling for substance use at baseline; and social support at baseline will predict substance use at the four-month assessment, after controlling for substance use at two months. Similarly, social support at four months will predict substance use at the six-month assessment, after controlling for substance use at four months; and social support at four months will predict substance use at the eight-month assessment, after controlling for substance use at six months.
Next, social support at eight months will predict substance use at the 10-month
assessment, after controlling for substance use at eight months; and social support at
eight months will predict substance use at the 12-month assessment, after controlling for
substance use at 10 months. Social support at 12 months will not be a predictor. Figure 5
shows the path analysis model.

**Hypothesis 6:** Social support will mediate the prospective predictive
relationship/s between psychological distress and substance use across time for
women in substance use recovery.

**Analysis:** Path analysis was used to test these relationships. Social support will
mediate the relationship between psychological distress and substance use after
two-month and four-month lags between assessments, after controlling for the
level of use at the previous assessment. That is, the relationship between
psychological distress at baseline and change in substance use at two-month
follow up will be mediated by baseline level of social support; and the
relationship between psychological distress at baseline and change in substance
use at four-month follow-up will be mediated by baseline level of social support.
Similarly, the relationship between psychological distress at four-month follow-
up and change in substance use at six-month follow-up will be mediated by level
of social support at four-month follow-up; and the relationship between
psychological distress at four-month follow-up and change in substance use at
eight-month follow-up will be mediated by the four-month level of social support.
Next, the relationship between psychological distress at the eight-month follow-
up and change in substance use at 10-month follow-up will be mediated by level
of social support at eight-month follow-up; and the relationship between psychological distress at eight-month follow-up and change in substance use at 12-month follow-up will be mediated by the eight-month level of social support. Psychological distress and social support at 12 months will not be predictors. Figure 6 shows the path analysis model, with psychological distress predicting social support (a) and social support predicting change in substance use at two-months (b) and four-months (b’), and mediating the relationship between psychological distress and change substance use at two months (c) and four months (c’). As with hypothesis 3, mediation was tested using the bias-corrected bootstrap method (MacKinnon et al., 2004).
Chapter 3

Results

Preliminary Analyses

Preliminary tests of the assumption of stationary relationships indicated that the assumption of stationary was rejected for substance use autoregressions ($\chi^2 = 16.93$, $df = 5$, $p < .01$). For substance use, model fit was worse for the model with stationarity assumed (BIC = 652.21) than without stationarity assumed (BIC = 643.66). The stationarity assumption was not rejected for lagged paths across time between psychological distress and substance use ($\chi^2 = 5.10$, $df = 4$, $p = .28$) and between social support and substance use ($\chi^2 = 0.17$, $df = 4$, $p = 1.00$). For the lagged paths between psychological distress and substance use, model fit was better for the model with stationarity assumed (BIC = 755.78) than without stationarity assumed (BIC = 757.38). For the cross-lagged paths between social support and substance use, model fit was better for the model with stationarity assumed (BIC = 933.68) than without stationarity assumed (BIC = 940.20). Thus, the following results incorporate the assumption of stationarity for those relationships where the assumption was not rejected in the primary tests of hypotheses described below, i.e. the prospective predictive relationships between 1) psychological distress and substance use two months later, 2) psychological distress and substance use four months later, 3) social support and substance use two months later, and 4) social support and substance use four months later were held equal.

Although the assumption of stationary autoregressive relationships of substance use was rejected, these relationships were statistically significant across all two-month lags, except one—between substance use at baseline and substance use at two months, $B$.
The relationships between substance use at two months and substance use at four months, $B = 3.42, SE = 0.67, p < .001, OR = 30.69$; between substance use at four months and substance use at six months, $B = 1.80, SE = 0.63, p < .01, OR = 6.06$; between substance use at six months and substance use at eight months, $B = 2.73, SE = 0.68, p < .001, OR = 15.25$; between substance use at eight months and substance use at 10 months, $B = 2.47, SE = 0.77, p < .001, OR = 15.25$; between substance use at 10 months and substance use at 12 months, $B = 3.42, SE = 0.67, p < .001, OR = 62.43$ were all significant. The autoregressive relationships of substance use, except between baseline and two months, had a large magnitude (i.e., $d_s > 1.09$), indicating that substance use was generally stable over time. Table 2 shows the proportion of women who were using at each consecutive assessment.

To control for possible intervention effects on substance use, psychological distress, and social support at each assessment point, treatment condition was included as a time-invariant covariate in the analyses. A dummy-coded variable (SET = 0 and the Health Group = 1) was used to represent treatment condition. There were no significant differences in substance use between treatment conditions at any timepoint (baseline, $B = 0.21, SE = 0.45, p = .64$; two months, $B = -0.75, SE = 0.51, p = .14$; four months, $B = -1.17, SE = 0.69, p = .09$; six months, $B = 0.34, SE = 0.61, p = .58$; eight months, $B = -0.23, SE = 0.57, p = .69$; 10 months, $B = -0.74, SE = 0.75, p = .33$; 12 months, $B = 0.79, SE = 0.82, p = .33$). Psychological distress was significantly lower for women in the SET condition ($M = -0.10, SD = 0.89$) than for those in the control condition at eight months after baseline ($M = 0.11, SD = 0.93$), $B = 0.10, SE = 0.05, p < .05$. There were no significant differences in psychological distress between treatment conditions at any other
timepoint (baseline, $B = 0.09$, $SE = 0.06$, $p = .10$; four months, $B = -0.09$, $SE = 0.05$, $p = .07$; 12 months, $B = 0.05$, $SE = 0.06$, $p = .40$). There were no significant differences in social support between treatment conditions at any timepoint (baseline, $B = 0.03$, $SE = 0.06$, $p = .64$; four months, $B = 0.04$, $SE = 0.07$, $p = .61$; eight months, $B = 0.07$, $SE = 0.06$, $p = .22$; 12 months, $B = -0.03$, $SE = 0.06$, $p = .60$).

**Series 1**

**Hypothesis 1:** Psychological distress will be concurrently related to substance use for women in substance abuse recovery.

Concurrent relationships between psychological distress and substance use were not statistically significant at baseline, $B = 0.87$, $SE = 0.65$, $p = .18$, four-months post-baseline, $B = 0.03$, $SE = 1.27$, $p = .98$, eight-months post-baseline, $B = 0.41$, $SE = 1.01$, $p = .69$, but the concurrent relationship was significant at 12-months post-baseline, $B = 2.51$, $SE = 1.18$, $p = .033$.

**Hypothesis 2:** Social support will be inversely concurrently related to substance use for women in substance abuse recovery.

Concurrent relationships between social support and substance use were not statistically significant at baseline, $B = -0.97$, $SE = 0.76$, $p = .20$, four-months post-baseline, $B = 0.40$, $SE = 0.90$, $p = .65$, eight-months post-baseline, $B = 0.31$, $SE = 1.15$, $p = .79$, or 12-months post-baseline, $B = -1.30$, $SE = 1.03$, $p = .21$.

**Hypothesis 3:** Social support will mediate the concurrent relationship between psychological distress and substance use for women in substance abuse recovery.

Relationships between social support and psychological distress were not statistically significant at baseline, $B = 0.05$, $SE = 0.08$, $p = .58$, four-months post-
baseline, $B = 0.15, SE = 0.12, p = .23$, eight-months post-baseline, $B = 0.02, SE = 0.11, p = .89$, or 12-months post-baseline, $B = -0.17, SE = 0.10, p = .10$. As a necessary condition of mediation was not present (i.e., no statistical relationship between hypothesized predictor variable and mediator variable), there was no evidence of mediation.

*Series 2*

**Hypothesis 4:** Psychological distress will prospectively predict change in substance use for women in substance abuse recovery.

Figure 7 shows the results of this analysis. Psychological distress predicted change in substance use after a two-month lag, $B = 1.22, SE = 0.57, p = .03$. A one-unit elevation in the distribution of the square root of psychological distress at a single assessment point was related to over three times the odds ($OR = 3.40$) of substance use two months later, a medium-to-large relationship between psychological distress and substance use ($d = .74$). However, psychological distress did not predict change in substance use after a four-month lag, $B = -0.47, SE = 0.75, p = .53, OR = 0.63$.

**Hypothesis 5:** Social support will prospectively predict change in substance use for women in substance abuse recovery.

Social support did not significantly predict change in substance use after a two-month lag, $B = -0.83, SE = 0.49, p = .09$, or substance use after a four-month lag, $B = 0.29, SE = 1.03, p = .21$.

**Hypothesis 6:** Social support will mediate the prospective relationship/s between psychological distress and change in substance use for women in substance abuse recovery.
The relationship between social support and psychological distress was not statistically significant at baseline, $B = 0.05$, $SE = 0.08$, $p = .58$, four-months post-baseline, $B = 0.15$, $SE = 0.12$, $p = .23$, eight-months post-baseline, $B = 0.02$, $SE = 0.11$, $p = .89$, or 12-months post-baseline, $B = -0.17$, $SE = 0.10$, $p = .10$. As a necessary condition of mediation was not present (i.e., no statistical relationship between hypothesized predictor variable and mediator variable), there was no evidence of mediation.
Chapter 4

Discussion

The purpose of this study was to investigate relationships between psychological distress, social support, and substance use in a convenience sample of predominantly minority HIV+ women in substance use recovery. This investigation involved a secondary analysis of data from a randomized controlled trial that compared a family therapy intervention with a health promotion group intervention (Feaster et al., 2010). A series of path analyses was used to test six hypotheses. Results of the current investigation failed to reject the null hypothesis for all six hypotheses. Partial support was found for two hypotheses. Treatment condition assignment differences in each variable were controlled statistically in all analyses. There were three hypotheses involving concurrent relationships. Specifically, psychological distress and social support were not concurrently related to substance use (Hypotheses 1 and 2), except psychological distress at 12 months was related to change in substance use between 10 and 12 months. There was one hypothesis involving mediation among those involving concurrent relationships. Social support was hypothesized to mediate the relationship between psychological distress and substance use (Hypothesis 3), but there was no evidence of mediation. Psychological distress was not related to social support. There were three hypotheses involving prospective relationships. Psychological distress predicted change in substance use that was measured at two months, but not four months, after psychological distress was measured (Hypothesis 4). Social support did not predict substance use (in either two or four-month follow-up analyses (Hypothesis 5). There was one hypothesis involving mediation among those concerning prospective relationships. Social support was
hypothesized to mediate the relationship between psychological distress and substance use (Hypothesis 6), but there was no evidence of mediation. Psychological distress was not significantly related to social support.

**Unique Aspects of this Study**

The current study’s focus on women with HIV in substance abuse recovery provided an opportunity for investigating the links between psychosocial constructs in an underserved population experiencing significant life challenges. Few closely related studies were available for comparison purposes. In comparing the current results to those in available studies one must consider factors unique to the women involved this study. Participants were women with HIV in substance use recovery and predominantly from minority backgrounds (79% African American, 12% Hispanic). Women could enter the study up to one year after the completion of treatment for substance use disorders. Hence, they could have been in various points in the recovery or relapse process and have had a variety treatment experiences. About a fifth (21%) of participants reported using substances at the time they entered this study. In contrast, relapse prediction studies generally include participants having demonstrated a period of abstinence established in treatment and consider return to substance use evaluated from a common starting point (i.e., treatment discharge).

Unlike relapse prediction studies, the variability in substance use (i.e., some women using, some women not using) at baseline allowed for a test of relationships between psychological distress, social support, and substance use at baseline. Further, few of the relapse prediction studies reviewed had participants enrolled in any formal aftercare interventions (with the exception of self-help groups) that attempted to reduce
substance use or psychological distress during the period when substance use was assessed. Even though there was not much difference in levels of distress, social support, and substance use between participants in the two aftercare intervention conditions in the current study, participation in aftercare designed to reduce distress, improve supportive relationships, and decrease/prevent substance use may have influenced hypothesized associations among these variables. The timing of assessments was also unlike many relapse prediction studies, which generally assess substance use for a continuous period of time starting at the end of treatment. Figure 8 shows the timing of the assessments of psychological distress and substance use over the first half of the current study. The second half of the study follows the same pattern as the first. Substance use over a 30-day period was assessed at baseline and two-month follow-up intervals: two, four, six, eight, 10, and 12-months post-baseline. Psychological distress over a seven-day period was assessed at baseline and four-month follow-up intervals: four, eight, and 12-months post-baseline. (Social support is not shown in the figure, but was assessed at the same intervals as psychological distress. Instructions for the social support instrument did not specify a time frame.)

**Psychological Distress**

Psychological distress was hypothesized to be concurrently and prospectively related to substance use, with higher levels of psychological distress related to greater substance use at baseline and change in substance use at follow-up assessments. Change in substance use was assessed by controlling for previous substance use. These hypotheses were linked with self-medication and instrumental conditioning theories, as well as with results of multiple empirical studies revealing a link between psychological
distress and substance use for individuals in substance use recovery. The self-medicating hypothesis (Khantzian, 1985) explains substance use as a conscious or unconscious attempt to ease unpleasant emotions. Hypotheses were generated based on a broad conceptualization of the self-medicating hypothesis that involves the assumption that substance use alleviates symptoms of distress (i.e., anxiety, agitation, sadness) that may or may not be linked with a number of disorders. This approach does not involve the assumption of self-medication for relief of particular disorders, or particular symptoms of disorders (Henwood & Padgett, 2007). Conceptions of negative reinforcement drawn from instrumental conditioning theory have been used to explain repetitive substance use and relapse (Brandon et al., 2007). In this process, an individual learns that a behavior (substance use) removes an unpleasant stimulus (unpleasant emotions). The behavior is then more likely to be repeated as a consequence of negative reinforcement (i.e., the removal of the aversive stimulus).

The three hypotheses involving concurrent links between psychological distress and substance were not confirmed. There was partial support for a concurrent relationship between psychological distress and substance use. Psychological distress (reflecting distress during the week prior to assessment) measured at 12 months was concurrently related to change in substance use (reflecting use over the 30 days prior to assessment) from 10 months to 12 months. However, results showed that psychological distress was not concurrently related to substance use at baseline or change in substance use at any other follow-up assessment point. Figure 7 depicts the concurrent and prospective relationships between psychological distress and substance use. The current study failed to find statistically significant prospective relationships between
psychological distress and change in substance use measured at the four-month intervals (i.e., psychological distress at baseline was not related to change in substance use from two months to four months, psychological distress at four months was not related to change in substance use from six months to eight months, and psychological distress at eight months was not related to change substance use from 10 months to 12 months into the follow-up period). There were statistically significant prospective relationships between psychological distress and change in substance use measured at the two-month intervals (i.e., psychological distress at baseline was related to change in substance use from baseline to two months, psychological distress at four months was related to change substance use from four months to six months, and psychological distress at eight months was related to change in substance use from eight months to 10 months).

In summary, psychological distress was prospectively related to change in substance use two months later, and there was a concurrent relationship between psychological distress and change in substance use between the 10-month and 12-month assessments. The significant prospective relationship between psychological distress and change in substance use is partially consistent with the self-medicating hypothesis, which postulates that causation runs from psychological distress to substance use. That is, women with high levels of psychological distress had greater increase in odds of substance use during the period between 30 and 60 days after psychological distress was measured than women with lower levels of psychological distress. These results are similar, although not identical, to those from the literature reviewed earlier from relapse prediction studies. Several relapse prediction studies showed that psychological distress
was related to relapse following substance use treatment, but by design could have
predicted change in substance use status over time in one direction: abstinence to use.

The significant concurrent relationship between psychological distress at 12
months and change in substance use at 12 months is also consistent with the self-
medicating theory. It is possible that the psychological distress measured at the 12-month
assessment reflected psychological distress that had been experienced for some time, but
was not measured directly and may have led to the change in substance abuse measured
at the 12-month assessment. However, it is also possible that a higher level of
psychological distress at 12 months was caused by increased substance use between 10
and 12 months.

Although the self-medicating theory does not specifically describe reciprocal
relationships, it does posit that using substances to decrease distress is at best a temporary
solution, and often leads to increases in problems (and some likelihood of subsequent
distressing emotions) in the longer-term. Tests of the reciprocal relationships between
substance use and psychological distress were beyond the scope of the current
investigation; future studies should examine these relationships in more detail.

**Noteworthy Limitations**

Some aspects of this dataset may have limited the ability to detect significant
relationships. The following paragraphs will address the timing of assessments, the
limited variability in the upper (or clinically distressed) range of the psychological
distress instrument, and possible problems with validity of the instrument. The timing of
measurements may have restricted the likelihood of detecting relationships between
psychological distress and substance use level or change (see Figure 8). There were 30-
day periods (1-30 days for the assessment at two months, 31-60 days for the assessment at four months, etc.) when substance use could have occurred following the measurement of psychological distress, but would not have been detected. There were only brief ‘snapshots’ of psychological distress (perhaps reflecting distress for one-week periods), with no assessment of psychological distress over large portions of the follow-up period. The duration of psychological distress reported by participants was unknown.

Another possible problem was the limited variability in psychological distress in the upper (or likely clinically distressed) range of the scale. Detecting statistically significant relationships requires that both predictor and criterion variables have adequate variability in their distributions. In this case failure to detect a relationship between psychological distress and substance use level or change may have been due to low variability in psychological distress in the upper range where individuals would be expected to have used substances to ameliorate such distress. That is, variability in the subclinical range on distress scores might not be expected to be associated with level of substance use. The low variability in the clinical range was related to having few highly distressed individuals among the women sampled for this study. The average depression score of women in this sample over the course of the study was 6.53 ($SD = 6.19$) and the average anxiety score was 6.85 ($SD = 7.10$). Although multiple values have been adopted, 17 is the standard HRSD cutoff for identifying likely clinical depression (e.g., Aben, Verhey, Lousberg, Lodder, & Honig, 2002; Hamilton, 1960) and a score of 16 on the HRSA is the standard cutoff for moderate anxiety (Hamilton, 1959). Most (90%) women in this sample scored at 16 or below on Hamilton indices of depression and anxiety. Other studies, however, have found statistically significant relationships
between psychological distress and substance use with samples of participants with relatively low levels of psychological distress (e.g., Curran et al., 2000; Glenn & Parsons, 1991; Witkiewitz & Villarroel, 2009).

A possible explanation for the relatively low levels of psychological distress is that the instrument (Hamilton Anxiety and Depression Subscales or SIGH-AD) had limited validity as an index of psychological distress for this sample. Given the life circumstances of most women in this study—including poverty, limited employment prospects, substance use recovery, and chronic health problems associated with HIV—one might be surprised at the low levels of psychological distress. There is evidence supporting both acceptable and poor measure performance. Because the original study involved a clinical trial, change in psychological distress over four-month periods was expected. Even so, test-retest for psychological distress was adequate ($r > .59$). Past research has indicated that ratings scales, even when administered by non-clinicians, may be superior to self-report scales for identifying need for treatment (e.g., Taylor et al., 1981). But, a drawback of interview-type scales is reactivity of the respondent (e.g., social desirability of answers provided by the respondent leading to few expressing distress). Further, no inter-rater reliability information was available in the current study. Without inter-rater reliability information, one cannot rule out the possibility that judgments of raters diverged as the study progressed, leading to greater error. The items on this scale may not have functioned as intended with this sample for several reasons. Culture has been shown to influence cognition and emotion (Markus & Kitiyama, 1991), and culture likely influences the experience of psychological distress. The meaning of SIGH-AD items could be ‘lost in translation’ for non-English speakers or speakers of
non-standard English. Items may not have assessed symptoms of depression or anxiety in the same way for women from different ethnic/cultural groups, particularly if members of different groups have different perceptions of these constructs. For example, some Hispanics have been noted to express emotional/mental health as physical health symptoms (Finch, Kolody, & Vega, 2000; Guarnaccia, Angel, & Worobey, 1989), which may be different from the expression of mental health symptoms by non-Hispanic whites. Future research should assess the validity of the SIGH-AD for women from varied ethnic backgrounds, with HIV, and in substance use recovery. Quantitative examination of differential item functioning across various ethnic groups, qualitative investigation of how women understand the SIGH-AD items, and comparison of the scores on the SIGH-AD to self-report and clinician-performed diagnostic measures of psychological distress or disorder are warranted. Future studies should examine psychological distress levels in this population of women. The non-random nature of the current sample precludes generalizations to larger populations. It would be informative to examine randomly selected population-based samples of women living with HIV in substance use recovery from communities where women in the current study were recruited. It is possible that the women recruited in this study had particular resiliency in the face of stressful life circumstances. It is also possible that the ability or willingness to participate in a study involving multiple follow-ups led to a non-representative group with lower psychological distress.

Few studies report scores on this instrument with women with HIV from predominantly minority backgrounds. However, four studies were located that used the same measure of psychological distress with samples from a population similar to that in
this study. A sample of 82 African American mothers with HIV from the same
community as the current study (Smith, Feaster, Prado, Kamin, Blaney, & Szapocznik,
2004) showed mean levels of depression ($M = 6.07, SD = 5.05$) and anxiety ($M = 6.60,
$SD = 6.81$) similar to those of women in the current sample. Jones and colleagues (2011)
reported higher mean levels of depression ($M = 13.99, SD = 6.57$), but not anxiety ($M =
5.19, SD = 5.80$), in a sample of 130 (54% women) injection drug users with HIV in
South Florida. Swarz, Markowitz, and Sewell (1998) also found that 33 women with
HIV (51% African American, 36% Hispanic, 12% white) in New York, NY had higher
mean depression levels ($M = 12, SD = 8$) than women in this study. In a study of 88
African American women with HIV from urban New Orleans, LA, Kimerling,
Armistead, and Forehand (1999) showed that those without a history of victimization
(mugged or robbed, physically attacked, or forced into sex) had a significantly lower
mean level of depression ($M = 8.70, SD = 5.31$) than those with a history of victimization
($M = 13.30, SD = 8.29$).

It is possible that the relatively small number of women in the current sample who
showed elevated symptoms of psychological distress was not an artifact of
instrumentation problems. About a third ($n = 44, 35\%$) of women reported that they
received inpatient or outpatient mental health treatment services in the 12 months before
baseline. If most women were receiving treatment, the low levels of distress even at
intake in this study might be explained as treatment effects. However, given the low
number receiving treatment for disorders other than substance use disorders during the
year before baseline, it is reasonable to assume that a relatively small number fell into a
co-morbid group that might have enduring symptoms of distress.
Schuckit (2006) described a number of subsets of people who enter treatment for substance use disorders. Symptoms are likely to remit for those clients with psychological distress that is related to intoxication, withdrawal, or the stress and other factors associated with substance use disorders and treatment entry. A subset of individuals will continue to have symptoms after completing treatment. These individuals with persisting symptoms of psychological distress may have one or more other mental disorders that are independent of their substance use disorder. That is, each type of disorder can be expected to run the distinct clinical course that is typical of that disorder and must be treated accordingly. Others with persisting symptoms may have a mental disorder that developed in response to the substance use disorder. For example, high levels of substance use can unmask a latent predisposition to depression. Thus, those with comorbid disorders with treatment-resistant symptom expression would show little change (high stability), and those without symptoms (i.e., low levels of trait neuroticism) would be unlikely to change. Stability in symptom expression would limit opportunity to find links between psychological distress and change in substance use.

The levels of psychological distress reported in the studies reviewed above were generally consistent with the existence of subgroups as described by Schuckit (2006). If psychological distress were assessed near treatment intake, participants would be likely to have more symptoms, or more severe symptoms than those found in studies that assessed psychological distress after intake, when participants would be expected to have fewer or less severe symptoms. The reported levels of psychological distress from studies that assess distress at different points in treatment are consistent with this notion. Studies that assessed psychological distress at treatment entry generally revealed higher levels of
psychological distress (e.g., Hall et al., 1991; Sellman & Joyce, 1996; Greenfield et al., 1998). In contrast, studies (e.g., Curran et al., 2000; Glenn & Parsons, 1991; Witkiewitz & Villarroel, 2009) that assessed psychological distress well into treatment or after completing treatment showed relatively low levels of psychological distress. Future studies could attempt to identify group membership of individuals based on levels of psychological distress at treatment intake and treatment completion, and examine the trajectories of substance use during and following treatment completion of the various subgroups. Careful assessment of the history, onset, and duration of symptoms over the lifetime would be needed to establish temporal precedence of substance use disorders and other mental disorders. It would also be interesting to link these subgroups to growing knowledge about genetic variations and mental disorders (e.g., Feinn, Nellissery, & Kranzler, 2005; Lopez-Leon et al., 2008).

It may be that the optimal strategy to detect relationships would be to measure psychological distress and substance use more often than the periods used in this study. Assessing substance use immediately (or at least within a day) after the onset of distressing emotions (and vice-versa), or continuously (i.e., daily) assessing substance use and psychological distress over a long follow-up period, might provide a better test of these relationships. A similar assessment strategy has been attempted with stress and cocaine relapse in at least one previous study (Hall et al., 1991). Mobile communication technologies (e.g., smartphones) have shown promise for cost-effective assessment approaching real-time alcohol use (e.g., Cohn, Hunter-Reel, Hagman, & Mitchell, 2011), and could be included in future studies.
Social Support

Social support was hypothesized to be concurrently and prospectively related to substance use, with levels of social support inversely related to substance use at baseline and change in substance use at follow-ups. The development of these hypotheses was influenced by several theories of social support, as well as the results of multiple empirical studies that showed a link between social support and substance use for individuals in substance use recovery. No tests of hypotheses involving relationships between social support and substance use were supported. Social support was not concurrently related to baseline substance use or to change in substance use (over the previous 30 days) at any follow-up assessment, and social support did not prospectively predict change in substance use two or four months later.

An explanation for the lack of significant findings is that there was a restricted range and generally quite low levels of social support (defined by the number of available supportive others) reported by the women in this sample. This may have prevented an adequate test of the hypotheses. A restricted range of social support values may have contributed to attenuated statistical relationships between variables. Generally low support levels may also have presented problems in detecting relationships. Limited variability among participants in support levels and generally low support levels are separate issues, although in this case the low responses and restricted range appeared to be related as most of the support scores clustered near one. As shown in Table 1, the mean number of supportive others was 1.57 to 1.72 (SD range 1.18 to 1.47). The modal number of supportive persons identified by women in this study was one. Nearly half
(45%) of the women reported one person or no one upon whom they could count on for help or support in several contexts.

Only one study was identified that examined the links between the number of supportive others and substance use. McMahon (2001) assessed two dimensions (quantity and quality) of social support using the Perceived Social Network Inventory (Oritt et al., 1985). The number of supportive others was assessed by asking for a list of individuals that would available in times of need. In the McMahon (2001) study, participants who relapsed had smaller support networks ($M = 3.71, SD = 2.54$) than those who did not relapse ($M = 4.12, SD = 3.06$), but both groups had larger support networks than women in the current sample. Further, the McMahon (2001) sample as a whole had greater variability. There were variations in the stimulus properties of the instruments and in sample composition that could account for the differences between the number of supportive others in the McMahon (2001) study and in the current study. (Appendix C shows the Social Support Questionnaire instructions that were used in this study.)

Unfortunately, no studies could be located that examined the link between substance use and the number of supportive others measured with the same scale (SSQ, six items) as was used in this study. Only a small number of studies with adults that used the SSQ could be located to make comparisons to the findings of this study. No studies of participants with random or probability population-based samples that included predominantly minority women could be located. Two studies were located that examined African American participants from the Southeastern United States who did not report their HIV status; the majority of these participants were presumptively HIV negative. In a study (Williams and Dilworth-Anderson, 2002) of 187 African American
caregivers of elders from the Duke Established Populations for Epidemiological Studies of the Elderly (EPESE: Cornoni-Huntley, Blazer, Service, & Farmer, 1990) in the Piedmont region of North Carolina, the mean number of supportive others was 2.70 (SD = 1.77). These caregivers were mostly female (82%) with low annual incomes (74% less than $15,000). A study of 155 employed men and women non-randomly sampled for the Duke Biobehavioral Investigation of Hypertension (Steffen, Hinderliter, Blumenthal, & Sherwood, 2001) reported that the average number of supportive others of the African American participants was 2.8 (SD = 1.7). In Steffen and colleagues (2001), the majority of African American participants were women (57%) with incomes less than $30,000 per year (54%). Only two studies that had relatively large numbers of Hispanic participants who completed the SSQ could be located. In a sample of 95 Hispanic caregivers (67% women) of elders with Alzheimer’s disease Weathers, Query, & Kreps (2010) reported that the mean number of supportive others was 2.2 (SD not given). Ribas and Lam (2010) reported an average of 2.94 (SD = 1.47) supportive others in a convenience sample of 60 Hispanic outpatients (65% women; 61% unemployed) with mental disorders at community mental health center in Midwestern city.

Three studies that sampled African American or predominantly minority individuals with HIV were located. Song and Ingram (2002) reported higher numbers of supportive others (M = 4.93, SD = 3.81) in a sample of 117 African American women with HIV from the Richmond, VA area. The mean number of supportive others in a sample (Vyavaharkar et al., 2007) of 244 women with HIV who were prescribed ART was 5.12 (SD = 1.74). The women in Vyavaharkar and colleagues’ (2007) study were all from rural areas (populations under 50,000) in three southeastern states, were mostly
African American (82%), and had low annual incomes (73%, < $10,000). A secondary analysis of data from an earlier trial of SET (Szapocznik et al., 2004) that assessed 252 African American mothers with HIV from the same community as the current study (Prado, Feaster, Schwartz, Pratt, Smith, & Szapocznik, 2004) showed that the average woman’s supportive network was somewhat larger ($M = 2.32$, $SD = 1.32$) than that of women in the current sample, although the variability was similar.

There may have been differences in recruitment strategies that led to sample characteristics (e.g., age, income, comorbid psychopathology) that differed from those in prior studies along a range of dimensions that perhaps correlated with levels of social support. It is difficult to make comparisons across studies that have such a diversity of design elements. However, it appears that a range of supportive others have been detected with the SSQ in samples of African American and/or minority women with low socioeconomic status. Though not definitive, the range of values reported in other samples argues against the likelihood that the SSQ has severe measurement problems leading to consistently low numbers of identified supportive figures for women from minority backgrounds. One possible explanation for the quite low levels of support identified by women in the current study is that women experienced rejection from others, or at least perceived that others would reject them, due to the stigma of being HIV+ and/or in substance use recovery (Boyd-Franklin et al., 1995; Mitrani, Prado, Feaster, Robinson-Batista, & Szapocznik, 2003; Walker, 2002; Wechsberg, Luseno, & Ellerson, 2008). Perceived risks of rejection could have led to smaller numbers of others viewed as potentially supportive. With a convenience sample, it is not possible to rule out the possibility that other, uncontrolled factors led women with small networks to
enroll in the parent trial. Future studies should carefully examine whether the social support networks of women with HIV and in substance use recovery are smaller than African American women with HIV who are not in recovery. The possible limitations in social support networks of minority women with HIV in recovery are an issue of considerable importance and deserve further study.

Although other studies with comparable samples have reported a range of means and variability in number of supportive others, the distribution of values on an index of satisfaction with support in this study was concerning from a psychometric perspective. The scale was not used in analyses because it was highly skewed (over 66% endorsed the highest possible satisfaction). It should be noted that the interpretation of findings from these two measures is that women were extremely satisfied with support from a small number of people or only one person. On the one hand, one might speculate that the measure may not have captured the full (upper) range of satisfaction with support experienced by women in this sample. On the other hand, it could be that the support perceived by women matched or exceeded their expectations, and this led to their rather consistently high scores. Evaluating the validity of the support scales used in this study is beyond the scope of the current project and would require comparison of multiple measures from various perspectives (e.g., other self-report scales, observer-rated instruments). Multiple social support measures should be used in future studies.

Another explanation for the lack of significant relationships in this study is that the social support measure used in this study might not have assessed the most relevant aspects of social support for protection against substance use. As may be seen from the review of literature, of the reviewed studies that examined links with substance use only
McMahon (2001) used a measure of the number of supportive others. Social support is a construct that has been conceptualized in many ways. Inherent in these conceptualizations is the suggestion that social support may provide: a reasonable level of structure, monitoring, and goal-directedness; alternative activities to substance use, such as engagement in work, active leisure, and spiritual pursuits; sobriety-oriented norms and role models; and self-efficacy and socially-assisted coping skills. Multiple measures of social support have been used in studies that examine the aspects of social support that might influence substance use recovery. Those aspects other than the number of supportive others may be more predictive of substance use. Some alternate measures of social support used in other studies are the perceived quality of relationships, the frequency of social contacts or the amount of time spent with various social groups, the provision of help in various situations of need, the amount of substance use within a “support” group of peers or family members, and the specific support for recovery maintenance. Future studies should include several additional measures of support that may be potentially relevant to substance use among minority women with HIV in recovery.

**Mediation**

Social support was hypothesized to mediate the concurrent and prospective relationships between psychological distress and substance use. All tests of mediation hypotheses failed to show statistically significant mediation. These hypotheses were based on theories of psychological distress and social support, in addition to the results of a few empirical studies that suggested that social support might mediate the relationship between psychological distress and substance use for individuals in substance use
recovery. All tests of mediation hypotheses failed to show evidence that social support mediated the relationship between psychological distress and substance use. Psychological distress was not concurrently related to social support. As noted above, social support was not related to substance use, either concurrently or prospectively. As the proposed mediator (social support) was not related to either psychological distress or substance use, there was no evidence that social support mediated the relationship between psychological distress and substance use. Several limitations of this study that may have affected the ability to detect statistically significant relationships between variables – a requirement for identification of mediation effects – have been discussed previously.

**Stability over Time**

No hypotheses regarding autoregressive relationships were proposed, but the stability of indicators of substance use over the follow-ups of this study is interesting and worthy of comment. Significant autoregressive coefficients indicate lack of change in the values of variables over time (Kenny, 1975). Substance use was stable over two-month intervals for most of the study assessment periods, with one exception: baseline substance use did not significantly predict substance use two months later. However, substance use at the two-month assessment and all subsequent assessment points until 10 months were significantly related to substance use two months later. That is, more women changed their use status (i.e., self-reported use or no use) in the period from baseline to the two-month follow-up than during all subsequent two-month periods. The size of autoregressive relationships for substance use (after the first pair of assessments) was large. Table 2 shows the proportions of women reporting substance use at consecutive
assessments. Stable reports (i.e., reporting either use-use or no use-no use) at consecutive assessments are in the upper left and lower right quadrants for each assessment point. Abstinence at two consecutive assessments had the highest proportion, with 60 – 70% across all time lags.

Another type of stability was evident in the data. Stationary relationships fit the data for prospective predictive relationships from psychological distress and social support to substance use better than non-stationary relationships, which indicated lack of change in the strength of the coefficients over time (Kenny, 1975). For example, the strength of psychological distress at baseline predicting change in substance use at two months did not differ from the strength of psychological distress at eight months predicting change in substance use at 10 months. Future research might test whether samples with greater variability in levels of psychological distress and social support show similar levels of relational stability over time. With respect to tests of hypotheses in the current study, it is likely that in addition to the restricted ability to detect relationships due to the limited variability in psychological distress and social support at most assessment points, there also was diminished ability to detect prospective relationships with substance use due to the narrow range of change in substance use over the follow-up period.

**Limitations and Implications**

Several limitations were noted previously. The restricted ranges of psychological distress and social support and the timing of measurements may have limited the possibility of detecting significant relationships. The psychological distress and social support measures used in this study had acceptable reliability indicated by Cronbach’s
alpha, but the validity of these measures for women in this study is open to discussion.
Future studies should investigate psychological distress and social support of women from backgrounds similar to those in this current study using a variety of potentially more sensitive measures. Self-report measures are subject to several biases, including imperfect recall and social pressure to distort responses (e.g., Bower, 1981; Crown & Marlow, 1964; Podsakoff, MacKenzie, Podsakoff, & Lee, 2003). One way to examine validity would be to include multiple types of measures, such as clinician ratings, observation scales, and laboratory results in addition to paper-and-pencil self-report scales (Campbell & Fiske, 1959).

Although individuals were randomly assigned to intervention condition, they were not assigned to levels of psychological distress or social support. There may have been unidentified or uncontrolled variables in the current sample that would not be present in a randomly selected sample. Such unmeasured variables could have been responsible for the significant relationships between psychological distress and substance use. Researchers have identified multiple factors that may be related to substance use and psychological distress that were beyond the scope of the current study, including self-efficacy, stress, coping, and biological vulnerability. Self-efficacy refers to self-confidence regarding the performance of a particular behavior, in this case the several behaviors necessary to maintain abstinence (Bandura, 1977). Stress may be related to psychological distress (Cohen, 2004) and substance use (Shiffman, 1989). Stress and stressors have been conceptualized as daily hassles (e.g., Kanner et al., 1981), major life events (e.g., Sarason et al., 1978), and as related to generally stable conditions of living, such as poverty (e.g., Cochran & Mays, 1994) or living in neighborhoods with prevalent
drugs that contribute to risks for substance use or psychological distress. A variety of 
coping methods for general stressors or specifically for temptations to use drugs --
including distancing, avoidance, confrontation, and planful problem solving -- have also 
been linked to substance use (Shiffman & Wills, 1985). There may be a genetic 
component of both substance use and psychological distress (Clark, 2005; Martins, Keys, 
Storr, Zhu, & Chilcoat, 2009). Future studies should consider these variables to rule out 
spurious relationships and to increase understanding of the relationships between 
psychological distress, social support, and substance use for women in recovery.

An important aim of the parent study was to address a need for aftercare 
interventions in an understudied population. Caution should be used when applying 
current findings to other populations due to the convenience sample in this secondary 
analysis of data from a clinical intervention study. An increased risk of use was 
associated with psychological distress, which suggests that developers of aftercare 
interventions should include strategies to reduce psychological distress. For many 
individuals, psychiatric medication has been shown to be effective at alleviating 
symptoms of depression (e.g., Geddes et al., 2003) and anxiety (e.g., Zohar & 
Westerberg, 2000). Individuals also often show improvements in symptoms of 
depression and anxiety after participating in psychological treatment (e.g., Westen & 
Morrison, 2001). As noted previously, women in this sample had relatively small social 
networks, even though satisfaction with support was high overall. A recent review 
(Hogan, Linden, & Najarian, 2001) suggested that social support interventions may be 
useful in increasing the size of social networks.
References


Archives of General Psychiatry, 4, 561 – 571.


Table 1.

**Substance Use, Psychological Distress, and Social Support at Baseline and Follow-up Assessment Points.**

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>2 months</th>
<th>4 months</th>
<th>6 months</th>
<th>8 months</th>
<th>10 months</th>
<th>12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Substance Use</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n</td>
<td>125</td>
<td>93</td>
<td>102</td>
<td>71</td>
<td>94</td>
<td>49</td>
<td>93</td>
</tr>
<tr>
<td>n using</td>
<td>26</td>
<td>24</td>
<td>26</td>
<td>20</td>
<td>27</td>
<td>15</td>
<td>29</td>
</tr>
<tr>
<td>%</td>
<td>21%</td>
<td>26%</td>
<td>25%</td>
<td>28%</td>
<td>29%</td>
<td>31%</td>
<td>31%</td>
</tr>
<tr>
<td><strong>Psychological Distress</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n</td>
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<td>91</td>
<td>--</td>
<td>93</td>
<td>--</td>
<td>94</td>
</tr>
<tr>
<td>M</td>
<td>6.13</td>
<td>6.24</td>
<td>6.92</td>
<td>6.80</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SD</td>
<td>6.42</td>
<td>6.12</td>
<td>6.03</td>
<td>6.51</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anxiety</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n</td>
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<td>91</td>
<td>--</td>
<td>93</td>
<td>--</td>
<td>94</td>
</tr>
<tr>
<td>M</td>
<td>6.70</td>
<td>6.45</td>
<td>6.78</td>
<td>7.18</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SD</td>
<td>7.38</td>
<td>6.86</td>
<td>6.52</td>
<td>7.98</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Support</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n</td>
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<td>116</td>
<td>--</td>
<td>105</td>
<td>--</td>
<td>99</td>
</tr>
<tr>
<td>M</td>
<td>1.72</td>
<td>1.70</td>
<td>1.60</td>
<td>1.57</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SD</td>
<td>1.19</td>
<td>1.47</td>
<td>1.18</td>
<td>1.19</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: n is number (of 126 possible) without missing data.
Table 2.

Comparisons of the Proportions of Women Reporting Substance Use at Consecutive Assessments.

<table>
<thead>
<tr>
<th></th>
<th>2 months</th>
<th></th>
<th>4 months</th>
<th></th>
<th>6 months</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Use</td>
<td>No Use</td>
<td>Use</td>
<td>No Use</td>
<td>Use</td>
<td>No Use</td>
</tr>
<tr>
<td>Baseline Use</td>
<td>9%</td>
<td>15%</td>
<td>Use</td>
<td>18%</td>
<td>7%</td>
<td>Use</td>
</tr>
<tr>
<td></td>
<td>13%</td>
<td>9%</td>
<td>No Use</td>
<td>15%</td>
<td>63%</td>
<td>No Use</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>8 months</th>
<th></th>
<th>10 months</th>
<th></th>
<th>12 months</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6 months</td>
<td>Use</td>
<td>8 months</td>
<td>Use</td>
<td>10 months</td>
<td>Use</td>
</tr>
<tr>
<td></td>
<td>16%</td>
<td>13%</td>
<td>No Use</td>
<td>11%</td>
<td>63%</td>
<td>No Use</td>
</tr>
<tr>
<td></td>
<td>6%</td>
<td>66%</td>
<td>No Use</td>
<td>2%</td>
<td>70%</td>
<td></td>
</tr>
</tbody>
</table>
Figure 1.

Path analysis models of concurrent relationships between psychological distress and substance use.

Note. USE = substance use. PSY = psychological distress. Error terms, correlations between variables, and treatment condition as a covariate are not shown.
Figure 2.

Path analysis models of concurrent relationships between social support and substance use.

Note. USE = substance use. SS = social support. Error terms, correlations between variables, and treatment condition as a covariate are not shown.
Figure 3.

Social support as a mediator of the concurrent relationship between psychological distress and substance use in a longitudinal path analysis model.

Note. USE = substance use. SS = social support. PSY = psychological distress.

Paths for mediation tests are shown as follows: predictor to mediator (a), mediator to outcome (b), and predictor to outcome (c).
Figure 4.

Path analysis models of prospective relationships between psychological distress and substance use.

Note. USE = substance use. PSY = psychological distress. Error terms, correlations between variables, and treatment condition as a covariate are not shown.
Figure 5.

Path analysis models of prospective relationships between social support and substance use.

Note. USE = substance use. SS = social support. Error terms, correlations between variables, and treatment condition as a covariate are not shown.
Figure 6.

Social support as a mediator of the prospective relationship between psychological distress and substance use in a longitudinal path analysis model.

Note. USE = substance use. SS = social support. PSY = psychological distress.

Paths for mediation tests are shown as follows: predictor to mediator (a), mediator to outcome (b, b′), and predictor to outcome (c, c′).
Figure 7.

Psychological distress prospectively predicted change in substance use 2-months later, but not 4-month later, and change in substance use from ten to twelve months.

Note. USE = substance use. PSY = psychological distress. Error terms, correlations between variables, and treatment condition are not shown. The paths between psychological distress and substance use two-months later were held constant across time and the relationships between psychological distress and substance use four-months later were held constant across time. Autoregressive and concurrent paths were not held constant. *p < .05. **p < .01. ***p < .001.
Figure 8.

Windows of assessment of psychological distress and substance use over the first half (baseline to six months).

Note. USE = substance use assessment. PSY = psychological distress assessment.

Assessments repeat this pattern through the twelve month assessment.
Appendix A.

*Addiction Severity Index Lite, substance use item.*

The following questions look at two time periods: the past 30 days and lifetime. ⇒ 30 day questions only require the number of days used. ⇒ Alcohol to intoxication does not necessarily mean "drunk", use the words “felt the effects”, “got a buzz”, “high”, etc. instead of intoxication. As a rule of thumb, 5+ drinks in one setting, or within a brief period of time defines “intoxication”. ⇒ "How many days in the past 30 have you used....?"

<table>
<thead>
<tr>
<th>Substance</th>
<th>a. Past 30 Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1. Alcohol (any use at all)</td>
<td></td>
</tr>
<tr>
<td>D2. Alcohol (to intoxication)</td>
<td></td>
</tr>
<tr>
<td>D3. Heroin</td>
<td></td>
</tr>
<tr>
<td>D4. Methadone/LAAM (prescribed)</td>
<td></td>
</tr>
<tr>
<td>D4a. Methadone/LAAM (illicit)</td>
<td></td>
</tr>
<tr>
<td>D5. Other Opiates/Analgesics</td>
<td></td>
</tr>
<tr>
<td>D6. Barbiturates</td>
<td></td>
</tr>
<tr>
<td>D7. Other Sedatives/Hypnotics/Tranquilizers</td>
<td></td>
</tr>
<tr>
<td>D8. Cocaine</td>
<td></td>
</tr>
<tr>
<td>D9. Amphetamines</td>
<td></td>
</tr>
<tr>
<td>D10. Cannabis</td>
<td></td>
</tr>
<tr>
<td>D11. Hallucinogens</td>
<td></td>
</tr>
<tr>
<td>D12. Inhalants</td>
<td></td>
</tr>
<tr>
<td>D36. Nicotine (tobacco products)</td>
<td></td>
</tr>
<tr>
<td>D13. More than 1 substance per day</td>
<td></td>
</tr>
</tbody>
</table>

Note. This instrument is in the public domain.
Appendix B.

*Hamilton Depression and Anxiety Ratings Scale (SIGH-AD) Items.*

<table>
<thead>
<tr>
<th>Depression</th>
<th>Anxiety</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Depressed mood</td>
<td>1 Insomnia, general</td>
</tr>
<tr>
<td>2 Work/Activities</td>
<td>2 Depressed</td>
</tr>
<tr>
<td>3 Insomnia, early</td>
<td>3 Intellectual</td>
</tr>
<tr>
<td>4 Insomnia, middle</td>
<td>4 Genitourinary symptoms</td>
</tr>
<tr>
<td>5 Insomnia, late</td>
<td>5 Anxious mood</td>
</tr>
<tr>
<td>6 Genital symptoms</td>
<td>6 Tension</td>
</tr>
<tr>
<td>7 Somatic, gastrointestinal</td>
<td>7 Somatic, muscular</td>
</tr>
<tr>
<td>8 Weight loss</td>
<td>8 Somatic, sensory</td>
</tr>
<tr>
<td>9 Somatic, general</td>
<td>9 Fears</td>
</tr>
<tr>
<td>10 Guilt</td>
<td>10 Gastrointestinal symptoms</td>
</tr>
<tr>
<td>11 Suicide</td>
<td>11 Autonomic symptoms</td>
</tr>
<tr>
<td>12 Anxiety, psychic</td>
<td>12 Cardiovascular symptoms</td>
</tr>
<tr>
<td>13 Anxiety, somatic</td>
<td>13 Respiratory symptoms</td>
</tr>
<tr>
<td>14 Hypochondriasis</td>
<td>14 Interview behavior</td>
</tr>
<tr>
<td>15 Insight</td>
<td></td>
</tr>
<tr>
<td>16 Agitation</td>
<td></td>
</tr>
<tr>
<td>17 Retardation</td>
<td></td>
</tr>
</tbody>
</table>

Note. The complete structured interview guide is copyrighted by Janet B.W. Williams.
Appendix C.

Social Support Questionnaire items.

INSTRUCTIONS: The following questions ask about people in your life whom provide you with help or support. Each question has two parts. For the first part, I will ask you to tell me all the people you know, except for yourself, whom you can count on for help or support in the manner described. Give the person's initials (first name/last name), relationship to you (see example) and their birth year if you know it. Please ignore the last box, labeled "code." Do not list more than 9 people.

For the second part, tell me how satisfied you are with the overall support you have.

1. Who can you count on when you need help?
2. Whom can you really count on to help you feel more relaxed when you are under pressure or tense?
3. Who accepts you totally, including both your worst and your best points?
4. Who can you really count on to care about you, regardless of what is happening to you?
5. Whom can you really count on to help you feel better when you are feeling generally down in the dumps?
6. Who can you count on to console you when you are very upset?

How satisfied?

1 Very dissatisfied  2 Fairly dissatisfied
3 A little dissatisfied  4 A little satisfied
5 Fairly satisfied  6 Very satisfied

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