A LONGITUDINAL STUDY OF THE PERSONAL NETWORKS OF INDIVIDUALS RECEIVING TREATMENT FOR MENTAL ILLNESS AND SUBSTANCE ABUSE PROBLEMS

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A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Psychology

1995

ABSTRACT

A LONGITUDINAL STUDY OF THE PERSONAL NETWORKS OF INDIVIDUALS RECEIVING TREATMENT FOR MENTAL ILLNESS AND SUBSTANCE ABUSE PROBLEMS

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There has been increasing recognition that social forces, such as social support and social networks, influence substance abuse treatment outcome. Although individuals with psychiatric disorders are fairly prevalent among individuals receiving substance abuse treatment, the literature on the social networks of individuals with these dual disorders is practically nonexistent. Therefore, the present study utilized a structured social network methodology to study the social networks of 467 dually diagnosed individuals. Participants were interviewed upon admission to a public psychiatric hospital and then 2- and 6-months post-discharge. A model was proposed that predicted both relapse and problem alcohol or drug use following treatment based on selected pre- and post-discharge variables. Hierarchical multiple regression and logistic regression were employed to test this model and to assess the impact of social network/support variables and the role of psychiatric distress in predicting treatment outcomes.

The results indicated that poorer outcomes were consistently associated with having contact with substance using social network members and experiencing greater

psychiatric distress. Other variables related to positive treatment outcomes, albeit less consistently, were employment status, longer length of treatment, having family members involved in treatment, and having more confidants or intimate network members. This study supports prior empirical studies showing that friends, family, and other network members can either promote or undermine a person's recovery from substance abuse problems. Finally, for the first time in a dual diagnosis population, this study demonstrates that severity of psychiatric problems was the strongest predictor of substance abuse treatment outcome.

ACKNOWLEDGEMENTS

A project as complicated as a dissertation requires a small cast of supporting individuals. I have been most fortunate to be blessed with the companionship and assistance of my wife Erin. Not only did she employ numerous tactics to help me remain sane throughout this project, she also tirelessly helped me enter and double-check the numbers in the Results section. Certainly, only true love can explain her assisting me in such essential, albeit tedious, tasks. Thanks for the advice, comedic diversions, and help as I struggled through this project...and probably most important, thanks for putting up with me.

My best friend Paul Krecke stimulated me with his support and curiosity about how science works. I will always fondly remember those important discussions and debates about life that have occurred on the ultimate field and atop El Azteco. And Dave, thanks for plying me with beverages at Paul Revere's Tavern the night before my defense. This thoughtful distraction prevented me from worrying too much. Finally, thanks to Gary Meyer, I was able to brainstorm dissertation ideas and exercise all at the same time. The only other non-academic folks I would like to acknowledge are two females who were there for me throughout the entire study. Although I was often envious of the carefree lives you both lead and the frequent napping you did while I

toiled with analyses, to Nike and Schmu - thanks for keeping my lap warm while I typed these pages.

My dissertation committee was truly top-notch. Thanks for inspiring me to do the best possible job on this project. William Davidson, my chair, did a great job of shaping my ideas into a manageable study. Neal Schmitt's guidance on the analyses was invaluable. Finally, thanks to Tom Reischl and Bertram Stoffelmayr for their substantive experience in this topic area and their encouraging words along the way.

In closing, I wish to acknowledge my student colleagues in the Eco program. I especially wish to recognize Maureen Rumptz, Barbara Schillo, and Madeline Wordes. Although our dissertation support group meetings were short-lived, our friendships have not been. Also, Bonnie BootsMiller has been a fantastic co-worker and a true friend. I look forward to keeping in touch with all of you as many of us migrate from East Lansing to other destinations.

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CHAPTER I

INTRODUCTION

The abuse of alcohol and other drugs has created a significant health problem in the United States. Approximately 100,000 deaths each year are attributable to misuse of alcohol and 20,000 deaths to illicit drug use (McGinnis & Foege, 1993). Alcohol was estimated to be involved in over 39% of all fatalities from traffic crashes in 1991, contributing to over 16,000 traffic deaths (Zobeck, Stinson, Grant, & Bertoluci, 1993). Moreover, alcohol-related traffic crashes differentially impact younger persons; alcohol-related traffic crashes alone were implicated in 49 percent of years of potential life lost for males and 34 percent for women in 1991 (Zobeck, Stinson, Grant, & Bertoluci, 1993).

Some of the key indicators of our nation's substance abuse problem have shown that positive changes are occurring; however, for many of the other indicators no change has occurred or the problems are getting worse. For instance, although deaths from traffic crashes have been declining in recent years, substantial increases have been observed for drug-related deaths due to AIDS cases that occur among injection drug users or from people who have had sexual contact with them (Institute for Health Policy, 1993). Although national surveys have shown encouraging declines in the numbers of individuals reporting using cocaine, consumption of cocaine has merely leveled off while the number of heavy cocaine users has continued to increase over the last decade (Everingham & Rydell, 1994).

The negative consequences of substance abuse, however, extend beyond mortality. The economic impact of substance abuse is substantial. Drug abuse in 1990 cost the nation approximately 70 billion dollars; the economic cost of alcohol abuse is even higher, and has been estimated at over 98 billion dollars (Institute for Health Policy, 1993). In addition, substance abuse can also place severe strains upon families (e.g. Holden, Brown, & Mott, 1988); approximately one in four Americans report that alcohol has been a cause of trouble in their family (Institute for Health Policy, 1993).

Breaking the grip of addiction is not an easy process. Quitting or becoming abstinent is usually attainable; however, maintaining abstinence is typically the challenging part of successful recovery (Marlatt, 1985b). This is why Mark Twain is frequently quoted as saying that quitting smoking is easy--because he had done it hundreds of times. The pioneering work of Marlatt and Gordon (1985) has greatly improved our understanding of the relapse process, how to prevent relapse, and how to prevent a lapse or slip from becoming a full-blown relapse. This line of research has suggested that most relapse episodes have causes that may be internal (e.g. cravings, mood states) and/or external (e.g. direct and indirect social pressure) (Daley & Marlatt, 1992; Marlatt, Baer, Donovan, & Kivlahan, 1988).

There has been increasing interest in studying the social factors related to both relapse and prolonged abstinence. Because factors outside of treatment probably have as much of an impact on recovery as the treatment experience (Billings & Moos, 1983; Westermeyer, 1989), several researchers have sought to explore how social influences, such as social support and social networks, can promote positive outcomes. In a general sense, social support refers to actions that are perceived as supportive or helpful,

whereas, the social network is simply the connections among individuals, some of which may provide support (Ritter, 1988; Thoits, 1982).

For individuals who already have alcohol or drug problems, the social network may help influence the type of alcoholism treatment sought (Strug & Hyman, 1981) and whether the individual subsequently is able to maintain abstinence from the problem substance. For instance, among individuals who have successfully modified their problem drinking behavior, many report that one of the most important factors in staying sober was the support they received from their family, friends, and partner (Sobell, Sobell, Toneatto, & Leo, 1993; Tuchfeld, 1981). However, network members can also facilitate relapse. For example, the Narcotics Anonymous Handbook tells readers that "old friends, places and ideas are often a threat to our recovery. We need to change our playmates, playgrounds and playthings" (Narcotics Anonymous, 1988, p.15).

Although prior studies have explored how social networks influence the initiation of alcohol and other drug use (Ellickson & Hays, 1992; Newcomb & Bentler, 1988) and how the existing personal network can affect substance abuse treatment outcomes (Goehl, Nunes, Quitkin, & Hilton, 1993; Hawkins & Fraser, 1987), a thorough literature search failed to retrieve any published studies of the social networks of individuals with substance abuse problems and a co-existing psychiatric diagnosis (i.e. the dually diagnosed). This apparent void in the substance abuse and dual diagnosis literatures is vexing given that psychiatric problems tend to co-occur with substance abuse problems at an alarming rate. For example, estimates of the proportion of individuals in substance abuse treatment who have a psychiatric diagnosis range from 20 to 65 percent, depending on the population and study methods (El-Guebaly, 1990; Ross, Glaser, & Germanson,

1988). In addition to being fairly prevalent, having psychiatric problems may be related to having a poorer prognosis. Dually diagnosed patients have higher rates of hospitalization, homelessness, and violent and criminal behavior than patients with either psychiatric or substance use problems (Osher & Kofoed, 1989). Also, the level of co-existing psychiatric problems was the strongest predictor of poor treatment outcome in a study of over 800 persons with alcohol and other drug problems (McLellan, Luborsky, Woody, & Druley, 1983).

Given the multitude of problems facing dual diagnosis clients and the extensive demands that they place upon service delivery systems (Bachrach, 1986-1987), there is a pressing need to learn more about how to intervene with this population. A social network approach holds promise. A person's social contacts, their peers and friends, can influence an individual to remain drug-free or can facilitate their relapse (Brown, Vik, & Creamer, 1989). The pressure from network members to use substances can be great and can create what has been termed a "magnetic" pull back into addiction (Stephens & Cottrell, 1972). Understanding how the social network affects persons with dual diagnoses can be instrumental in shaping intervention strategies and providing a better understanding of the web of social influences that may contribute to their sobriety or relapse.

Purpose

The literature relating social support and social networks to substance abuse treatment outcome has indicated the potential importance of these variables in understanding relapse and the successful resolution of alcohol and other drug problems (Fraser & Hawkins, 1984a; Westermeyer, 1989, for example). However, most of these

studies are plagued with serious methodological shortcomings, such as small sample sizes, high attrition, and poor measurement of social network variables. Furthermore, the number of individuals receiving substance abuse treatment who have co-occurring psychiatric problems is rather high, but the literature on the social networks of individuals with both of these dual disorders is practically nonexistent. The purpose of the current study, therefore, is to examine how psychiatric distress, social support, and social networks are related to short-term relapse and substance abuse problems among a dual diagnosis sample that had recently received inpatient treatment.

Most of the methodological shortcomings of prior studies have been addressed in the current study. In the current study, the sample size is large (over 300), the design is prospective and longitudinal, and a standardized methodology was employed for assessing the social network. Before the literature review is presented, a brief description of the procedures for conducting the literature search is provided.

Description of the Literature Search

Computerized literature searches using PsycINFO (1976-1994, Spring) and Sociofile (1/74 - 4/94) supplied the majority of the references for the literature review. Key words for searching were: Drug use/usage, alcohol use, substance abuse, addiction, mental disorders, mental illness, mental patients, and social networks. A boolean search was conducted on each database separately (e.g. social networks AND {mental illness AND substance use}). No citations were found on either database, therefore, the search was modified slightly to include articles on social networks and either mental illness or substance use. This revised search yielded 294 English language citations in PsychINFO and 38 citations in Sociofile. Another search was attempted by using the keyword dual

diagnosis, which netted 337 PsychINFO citations, but only 1 article dealing with social networks. The keyword dual diagnosis is not used by Sociofile.

Additional criteria for inclusion in the present literature review were the following: (a) the articles must have been written in English; (b) the study population needed to include adults, therefore articles on the networks of children and adolescents were excluded; (c) only articles that focused primarily on social networks were included; (d) articles on individuals with the dual diagnoses of mental retardation and substance abuse were excluded because these individuals did not meet the eligibility criteria of the treatment wards used for recruiting the sample of the present study; (e) articles focusing on the HIV/AIDS risk behaviors of the social networks of injection drug users were beyond the scope of this topic. Additional references obtained from the reference sections of the articles from the original search were also used in this review.

This review starts by providing an overview of the intrapersonal and interpersonal factors that influence both relapse and recovery from alcohol and other drug problems. Next, this review addresses definitional and measurement issues in the social support and social network literature and discusses the potential mechanisms whereby social networks may influence substance use. A critical examination of the specific literature on social support and social network influences upon substance abuse treatment outcome is then provided. Special attention is given to the methodological quality of these studies. The final section focuses on the topic of dual diagnosis, especially upon the prevalence of co-occurring disorders and how psychiatric problems are related to poorer treatment prognosis.

Relapse Following Substance Abuse Treatment

One of the general conclusions from the substance abuse treatment outcome literature is that treatment typically has a positive, although quite modest effect and that most individuals who eventually relapse do so shortly after treatment completion (Longabaugh & Lewis, 1988). This section examines the frequency of relapse following substance abuse treatment and then explores the reasons for relapse or successful abstinence.

Frequency of Relapse

Although relapse is operationalized differently across studies, most studies have defined relapse simply as re-use of the drug (Stephens & Cottrell, 1972). In some instances, multiple categories reflecting a continuum of subsequent use are created instead of a simple binomial relapse category. For example, in a random sample of 922 individuals who had made contact with alcoholism treatment centers, Polich, Armor, and Braiker (1980) split their 4-year follow-up sample into individuals who were: Drinking with problems (54%), drinking without problems (18%), and abstinent six months before follow-up (28%). Although it does not appear very encouraging that 72 percent of the participants had consumed alcohol prior to their six month interview, the authors caution that this reflected a substantial improvement from baseline when 90 percent of the cohort was experiencing serious drinking problems.

In a follow-up study of 200 individuals addicted to narcotics (Stephens & Cottrell, 1972), 87 percent had re-used narcotics within six months of hospital discharge. When this relapsing group was subdivided, 10.5 percent had used narcotics only a few times, 12 percent used narcotics regularly without becoming re-addicted, and 64.5

percent were re-addicted. In a study that combined results from over 600 patients from three different treatment centers, it was found that only 10 percent of alcoholics had maintained continued abstinence 18 or 24 months later (Gottheil, Thornton, Skoloda, & Alterman, 1982). Wallace's study of cocaine smokers revealed that 76 percent relapsed in three months and 94 percent in six months.

All of these more recent findings are congruent with an earlier review of 84 studies examining relapse for various addictions (e.g. heroin, cigarette smoking, and alcohol addiction) that found that about two-thirds of relapses occur within three months and over 90% occur within six months following treatment (Hunt, Barnett, & Branch, 1971). There is also a striking similarity in the patterns of relapse for each of these addictions when these are graphed (although alcohol is slightly different, having a lower relapse rate). In summary, the relapse rates following treatment appear to be quite high, but more importantly, what are the factors contributing to the return to drug use or to the maintenance of sobriety?

Contributors to Relapse and Successful Remission

Marlatt and colleagues (1985c) have developed a useful and widely used scheme for categorizing relapse episodes. Two primary determinants of relapse have been proposed, factors that are intrapersonal (including reactions to environmental events) and interpersonal. The intrapersonal categories include: (1) Coping with negative emotional states, (2) Coping with negative physical-physiological states (including withdrawal and cravings due to withdrawal), (3) Enhancement of positive emotional states, (4) Testing personal control, and (5) Giving in to temptations or urges. The interpersonal determinants are composed of: (1) Coping with interpersonal conflict, (2) Social

pressure, and (3) Enhancement of positive emotional states. The social pressure component includes both direct pressure, such as provision of the substance and verbal pressure, or also indirect pressure, which includes modeling of substance use to the user. Interestingly, it appears that the type of social pressure may interact with the type of substance. For example, Marlatt suggested that most drinking relapses due to social pressure are caused by direct social pressure, but indirect mechanisms (i.e. modeling) are more salient for smoking.

Wallace (1989) examined the psychological and environment determinants of relapse for 35 crack cocaine smokers. Although the coding scheme for that study differed slightly from Marlatt's categorization, it was found that most relapse episodes (86 percent) were caused by multiple factors. The most popular psychological determinants were a relapse in response to a painful state and failure to enter arranged aftercare treatment. If relapses caused solely by either psychological or environmental determinants were considered, more relapses were caused by environmental factors (17 percent versus 9 percent). The most common environmental contributor (N = 12) was the environmental stimuli of people, places, and drugs. Lack of family support or being homeless was implicated in five episodes. In a study of 200 males addicted to narcotics, similar factors influenced relapse, such as the use of substances for coping with social problems, depression, and the influence of addict friends and their environment (Stephens & Cottrell, 1972).

In studies of individuals whose alcohol or drug problems have gone into remission, both intrapersonal and interpersonal factors appear to promote recovery. To understand the processes of spontaneous remission in alcoholics, Tuchfeld (1981)

conducted in-depth interviews with 35 men and 16 women who had resolved their drinking problems on their own. The primary reasons for stopping drinking included various health concerns, exposure to educational materials about alcoholism, religious involvement, interventions by families and friends, financial or legal problems, and extraordinary events (e.g. personal humiliation, attempted suicide, exposure to negative role models). Many of these factors appear to be related to the presence of social support from family, friends, and other network members. Tuchfeld noted that among people reporting that loved ones influenced their recovery, many had persistent support from a spouse or family member. In a more recent study of 182 individuals who reported having a current alcohol problem or who had successfully recovered without treatment, similar factors (e.g. support from spouses, friends, and family) emerged as being important to recovery (Sobell, Sobell, Toneatto, & Leo, 1993). In fact, spousal support was endorsed by the greatest number of participants (two-thirds) as being the most helpful factor in maintaining the resolution of alcohol problems. Moreover, participants in the study by Stephens and Cottrell (1972), reported that support of the family (27 percent) and support of non-addict friends (14 percent) were important reasons for abstinence.

Summary

The literature on the relapse process suggests that relapse is rather common after alcohol or drug treatment, nonetheless, individuals do show positive improvements in controlling their substance use. Relapses tend to occur shortly after treatment and most relapses occur within six months following treatment completion. Relapses have both intrapersonal and interpersonal origins. Furthermore, individuals who have successfully resolved their substance use problems frequently report that support from family and

friends was instrumental in their recovery. The next section provides an introduction to the social network concepts because many studies of the social influences upon recovery have utilized social network techniques.

Social Network Concepts

Definition

The terms "social network" and "social support" have been used quite loosely in the literature and although these terms have been used interchangeably, they are distinct concepts (Thoits, 1982). The most widely cited definition of social networks is that they are "a specific set of linkages among a defined set of persons, with the additional property that the characteristics of these linkages as a whole be used to interpret the social behavior of the person involved" (Mitchell, 1969, p. 2). In contrast, social support refers to actions that are perceived as being helpful or supportive. Therefore, the focus of social networks is human interaction and social contacts, which may or may not be indicative of the amount of social support available (Fraser & Hawkins, 1984b; Gottlieb, 1985; Israel, 1983). One of the major advantages of employing a social network approach over examining only social support, is that a network approach is more neutral allowing for the investigation of both supportive and unsupportive relationships and it permits the examination of numerous network characteristics beyond social support that may contribute to health status (Israel, 1983).

Types of Social Networks

Generally, there is a distinction made between open and closed social networks (Mueller, 1980). The unit of study in open networks, which are usually called personal or egocentric networks, is a focal individual and their relations to other members. When

the entire population of interest and their interactions are studied, the network is said to be closed. This is usually only possible for smaller, clearly bounded populations due to the amount of effort and cooperation required of respondents and also the massive amount of data that can be generated (Laumann & Schumm, March 1992). An advantage of the personal network approach is its ability to be used for studying large populations with many network variables (Mueller, 1980). Furthermore, personal networks permit the use of standard multivariate statistical techniques for data analysis (Laumann & Schumm, March 1992). Most studies in the area of mental health, physical health, and drug use have utilized the personal network approach.

Measurement of Personal Networks

The personal network approach was taken in the present study and, therefore, is of greater interest than the closed network. The most common method of assessing personal networks is first to enumerate the network members (Marsden, 1990). This is usually done by asking the focal individual (also called the ego or star) several name-generating questions. For instance, one of the most common questions asks the individual to name the individual(s) whom they would turn to if they needed to talk about an important personal problem. This approach is based on an exchange theory of social relations, which posits that people who are sources of rewarding social interactions are most likely to shape the focal person's attitudes, behavior, and well-being (McCallister & Fischer, 1983).

The number of name generators used to enumerate the network may affect the resulting network size. The appropriateness of different numbers of network delineation questions was examined in a study of the general population in the Netherlands using a

name generator approach to enumerating the network (Van der Poel, 1993). All participants were asked ten probe questions (e.g. Who would you talk to if you are depressed? Who would take care of you if you were sick for a couple of days? With whom do you have contact at least once a month?). When subsets of the 10 probe questions were varied to determine the minimum number of questions necessary to describe the network, it was concluded that three is the absolute minimum number of questions to obtain some indication of the network size, but five name generators yielded considerable improvements. Three questions explained only about 55% to 60% of total network size determined from 10 questions, but 5 questions explained about 84% of the total network size.

Once the network has been enumerated, detailed questions called name interpreters can then be asked about each of the network members (or alters) (Laumann & Schumm, March 1992). For example, it is common to inquire about the basic demographic characteristics of the alters (e.g. sex, age, race/ethnicity, relationship) and the type and frequency of interactions. A matrix that features the names of the alters is sometimes constructed, which permits the investigator to assess systematically whether each alter knows every other alter. Sometimes, however, this procedure for establishing network density is only performed on a subset of alters. Further questions about the ego and the alters are often developed based on the specific purposes of the study. For instance, the name generating questions may be customized to the study population (Van der Poel, 1993). Based on the detailed information collected from the alters, it is then possible to calculate several qualitative and quantitative indices for the social networks. For example, the functional characteristics (e.g. affective or instrumental support) and

structural characteristics (e.g. size of network) can be assessed (Israel, 1983; Mitchell & Trickett, 1980) and related to other variables of interest.

Social Networks and Health Behaviors

Network members can help influence individuals to make positive health changes. For instance, studies from the health promotion literature have shown that support from network members has been related to improved diet (Zimmerman & Connor, 1989) and quitting smoking (Coppotelli & Orleans, 1985; Mermelstein, Lichtenstein, & McIntyre, 1983). Sometimes, support from network members is not related to smoking cessation, but mere exposure to other smokers has been negatively related to abstinence (Curry, Thompson, Sexton, & Omenn, 1989). Moreover, positive health changes in husbands have been observed even when they were not the target of a dietary intervention, but their spouses were (Shattuck, White, & Kristal, 1992).

Networks can also provide negative influences whereby network members may introduce the use of cigarettes or illicit drugs to their friends or partners. For example, among female inpatients at a drug treatment program, one-fifth reported that they were initiated to crack cocaine through a family member and more than half through a male friend (Boyd & Mieczkowski, 1990). Parental modeling, which is often confounded with genetic factors, is also important. Comprehensive reviews by Robins and Smith (1980) and Hawkins, Catalano, and Miller (1992) have indicated that having a parent who uses alcohol or drugs is consistently related to increased likelihood of use by their children. In several instances, however, these reviews indicate that peer influences are stronger predictors of the initiation of substance use, especially for females who are often introduced to the substances by male partners. More recent studies of adolescents

confirm the finding that peer and family drug use is a risk factor for adolescent use (Newcomb & Bentler, 1988) and that offers of alcohol or drugs from family, friends, and other drug users was related to later drug use (Ellickson & Hays, 1992).

The mechanisms of how networks influence the health status and behavior of their members are not well understood (Hammer, 1983; Ritter, 1988). Ritter has examined some of the potential explanations. For instance, the networks may be useful in providing information to their members, may provide care and specific aid leading to improved health, or they may even provide a form of social control that influences members by peer pressure. Others posit that the process can be explained by Social Learning Theory and the importance of modeling (Akers, Krohn, Lanza-Kaduce, & Radosevich, 1979). The effects of network may be explained by classical conditioning and social learning, whereby, a former drug user may be exposed to drug-related cues (e.g. addicted friends, a particular environment, or the substance itself) that may elicit cravings or positive outcome expectancies about drug use (Goehl, Nunes, Quitkin, & Hilton, 1993; Marlatt, 1985a).

Summary

In summary, social network members and the support they can provide can have an important influence upon whether an individual is able to successfully adopt positive health behaviors and modify their negative health behaviors. In some cases, perceived social support is more strongly tied to behavior changes, whereas in other instances the modeling of the target behaviors by network members appears to be a more salient factor. In addition, intimate network members, such as a spouse or partner, seem to be the most

important individuals affecting the successful maintenance of the desired behavior change.

Social Factors and Substance Abuse Treatment Outcome

Previous studies that have examined the role of social support or social network influences upon substance abuse treatment outcomes are presented in Table 1. As mentioned earlier, the distinction between social support and social networks has not always been maintained in the literature. In some instances, when a study discussed clear social network influences but labelled them social support, they are placed in the social network column. The key differentiating factor was that when the independent variables were based on the ties among individuals (both supportive and unsupportive), they were placed in the network column. Some of these studies are cross-sectional, but most are longitudinal and almost all have utilized treatment samples. They are organized in the table in reverse chronological order by type of study--social support only, social network only, or both social support and social network variables assessed.

Table 1.

Background Information on Research Reports Relating Social Support and Social Network Variables to Substance Use or Treatment Outcomes

Author(s)	Methodology	Social Support Variables	Social Network (SN) Variables	Dependent Variable or Outcome	Variables related to positive outcomes (Abstinence, less substance use, treatment success)
Grey et al. (1986)	• 30 Methadone clients • 30 Naltrexone clients • Recruited from an outpatient addiction center • Longitudinal (intake to 12 weeks)	• Perceived Family Support (PSS-Fa)		Retention • No. clinic appointments kept during 12 weeks Drug abuse • % urinalysis containing illicit drugs	Retention • PSS-Fa - unrelated Drug abuse • High family support - negatively related (for both Methadone and Naltrexone groups)
Oyabu & Garland (1987)	• 83 inpatients • Alcohol & drug treatment (tx) program • Longitudinal (Pre-tx & End of tx)	• General Social Support. (Norbeck Social Relations Scale) • Significant Other Participation in Tx (Participation)		Social Psychological Well-being (Coping, Self-esteem, Depression)	Support - Unrelated Participation- Unrelated
Siddal & Conway (1988)	• 100 residential clients • Recruited from a substance abuse treatment center • Cross sectional	Family involvement in tx Social network support: • participation in AA/NA • having a sponsor in AA/NA • participation of extended family in tx • participation of nuclear family not living w/client • participation of nuclear family living w client		• Treatment Retention/Discharge disposition (7 point scale) • Successful vs. nonsuccessful discharge (dichotomy)	Retention • Well developed social support network • Employed at discharge Successful discharge • Family involvement in tx • Well developed social support network • Involuntary admission • Employed at discharge

Author(s)	Methodology	Social Support Variables	Social Network (SN) Variables	Dependent Variable or Outcome	Variables related to positive outcomes (Abstinence, less substance use, treatment success)
Booth et al. (1992)	• 61 inpatients • Alcoholism tx program • Longitudinal • Dependent variable obtained from secondary source	General Social Support (Social Provisions Scale) • SPS has overall score + 6 subscales • All scales completed for (1) Family/Friends, & (2) Tx Environment		• Readmission status (21/61 readmitted • No. days before readmission (up to 1 year)	Readmission • Reassurance of Warmth scale (Fam/Frnd) - positively related Time to Readmission • Attachment scale (Fam/Frnd) - positively related • Overall support (Fam/Frnd) - positively related • Reassurance of Warmth (Fam/Frnd) - positively related
Ohannessian & Hesselbrock (1993)	• 85 adult children of alcoholics • 68 controls • Cross-sectional	• Overall Social Support (Interpersonal Support Evaluation List-ISEL) • Perceived Family Support (PSS-Fa) • Perceived Friend Support (PSS-Fr)		• Michigan Alcoholism Screening Test-MAST • 6 mo. alcohol use • Age at 1st drink • Age drank regularly • Concern about drinking • Concern about developing drinking problem • Type of drinker • No. precautions to reduce having drinking problem • Drinking to get (1) "high," (2) drunk	ISEL • 6 mo. alcohol use - negatively related • Concern about drinking - negatively related PSS-Fr • Concern about drinking - negatively related PSS-Fa - Unrelated
Higgins et al. (1994)	• 52 cocaine-dependent adults • Outpatient tx sample • Significant other participates in tx • Longitudinal	Whether significant other participates in tx Yes = 41 No = 11		• Cocaine use from urine screen used to determine treatment "success" of ≥ 9 wks. continued abstinence or ≥ 92% abstinence over 12 wks.	*Multivariate Results* • Demographics - unrelated • Prior drug use - unrelated • Addiction Severity Index Composite Scores (ASI) - unrelated • Significant other participation - positively related

Author(s)	Methodology	Social Support Variables	Social Network (SN) Variables	Dependent Variable or Outcome	Variables related to positive outcomes (Abstinence, less substance use, treatment success)
Favazza & Thompson (1984)	• 42 inpatients (only 12 have complete data) • Alcoholism tx • Longitudinal (Baseline, 11 mo. follow-up)		Network size Network composed of most "important" people (family, friends, social relations); people-disliked, lost contact with, who are dead, & anybody else	Health Status Inventory - Composed of 10 items (e.g. participation in alcoholism tx, suicide attempts, drug use, drinking history). 3 categories created - Improved (N=6), Somewhat improved (N=4), Worse (N= 2)	Networks were the same size or larger for participants in the "Improved" or "Somewhat improved" groups. Average network size dropped from 28 to 13.5 people for the 2 participants with lower HSI scores.
Hawkins & Fraser (1987)	• 38 drug-abusing adults • Longitudinal (Pre-tx, 1-, 3-mo. post-tx)		• Network's drug use • Network's drug attitudes • Network composition • Structural characteristics (size, density, etc.)	3 mo. abstainers from opiate use. Abstinent - 29 Relapsed - 9	• Fewer drug users in network at 1 mo. - positively related • Fewer network members influencing participant to use drugs - positively related Many other positive changes occurred in networks over time (fewer drug dealers in networks, less support for using drugs in networks), however, these occurred for both groups of participants.
Westermeyer et al. (1988)	• 168 patients w/substance abuse diagnosis • Cross-sectional • Interviewed before referral to tx		• No. of intimate social network members (Net size) • No. of different plexus groups (e.g. family, friends, co-workers)	• Modified MAST • No. days substance use in last yr. • Lifetime no. yrs. substance use • Longest period of abstinence - (1) yr. & (2) 5 yrs.	Net Size • Larger network negatively related to MAST score • All other substance use variables - unrelated Plexus Groups • All substance use variables - unrelated
Moos et al. (1981)	• 55 recovered alcoholics • 58 relapsed alcoholics • 113 community controls • Recruiting at a residential alcoholism treatment centers • Longitudinal (BS, 6 mo.-, 2 yr.-follow-up) • Explored factors differentiating the 3 groups	• Family environment (quality of interpersonal relationships) • Work environment (quality of interpersonal relationships)	• No. of social contacts • No. of social activities • No. of confidants	• Drinking status at 2 yr. follow-up (recovered or relapsed)	• Community controls had more social contacts than the other 2 groups • Recovered group had more confidants than controls or relapsed group • Controls and recovered group had greater family cohesion

Author(s)	Methodology	Social Support Variables	Social Network (SN) Variables	Dependent Variable or Outcome	Variables related to positive outcomes (Abstinence, less substance use, treatment success)
Rosenberg (1983)	• 25 relapsers • 25 non-relapsers/non-problem drinkers • From residential alcoholism tx program • Retrospective	• Received family support • Received friend support • Comfort of living situation • No. people could go to for problems • Perceived support from SN contacts	• No. contacts in structured SN	Relapsers vs. non-relapsers	Multivariate test Support & SN variables unrelated to outcome Univariate tests • Family support - positively related • Friend support - positively related • Comfortable living arrangement - positively related • Perceived support in SN - positively related • More people to go to for problems - positively related • No. contacts - unrelated
Rhoads (1983)	• 49 heroin detox. patients • Longitudinal (1-,2-,3-mo. follow-up	• Perceived available support (Avail. Supt.) • Actual or Received support (Act. Supt.) • Presence of intimate relationships	• Overall network size • Heroin use of network members	30 day frequency of use for 11 abused drugs and alcohol	For females • High Act. Supt combined with stressful bad events related to less drug use at 1-mo. • Having an intimate relationship negatively related to 1- & 2-mo. drug use For males • Life events & lack of support unrelated to drug use • Fewer heroin-using friends - positively related
Joe & Simpson (1983)	• 882 opoid-addicted persons • Tx sample • Longitudinal (baseline, 6-yr follow-up)	Intimate Support • Live w/parents • Contact w/relatives • Family support for problems	Reference Group Time spent with drug users	Drug use classifications (3 abstinence categories and 2 relapse/continued use categories)	• Intimate Support - unrelated • Reference Group contact - negatively related to drug use
Macdonald (1987)	• 93 female alcoholics • Tx sample • Longitudinal (1-yr. follow-up)	• No. of close, emotionally supportive relationships (Primary) • No. supportive of sobriety (Supportive)	• No. unsupportive of tx goal of sobriety (Dysfunctional)	Drinking behavior (Abstinent or drinking in 3 mo. period before 1 yr. follow-up)	Primary - positively related Supportive - unrelated Dysfunctional - negatively related Demographics - unrelated

Author(s)	Methodology	Social Support Variables	Social Network (SN) Variables	Dependent Variable or Outcome	Variables related to positive outcomes (Abstinence, less substance use, treatment success)
Gordon & Zrull (1991)	• 156 inpatients (alcoholics or dually addicted) • Longitudinal (1-yr. follow-up)	<u>Support and Social Network Inseparable</u> • Perceived support for recovery (sobriety) • Participation support (joining in tx or supplying info. on participant) • Pattison Psychosocial Kinship Inventory used to enumerate network • 8 categories: Relationship (Family of origination, family of procreation, friends, co-workers) by Alcohol consumption (Co-drinker/non co-drinker)		<u>Treatment Recovery</u> 4 groups • Abstinent, abstinent w/slips, improved, no change (some corroboration by collaterals and medical records)	<u>6 direct effects tested using LISREL</u> • No. of co-workers participating who are not co-drinkers - positively related* • No. of family of origination participating who are co-drinkers - unrelated • No. of family of procreation participating who are not co-drinkers - unrelated • Family sobriety support - unrelated • Friend sobriety support - unrelated • Co-worker sobriety support - negatively related* <u>Indirect effects tested - predictors of the 2 significant paths (*)</u> • 4 of 5 significant paths indicated that having network co-drinkers was related to poorer outcomes.
Goehl et al. (1993)	• 70 methadone patients • Tx sample • Longitudinal (3-mo. follow-up)	General social support (ISEL)	Substance use of closest four in SN (SUSN)	<u>Drug use</u> - proportion of positive urine screens in approximately 12 screens over 3 mos.	• ISEL - unrelated • SUSN - negatively related

Social Support and Treatment Outcome

Six of the 16 studies featured in Table 1 related social support measures to substance abuse treatment outcomes. In four of the studies, general social support (including both family support and total support) measures were used, but in two studies, support was conceptualized as greater involvement of family or friends in treatment. General social support (e.g. emotional support, tangible support, etc.) was related to improved substance abuse outcomes in two studies (Booth, Russell, Soucek, & Laughlin, 1992; Grey, Osborn, & Reznikoff, 1986), showed mixed results in one (Ohannessian & Hesselbrock, 1993), and was not predictive of outcome in another (Oyabu & Garland, 1987). In the study by Oyabu and Garland (1987), however, drug use was not assessed, but treatment success was defined as better social and psychological well-being. Attempting to explain why support was unrelated to outcomes, these authors speculated that general social support measures may not be appropriate for a substance using population because the support questions ask about behaviors that may not be helpful to someone struggling with addiction problems. For example, the support items ask the person if they have people who support their actions, however, those actions may be destructive ones, such as excessive drug use.

When family and friends provided support by being involved in treatment, more positive treatment outcomes were likely. For instance, Siddall and Conway (1988) found that individuals who were discharged successfully from treatment had greater family involvement. In addition, individuals whose significant other participated in treatment were less likely at follow-up to be using cocaine as measured by urine screens (Higgins, Budney, Bickel, & Badger, 1994).

Social Networks and Treatment Outcome

Only 3 of the 16 studies investigated the impact of social networks upon treatment outcome. In these studies, treatment outcomes were related to network size (Favazza & Thompson, 1984), the number of intimate members and network breadth (Westermeyer & Neider, 1988), and the network composition and attitudes (Hawkins & Fraser, 1987).

In the study by Favazza and Thompson (1984), relapse was associated with having a smaller social network, but this was based on only 12 cases. In fact, individuals with poor outcomes constituted a group of only two persons. In an investigation of 168 patients labelled with a diagnosis of substance abuse, having fewer intimate network members was associated with: Higher symptom reports on the SCL-90 and the Beck Depression Inventory, more observed psychopathology on the Brief Psychiatric Rating Scale, and higher scores on a modified Michigan Alcohol-Drug Screening Test (Westermeyer & Neider, 1988). This study, however, was cross-sectional. In summary, the relationship between network size and outcome is unclear because these relationships have not been tested in well controlled, methodologically sound studies.

The impact of fellow network members who use substances probably is associated with poorer outcomes. For instance, a three-month follow-up study of 38 individuals who had received substance abuse treatment found that having more drug using network members was related to an increased likelihood of relapse (Hawkins & Fraser, 1987). These networks had members strongly influencing the respondent to use drugs (22.6 percent), but also influenced them against drug use (33.8 percent). Furthermore, it appeared that the social networks stayed about the same size over time, but for many respondents there were positive changes in network composition. New

members appeared to have been included in the networks because there were fewer long-term acquaintances and fewer drug users at follow-up.

Studies Incorporating Both Social Support and Social Networks

Assessing both social network and social support constructs in the same study may allow for a better understanding of the social processes that may impact relapse. The last seven studies cited in Table 1 investigated both network and support constructs. Two of the studies that have measured both social support and social network constructs have suggested that general support has positive effects (Macdonald, 1987; Rhoads, 1983), although support was unrelated to outcome in the investigation by Joe and Simpson (1983).

One advantage of assessing both support and network constructs in the same study is that the effects of each variable on substance use can be tested independently. In several instances the findings for support and networks have differed. Among methadone maintenance clients, social support was not related to drug use as measured by the number of drug positive urines, but having one close significant other who used drugs was related to drug use (Goehl, Nunes, Quitkin, & Hilton, 1993). The impact was significant: 63 percent of individuals with at least one drug-using network member tested positive, compared to only 36 percent of those with no drug-using significant others. Supporting this finding was the observation that having contact with current drug users was related to relapse in a six-year follow-up study of opiate-addicted persons (Joe & Simpson, 1983). Interestingly, Rhoads (1983) observed that males who avoided contact with former drug users had better outcomes, but for females it was social support that was related to positive outcomes (less substance use).

Social support has been conceptualized in many different ways in these studies. Sometimes support was assessed by scales measuring the quality of support, whereas in other studies support was defined by the number of supportive individuals in the person's social network. For instance, the number of individuals that a person could go to in response to problems (intimate members), was related to positive outcomes in the investigation by Rosenberg (1983). The mere number of social contacts (i.e. the size of the network) however, was unrelated to substance use.

In contrast to general social support, specific support for maintaining sobriety has not been widely studied, and may deserve greater attention. Sobriety support was unrelated to outcome in one study (Macdonald, 1987) and was actually related to negative outcomes in another (Gordon & Zrull, 1991). However, this negative effect was caused by support provided primarily by individuals who were not sober themselves, perhaps confounding support and network member drug use.

Methodological Shortcomings of Prior Studies

The studies cited previously have many notable methodological weaknesses. These shortcomings are highlighted in Table 2 and are discussed in the following sections.

Sample size and composition. Most of the reviewed studies had small sample sizes (N's from 38 to 60), which limits their statistical power and generalizability. Five studies had sample sizes from 12 to 59 persons, four had sample sizes 60 to 99 persons, and three studies had sample sizes larger than 100 persons. In many cases, these sample sizes were too small for the application of more sophisticated multivariate analyses. Furthermore, individuals with co-existing psychiatric problems were not explicitly

included in any of the reviewed studies. In fact, individuals with psychiatric problems systematically were excluded from five of them (Favazza & Thompson, 1984; Goehl, Nunes, Quitkin, & Hilton, 1993; Gordon & Zrull, 1991; Higgins, Budney, Bickel, & Badger, 1994; Rosenberg, 1983). Investigations by Westermeyer (1988) and Rhoads (1983) were the only published reports that investigated social networks and both mental health and substance abuse variables. Neither population, however, had co-occurring psychiatric problems or were labelled mentally ill.

Table 2.

Methodological Shortcomings of Research Reports Relating Social Support and Social Network Variables to Substance se or Treatment Outcomes

		Population's Problem Substance or Study Focus (Alc = Alcohol; Drug = Drug; MI = mentally ill)			Social Domains Assessed		Outcome of Interest			
Author(s)	N	Alc	Drug	MI	Support	Network	Relapse or Abstinence	Quantity-Frequency Substance Use or Problem Use	Longitudinal?	Methodological Shortcomings
Grey et al. (1986)	60	--	√	Excluded	√	--	--	√	√	Good study, author notes results should be replicated with a larger sample. Only used 1 scale to measure social support.
Oyabu & Garland (1987)	83	√	--	--	√	--	--	--	√	Did not examine substance use Did not examine short-term follow-up after treatment completion Social support measure given at end of treatment when recall about the time prior to admission may be inaccurate
Booth et al. (1992)	61	√	--	--	√	--	--	√	√	Reliance on readmission to Veteran's Affairs clinics as sole dependent variable, therefore, did not examine patterns of drug use
Siddall & Conway (1988)	100	√	√	--	√	--	--	--	--	Inadequate description of support constructs
Ohannessian & Hesselbrock (1993)	153	√	--	--	√	--	--	√	√	Cross-sectional

		Population's Problem Substance or Study Focus			Social Domains Assessed		Outcome of Interest			
		Alc = Alcohol; Drug = Drug; MI = mentally ill								
Author(s)	N	ALC	Drug	MI	Support	Network	Relapse or Abstinence	Quantity-Frequency Substance Use or Problem Use	Longitudinal?	Methodological Shortcomings
Higgins et al. (1994)	52	--	√	Excluded	√	--	√	--	--	Did not assess the possible mechanisms of how treatment involvement may have helped improve outcome. For instance, the provision of sobriety support.
Favazza & Thompson (1984)	12	√	--	Excluded	--	√	--	√	√	Minuscule sample size No statistics tests High attrition Poor conceptualization of social network
Hawkins & Fraser (1987)	38	--	√	--	--	√	√	--	√	Small sample
Westermeyer (1988)	168	√	√	--	--	√	√	√	--	Cross sectional
Moos et al. (1981)	226	√	--	--	√	√	√	--	√	No major limitations
Rosenberg (1983)	50	√	--	Excluded	√	√	√	--	--	Retrospective
Rhoads (1983)	49	--	√	--	√	√	--	√	√	Fairly small sample Large number of analyses performed Only 38% of all eligible clients participated
Joe & Simpson (1983)	882	--	√	--	√	√	√	--	√	36% attrition
Macdonald (1987)	93	√	--	--	√	√	√	--	√	Follow-up occurred at the end of 1 year, after most relapses would have typically occurred

		Population's Problem Substance or Study Focus Alc = Alcohol; Drug = Drug; MI = mentally ill			Social Domains Assessed		Outcome of Interest			
Author(s)	N	ALC	Drug	MI	Support	Network	Relapse or Abstinence	Quantity-Frequency Substance Use or Problem Use	Longitudinal?	Methodological Shortcomings
Gordon & Zrull (1991)	156	√	√	Excluded	√	√	√	--	√	No major limitations
Goehl et al. (1993)	70	--	√	Excluded	√	√	--	√	√	Network enumeration method not well specified nor is it one commonly used
The current study	~300	√	√	√	√	√	√	√	√	Mostly self-report data

Measurement. Concerning the measurement of the social networks, many studies have used different methods of enumerating the network, which makes comparisons across studies difficult. Also, some studies have used network enumeration methods with questionable reliability and validity. For instance, in one study (Favazza & Thompson, 1984) individuals could be considered social network members if they were dead or the individual had completely lost contact with them. These problems just highlight that more work needs to be done to develop and refine social network and support measures relevant to psychiatric populations (Mueller, 1980) and for addicted persons (Oyabu & Garland, 1987).

Lack of longitudinal design or adequate follow-up periods. Four of the studies in the table were cross-sectional or retrospective, but to examine how networks influence substance use typically implies a longitudinal design. There is a need for more longitudinal social network studies to investigate the ways in which networks change and to determine causal relationships among network characteristics and other variables (Ell, 1984; Mueller, 1980). Furthermore, the time periods chosen should reflect the fact that the most critical period for studying relapse is the first six months following treatment when most relapse episodes occur. Several studies had initial follow-up periods that extended well beyond this time frame.

High attrition. Several of the reviewed studies had substantial attrition, which limits their external validity. Favazza and Thompson (1984) interviewed 42 participants at baseline, but only located 14 and interviewed 12 participants (74 percent attrition) 11 months later. Joe and Simpson (1983) located 77 percent of their original target sample and interviewed 66 percent, which is fairly respectable given a six-year follow-up period.

High attrition rates, however, are not unique to social network studies of substance abusers. A meta-analysis of attrition rates for 85 substance abuse prevention studies found that the average follow-up interview completion rates were: 81 percent at three months and 78 percent at six months (Hansen, Tobler, & Graham, 1990).

High attrition, besides limiting statistical power due to a smaller sample size, can also threaten the generalizability of the study if attrition is differential. This is fairly common. Individuals reporting greater drug use at baseline have been more prone to be missing from the follow-up sample (Josephson & Rosen, 1978) or are more difficult to locate than other participants (Moos & Bliss, 1978). Rhoads (1983), for instance, reported that the 49 respondents who had completed all follow-up interviews represented only 38 percent of eligible participants. Furthermore, those lost to attrition tended to be older, had a longer history of drug use, and were involved in more illegal activities.

Reviewing the literature on the relationship of social networks to physical health, Berkman (1986) recommended that investigators expend the effort to minimize attrition because several prior longitudinal network studies experienced fairly substantial attrition. Moreover, in at least one of these studies, those who were socially isolated were more likely to be unlocated at follow-up. Consequently, when this type of differential attrition occurs, the generalizability of the findings and the ability to detect important substantive relationships among variables can become compromised.

Summary

After treatment, positive network changes may occur such as a shift in social network composition. It appears that successful maintenance of sobriety may be more strongly influenced by substance-using network members than having support for

maintaining sobriety, but few studies have tested both factors simultaneously. Unfortunately, many of the reviewed studies had serious methodological shortcomings such as a small sample size, poor measurement of social network variables, or high attrition. None of the reviewed studies were conducted with a dual diagnosis population despite the increasing awareness of the prevalence of co-existing psychological disorders in substance abuse populations.

Psychiatric and Substance Abuse Comorbidity

Prevalence of Dual Disorders

Psychiatric disorders and substance abuse disorders often co-occur for both treatment populations and the general population. Among cocaine addicts seeking substance abuse treatment, 55.7 percent met criteria for a current psychiatric diagnosis and 73.5 percent for a lifetime diagnosis (Ziedonis, Rayford, Bryant, & Rounsaville, 1994). For 501 patients seeking assistance for alcohol or drug treatment, 65 percent had a current Diagnostic Interview Survey mental disorder and 78 percent had a lifetime mental disorder, in addition to their substance use (Ross, Glaser, & Germanson, 1988). As cited earlier, prevalence estimates of substance abuse in psychiatric populations is accordingly quite high, with prevalence estimates of 20 to 75 percent of patients (El-Guebaly, 1990).

It is not appropriate to generalize the high rates of any co-morbid conditions that occur among treatment populations to the general population because individuals with several types of disorders are overrepresented in treatment settings (Kessler & Price, 1993). Incorrect generalization from treatment prevalence to true community prevalence is known to epidemiologists as Berkson's bias. However, fairly high rates of co-existing

substance and mental illness problems also have been observed in non-institutionalized populations. In the general population survey conducted for the National Institute of Mental Health, the Epidemiological Catchment Area study, more than half of the individuals with a substance abuse disorder qualified for a mental disorder; individuals with a mental disorder were nearly 3 times more likely to have an addictive disorder (Regier, Farmer, & Rae, 1990).

Treatment Difficulties Encountered with Dual Diagnosis

Individuals with these dual disorders present several challenges to the treatment system. For example, dually diagnosed patients: (1) use disproportionately greater amounts of medical, social, and legal services; (2) require more staff time in psychiatric and substance abuse treatment programs; (3) are more likely to disrupt medical and nonmedical staff relations; and, (4) have extremely high recidivism rates (National Institute on Drug Abuse, 1991). Indeed, in a study of 460 male alcoholic and 282 drug-addicted persons from six different rehabilitation programs, the severity of the psychiatric condition was the best predictor of response to drug abuse treatment (McLellan, Luborsky, Woody, & Druley, 1983). Individuals with lowest levels of psychiatric severity improved in every treatment program, but practically none of the individuals with the highest levels of psychiatric severity showed improvement in any of the treatment programs. In addition, a ten year follow-up study of former drug abuse patients found poorer employment and psychiatric outcomes for individuals with chronic psychosis compared to patients with acute psychosis or no evidence of psychosis (Perkins, Simpson, & Tsuang, 1986).

Given the widespread scope of dual diagnosis and the treatment difficulties facing individuals with these dual problems, promising approaches to treatment are urgently needed. Unfortunately, there is a dearth of longitudinal data on this population that might indicate which factors affect the long-term course of recovery (Brown, Ridgely, Pepper, Levine, & Ryglewicz, 1989). Two longitudinal studies have been recently published, but were based on preliminary reports each consisting of fewer than 30 participants (Hoffman, DiRito, & McGill, 1993; Ries & Ellingson, 1990).

Further contributing to the lack of an adequate knowledge base on dual diagnosis is the exclusion criteria employed in substance abuse and mental health studies. As demonstrated earlier, investigations in the substance abuse literature commonly exclude individuals with known psychiatric problems, which is also true of the psychiatric literature whereby persons with substance abuse problems are similarly excluded from study participation (Cohen & Kochanowicz, 1989; Wasylenki, Goering, Lemire, Lindsey, & Lancee, 1993, for example).

As described at the end of Table 2, the current study remedies most of the methodological shortcomings of prior social network studies on the topic of substance abuse. The current study has a large sample size (n over 300), is prospective and longitudinal, and was characterized by low attrition. Furthermore, a standardized social network methodology was employed in the present study.

Hypotheses of the Present Study and Rationale for Model

Based on the reviewed literature, a longitudinal model predicting alcohol and other drug use following treatment is proposed and featured in Figure 1. Two general classes of variables are used to predict substance use following discharge from treatment.

Pre-discharge variables include experimental condition, treatment duration, demographics, and family involvement in treatment. Post-discharge variables include sobriety support of network members, network member substance use, the number of intimate network members, and psychiatric distress. Each of the variables in the model and the hypothesized paths were carefully chosen based on the findings of prior empirical studies. The rationale for the model is summarized below.

Pre-Discharge Variables.

The direct effect of experimental condition upon reducing substance use is being tested because numerous studies have shown that substance abuse treatment is effective in decreasing later substance use and problems resulting from substance use (Institute for Health Policy, 1993; Rydell & Everingham, 1994; Simpson & Sells, 1983). An underlying reason for the effectiveness of treatment might be that the treatment program (a) encourages the client to avoid former drug-using network members and (b) helps the client muster support from network members for staying clean and sober. For example, prior studies have demonstrated that individuals who showed the most improvement in terms of reduced substance use successfully avoided their former drug-using social contacts and increased the amount of social support they received (Hawkins & Fraser, 1987; Rhoads, 1983). Therefore, these paths are tested in the model. The path leading from experimental condition to decreased psychiatric distress was not hypothesized because both treatment groups in the present study (described later in the Methods section) received similar psychiatric treatment; however, the experimental group was given more intensive substance abuse services.

Another factor related to substance use outcomes is the duration of treatment. Goehl and colleagues (1993) found that individuals who spent more time in treatment were less likely at follow-up to have used drugs based on urinalysis results. Furthermore, in an overview of the research contributions of the Drug Abuse Reporting Program, Simpson and Sells (1983) also noted that longer treatment duration was related to greater treatment benefit.

Several studies reviewed earlier showed that family support or significant other participation in treatment has been related to greater retention in treatment (Siddall & Conway, 1988) and more positive treatment outcomes (Grey, Osborn, & Reznikoff, 1986; Higgins, Budney, Bickel, & Badger, 1994). Therefore, the extent of family involvement in treatment has been incorporated into the model. Demographic variables have been included in the model as control variables because prior work has shown that demographic characteristics such as sex, race, age, education level, employment status, and marital status have been related to substance use or treatment outcomes (Lex, 1991; Macdonald, 1987; Smith, 1993).

Post-Discharge Variables.

Given the problems with using general social support measures for addicted populations mentioned by Oyabu and Garland (1987), a promising approach might be to assess the specific support for maintaining sobriety that is provided by network members. Although this construct has not been widely tested in the substance abuse field, support for maintaining behavior change has been related to increased likelihood of quitting smoking (Coppotelli & Orleans, 1985; Mermelstein, Lichtenstein, & McIntyre, 1983) and for other healthy behavior changes (Zimmerman & Connor, 1989).

Network member drug use has been shown to adversely affect an individual's sobriety in many studies. Individuals spending] more time with other drug users are more likely to use opiates themselves (Hawkins & Fraser, 1987; Joe & Simpson, 1983; Rhoads, 1983). The number of intimate network members, or confidants, has also been related to substance use. Rhoads (1983) found that individuals lacking intimate relationships reported greater drug use at follow-up. Among 168 persons with substance abuse diagnoses, those with larger networks had fewer alcohol-related problems as measured by a modified MAST (Westermeyer & Neider, 1988). Finally, successfully recovered alcoholics reported more confidants than relapsed alcoholics two years after study recruitment (Moos, Finney, & Chan, 1981). Thus, the number of close friends, or the intimate network, has been related to substance abuse measures in several diverse studies.

It was further hypothesized that affiliating with network members who use alcohol or drugs will be more strongly related to relapse or problem substance use than support from family during treatment, sobriety support from the network, and the number of intimate network members. This hypothesis was based on findings from the substance abuse literature that have never been applied to a dual diagnosis sample. In the studies reviewed in Table 1, the adverse impact of substance using network members has been related to relapse more consistently than the presence of the various forms of social support.

The final post-discharge factor related to substance use was psychiatric distress. The relationship between the severity of psychiatric problems and their negative impact on treatment outcome has been demonstrated in research by McLellan and colleagues

(McLellan, Luborsky, Woody, & Druley, 1983), although their sample was not dually diagnosed. Therefore, psychiatric distress is proposed as a predictor variable and not an outcome variable because the role of psychiatric distress in predicting substance abuse outcomes among a dual diagnosis population was not tested in any of the reviewed studies.

One possibility not tested in any of the reviewed studies is that a person's substance use may influence them to assemble a network of fellow substance users. In other words, it is not the network that influences the substance use of the focal person, but it is an active process of the focal person to structure their network based on their drug use inclinations or habits. Thus, the significant relationships between social network variables and substance use observed in the cross-sectional studies may not have been caused by social network influencing substance use. Brown, Vik, and Creamer (1989), for example, suggested that adolescent drug relapse can be caused by "situational self-selection" (p. 299), whereby teens who desire to use drugs seek out their pretreatment network of drug-using friends. The possibility of substance use leading changes in the social network composition is tested in an exploratory fashion in the proposed model (i.e. alcohol or other drug use at Time 2 is used to predict the three network variables at Time 3). Finally, the stability of the measures is assessed by the path from each construct at Time 2 leading to that same construct at Time 3.

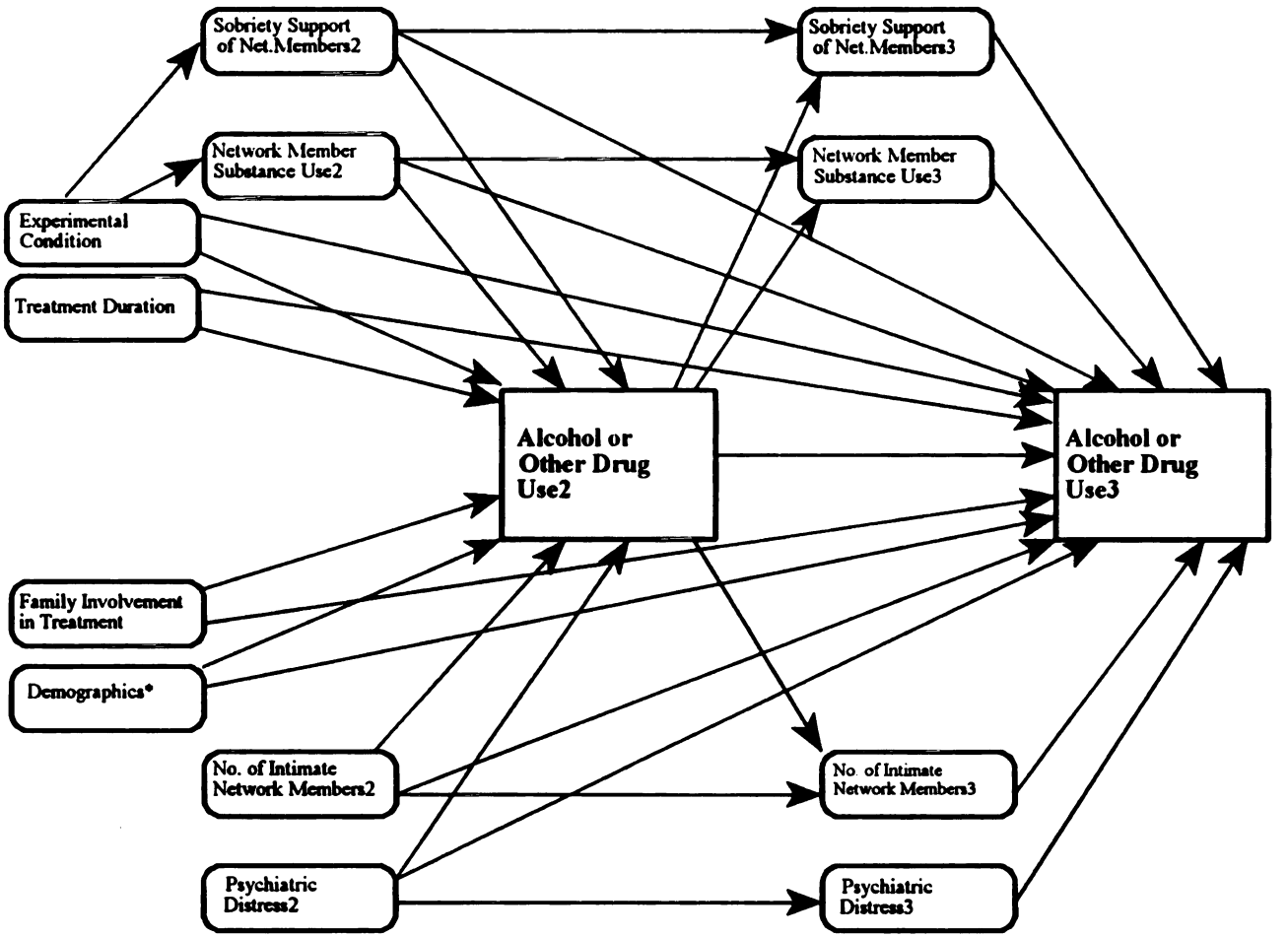

Figure 1. Hypothesized panel model predicting substance use. Time2 is short-term follow-up and Time3 is medium-term follow-up. Key Net. = Network. *Demographics are used as control variables.

CHAPTER 2

METHOD

The current study is part of the Substance Abuse and Mental Illness (SAMI) Project, a larger National Institute of Mental Health-funded evaluation of an innovative dual diagnosis treatment program at a public psychiatric hospital. The larger study employed a longitudinal design with five follow-up periods. The present study utilizes data obtained at baseline and during the first two follow-up periods.

Participants

The participants were consecutive admissions of men and women to Northville Regional Psychiatric Hospital (NRPH) in Northville, Michigan. All incoming patients were screened for eligibility based on diagnosis, problem behavior, and history of substance abuse. Eligibility criteria required that patients screen positively for substance abuse problems, based on a substance use and alcohol screening instrument similar to the Michigan Alcoholism Screening Test (Selzer, 1971). In addition, patients must not have been acutely psychotic and must verbalize some motivation to receive treatment for their substance abuse problems. Patients were excluded from consideration if they were severely cognitively impaired, were developmentally disabled, or if they had shown a predisposition toward violence or inappropriate sexual behavior, which might cause problems on one of the experimental wards that house both men and women on the same

ward. Participant recruitment occurred from June 1991 to June 1992 and the last follow-up interview was conducted in April 1994.

Out of 2,806 incoming hospital patients during the study period, 531 patients met the initial eligibility criteria and agreed to research participation. Further eligibility criteria for the study were developed and required that patients spend at least five days in treatment, which allowed all baseline measurements to be performed and assured a minimum level of treatment. This additional criterion was applied shortly after recruitment began when it was observed that some participants were being discharged abruptly after receiving a court hearing to determine if their involuntary commitment was justified. Almost all of the patients at NRPH were involuntarily committed based on meeting one of the following criteria: (1) being a threat to themselves, (2) being a threat to others, or (3) being unable to care for their basic needs. Additional participant loss occurred if respondents dropped out of the study before completing baseline measurements. Thus, there were 467 individuals with complete baseline information. Of that number, 395 individuals were successfully interviewed for the 2-month follow-up (84.6 percent) and 391 individuals at the 6-month follow-up (83.7 percent).

Detailed information on the demographic characteristics of these 467 patients is featured in Table 3. Participants were predominantly male, African American, and had graduated from high school. Based on NRPH discharge records, the most common diagnoses were: 27.6 percent schizophrenia and related, 8.4 percent major depression, 6.0 percent bipolar depression, 15.0 percent mild affective disorders, 21.0 percent organic mood disorders, 9.5 percent antisocial personality disorders, and 16.1 percent adjustment disorders. Determination of these psychiatric diagnoses was made by the psychiatrists at

NRPH using their clinical judgement. The hospital does not use a standardized diagnostic instrument, nor did the research team independently validate these diagnoses.

According to participant self-report, 32.5% had no prior psychiatric hospitalizations, 30.1% one or two hospitalizations, and 37.3% had three or more. Regarding substance abuse treatment, 33.6% reported never receiving any prior treatment, 37.9% had received either residential alcohol or drug treatment, and 28.5% reported receiving both alcohol and drug treatments. The substances that caused the primary problems leading to admission were as follows: Alcohol and another drug (32.0 percent), alcohol alone (31.6 percent), cocaine (21.1 percent), two or more drugs (11.8 percent), heroin (1.5 percent), and 1.2 percent other drugs (e.g. cannabis or sedatives). Finally, less than one percent said that they did not have a drug problem.

Table 3. Demographic Characteristics of Dual Diagnosis Participants at Baseline

Demographic Variable	Value
Mean age in years ± Standard Deviation (SD)	33.4 ± 7.3
Sex	
Male	74.3%
Female	25.7%
Race/Ethnicity	
African-American	76.2%
Non-Hispanic White	23.3%
Hispanic	.2%
Native American	.2%
Median Years of education ± SD	11.20 ± 2.30
Employment pattern	
Full-time	30.3%
Part-time	22.5%
Retired/disabled	10.2%
Unemployed	33.2%
Other	3.7%
Marital status	
Never married	62.9%
Married	8.9%
Separated, divorced	26.1%
Widowed	2.1%
Percent ever charged with any crime	
Yes	73.2%
No	26.8%
Experimental Condition	
Referred to experimental Wards	64.7%
Referred to usual care Wards	35.3%

n = 467; Sample sizes for variables range from 311 (due to missing data on race) to 467.

Design

An overview of the design of the current study is given in Table 4. Follow-up interviews were conducted at two and six months post-discharge. The 2-month follow-up period was chosen because the first follow-up needed to occur shortly after discharge for detecting short-term treatment effects. In addition, it would take approximately two months for participants' personal networks to stabilize after their release from the treatment facility. Furthermore, having a short time between discharge and the first follow-up period helped the project maintain contact with participants, thereby improving the retention rate. The 6-month follow-up period was chosen because the majority of relapse episodes occur within the first six months following treatment completion (Hunt, Barnett, & Branch, 1971).

Although not a focus of the present study, the larger investigation employed a randomized experimental design to evaluate the impact of the specialized dual diagnosis treatment program. After recruitment into the study, project staff administered a baseline interview and then randomly assigned patients to either the specialized Mental Illness - Chemical Dependency unit (MI-CD) or to a usual care unit. The baseline interview contained the Addiction Severity Index (McLellan, Luborsky, Woody, & O'Brien, 1980). Patients were given the second part of the baseline interview, which contained the social network questions and all other baseline measures, within three days. The decision to split up the interview was based on pilot test results that indicated the duration of the full interview was too long for most participants. The final in-hospital interview was completed before the participant's discharge, or at the end of four weeks after initial

admission, whichever came first. Data collected with the discharge interview were not used in the current study.

Table 4

Design of the Dual Diagnosis Study

		Psychiatric Hospital Portion (Time 1)				Community Follow-up (Time since discharge)	
		Experimental Condition	Baseline Interview (Part II)	Referred to experimental ward	Discharge Interview	Time 2 (2 months)	Time 3 (6 months)
Baseline Interview (Part I)	Random Assignment						
		Usual Care Condition	Baseline Interview (Part II)	Referred to usual care ward	Discharge Interview	Time 2 (2 months)	Time 3 (6 months)

The project guaranteed participants that all interview and follow-up location information would be kept strictly confidential and that they would be paid for their participation. Individuals were compensated: $10.00 when they had completed the second part of the baseline interview, $15.00 after completing the discharge interview, and $20.00 after completing each of the five follow-up interviews. All of the study procedures were approved by human subjects review committees at Michigan State

University and at the Michigan Department of Mental Health (See APPENDIX A for the consent form). Those who indicated that they would be willing to participate were asked to sign an informed consent statement and were then given the first portion of the baseline interview. After the baseline interview was completed, project staff gave each patient an envelope that contained a random assignment card to either the experimental condition (MI-CD) or to a regular NRPH acute admission ward with a ratio of 3:2 experimental participants to usual care participants. As mentioned earlier, the experimental design is not a critical component of the current study; however, the two conditions are briefly described for descriptive purposes.

The Experimental Treatment Program

The MI-CD unit provided specialized, co-educational treatment on two 30-bed wards. Similar to other reports (Minkoff, 1989), the program philosophy endorsed the belief that both mental illness and chemical dependency are bio-psychosocial illnesses. The program incorporated comprehensive treatment modalities addressing physical, psychiatric/psychological, family, social/interpersonal and substance abuse problems. The MI-CD program was didactic and intensive--structuring 16 hours of the patient's weekday with scheduled therapeutic activities, such as psychiatric treatment, individual/group psychotherapy, family therapy (as needed), 40 educational lectures, group discussion and self-help groups on the ward, family education, activity therapy, medical services and aftercare planning.

The Usual Care Program

Usual care participants were assigned to one of the acute care admissions wards at NRPH depending upon availability. Treatment on these wards featured activity therapy,

individual and group psychotherapy, and access to hospital-wide AA and NA groups. Usual care participants received the same treatment provided to the other non-substance abusing patients at NRPH. This treatment approach was identical to the way in which all dual diagnosis patients were treated before the creation of the MI-CD unit. Treatment staff on the usual care wards did not receive any special training in substance abuse, in contrast to the specialized training received by MI-CD unit staff. Finally, the usual care wards had a lower staff-to-patient ratio than the MI-CD unit.

Community Follow-up Procedures

Follow-up interviews were conducted at 2-, and 6-months post-discharge. As mentioned earlier, most relapse episodes occur in the first six months of treatment completion, making this an ideal period for studying the social factors influencing the relapse process. Experimental participants spent an average of 50.8 (SD = 32.1) days in treatment, compared to 30.8 (SD = 25.4) days for usual care participants.

Given that previous studies in the dual diagnosis and substance abuse literature have been marked by high attrition, extensive efforts were employed to ensure high rates of follow-up interview completion. Procedures for locating participants in the community were similar to approaches employed by other researchers conducting longitudinal studies (Cohen, et al., 1993; Davidson, Redner, Amdur, & Mitchel, 1990; Goldstein, Abbott, Paige, Sobel, & Soto, 1977; Rumptz, Sullivan, Davidson, & Basta, 1991). The project's general tracking approaches were to: Make contacting the project convenient and enjoyable for each participant, reward participants when they contacted the project office by phone or mail, contact participants frequently, reward interviewers for locating participants and completing interviews in a timely fashion, and dedicate

substantial resources to tracking. The population in this study was generally considered difficult to locate because some participants had sparse tracking information due to having few friends and relatives or because they did not have a stable residence.

Tracking information and release of information forms were collected at baseline and confirmed or updated at discharge as needed. Two release forms were completed, one for friends and relatives and another for formal service agencies. For the first release form, respondents provided the names of friends and relatives that project staff could contact in the event that the interviewer had difficulty finding them. The other release form was developed in conjunction with the Detroit-Wayne County Community Mental Health Board (D-WCCMHB) to allow access to service utilization records for the purpose of locating any difficult-to-find participants. If interviewers experienced difficulties in locating a particular participant, the D-WCCMHB representative would identify the most recent treatment services utilized and then contact the agency or agencies that provided the services in order to obtain more information about the client's location. Interviewers also probed to generate the names of places where the participant may have had criminal justice system involvement, where they have received previous medical and psychiatric services, the churches they attended, and the shelters frequented. New release and tracking forms were completed after each of the two community follow-up interviews.

If the relatives/friends were reluctant to help locate the participant and the interview was at least two weeks late, they were offered $10.00 to $25.00 for their help in coordinating the interview. In addition, interviewers were also offered monetary incentives for completing interviews in a timely fashion. If the participant could not be

found by the previous approaches, more formal procedures were employed, such as examining the hospital's discharge records and checking the respondent's service utilization patterns. Finally, as a last resort, a list of "lost" participants was distributed to the local morgue on a regular basis to help locate deceased participants.

Measures

An overview of the measures and data sources is provided in Table 5. Psychometric information (i.e. internal consistency) based on the present sample is provided for most study measures. In addition to assessing the internal consistency of scales in this study, the inter-rater agreement for these scales was also computed for 45 interview pairs in which a project staff member coded the interview while the primary interviewer questioned the respondent. Because more sophisticated analyses are ongoing, the agreement statistic presented here is based on the percent agreement between pairs; percent agreement was not corrected for chance agreement. However, the typical rates of agreement are sufficiently high (averaging $\geq$ 98%) that even chance-corrected measures would certainly be acceptable.

Addiction Severity Index (McLellan, Luborsky, Woody, & O'Brien, 1980) The ASI is a structured clinical and research instrument that assesses the severity of seven unique problem areas commonly found in patients with alcohol and substance problems. These seven domains are: Medical, Employment, Legal, Drug/Alcohol, Family/Social, and Psychiatric. However, the medical, employment, legal, and family/social sections were not used in the current study. For the first section of each problem area, participants are asked several objective and potentially verifiable questions about their problem symptoms. In the latter portion of the section, participants provide subjective

information about the extent to which they have been bothered by these problems and the importance of treatment based a 5-point response scale ranging from 0 "Not at all" to 4 "Extremely."

Table 5

Measures and Time Periods for the Dual Diagnosis Study

Time Frame	
Baseline Measures (Time 1)	Post-Discharge Follow-up Time #2 (2 months) Time #3 (6 months)
Social Support • Family Involvement in Treatment (Involved, Moderately involved, Not involved) Demographics (Possible Co-variates) • Sex • Age • Ethnicity (White/Non-white) • Years of Education • Marital Status • Employment status (typical employment pattern over past 3 years) Experimental Condition • Experimental (MI-CD) wards • Usual Care wards Treatment Duration (Number of days)	Psychiatric Distress (Both scales standardized and combined into one score) • Symptom Checklist - 10 (SCL-10) • Addiction Severity Index (ASI - Psychiatric Composite Score Social Support • Sobriety Support of Network Members (Mean reported support for staying clean) Social Network • Number of intimate network members (Total number of people mentioned in response to first probe question) - confidants • Network Substance Use (Proportion of network members reported to use drugs or alcohol) Alcohol and other Drug Use • Alcohol Relapse (Use of alcohol to intoxication in the 30 days prior to the interview) • Drug Relapse (Any use of 12 substances in the 30 days prior to the interview) • ASI Alcohol Composite score • ASI Drug Composite score

The ASI yields both interviewer severity ratings indicating need for additional treatment and also composite scores that are indicators of overall problem severity and are capable of showing change over the last 30 day period. The Interviewer Severity Ratings were designed to be used for treatment planning and the composite scores for research purposes. Therefore, the ASI composite scores were used in the present study.

In this study, for individuals who had mostly complete data (66 to 75 percent complete), median substitutions replaced missing scores. Composite scores were composed of items that referred to the prior month, which allows these scores to measure change. For example, the alcohol composite score was derived from six questions based on the prior 30 days: (1) numbers of days alcohol use, (2) number of days alcohol used to get drunk, (3) number of days experiencing alcohol problems, (4) the amount of money spent on alcohol, (5) how troubled the person was by alcohol problems (ranging from 1=Not at all to 5=Extremely), and (6) how important treatment is for their alcohol problems (same 5-point scale). The responses to each item are divided by the product of the highest possible score for that item and the total number of items composing that particular composite score. For instance, the number of days of alcohol problems is divided by 180 (30 days X 6 items). It should be noted that the amount of money spent on alcohol can have extreme values with non-normal distributions; therefore, the scale developers adjust for these responses by using a log normal value for the response. The resulting composite scores range from 0 to 1.0 with higher scores indicating more serious problems. Each of the composite scores; however, is scaled differently and therefore scores are not directly comparable across the different domains. For example, a score of

.14 on the Drug Composite does not necessarily equate with a score of .14 on the Alcohol Composite.

In the present study, the percent agreement between matched interviewer pairs was 97 percent for the alcohol and drug sections of the ASI and 96 percent for the psychiatric section. The original report documents that the ASI Alcohol and Drug Composite scores were significantly correlated with the number of overdoses, total years of regular use of alcohol/drugs, and the amount spent on alcohol/drugs per week. The average concordance between trained interviewers is .89 and the interview has adequate test-retest reliability. Stronger evidence for the concurrent validity of the ASI has also been provided (Kosten, Rounsaville, & Kleber, 1983). However, some caution is warranted when applying this measure to persons with dual diagnoses because this measure has not yet been validated with this population (Ridgely, Osher, & Talbott, 1987).

Symptom Checklist -10 (Nguyen, Atikisson, & Stegner, 1984). The SCL-10 is a 10-item version of the SCL-90 (Derogatis, Lipman, & Covi, 1973) that is used as a global index of psychopathology or discomfort. The SCL-10 was originally developed based on the findings of factor analysis of SCL-90 scores which suggested a five factor solution; however, three factors were the most clearly defined and accounted for the most variance. Therefore the items constituting the SCL-10 represent three factors (Depression, Somatization, and Phobic Anxiety). The reliability of this scale in the current study was .91 (coefficient alpha) and in study of 3,628 individuals receiving service treatment was .88. There was 96 percent inter-rater agreement for this measure.

Social Network and Sobriety Support. The approach to measuring the participant's social networks was based on the approach of McCallister and Fischer (1983). This methodology, which uses probe questions to enumerate the network, is commonly used with general population samples, but has also been recommended for research with schizophrenics and other special populations (Phillips, 1981).

Five probe questions were used to elicit core network members. The first question was "When you are concerned about a personal matter--for example, something you are worried about or you are concerned about someone you are close to--who do you talk with?" This question, originally developed for use in the General Social Survey by Burt (1984), has also been used with chronic mental patients (Holmes-Eber & Riger, 1990). One difficulty reported by the latter authors was that several individuals were unable to think of anybody and therefore two additional probes needed to be developed. The four other questions used in the current study asked participants who they spend time with, who they would borrow money from, if they have good friends in either an AA or NA group, and finally if there is anyone else important in their life that they have not mentioned. After the network has been enumerated, participants are then asked to list the first name and the first letter of the last name of each network member, a procedure which still preserves the confidentiality of the alters.

After the list of names is compiled, the name interpreter questions are asked. For example, detailed background information is asked about each person including demographic questions (i.e. sex, relationship, and whether they met the individual at the psychiatric hospital), the frequency of contact with the network member, how important this person is to the respondent, and how satisfied the participant is with their contacts.

None of the previous name interpreter questions were used in the present study. Of greater interest is the proportion of the total network that drinks alcohol or does drugs (Network Member Substance Use), which is calculated by dividing the reported substance use of the members by the total number of network members elicited from the five probe questions. Furthermore, the support the individual receives from network members for helping the person to stay clean and sober (Sobriety Support) is simply the average rating across all reported network members. The inter-rater agreement was 97.8 percent in the present study. See APPENDIX B for a copy of the network measure used in this study.

Family Involvement in Treatment. The extent of family involvement in treatment was coded based on hospital records. Project staff referred to pre-release discharge summaries and psychosocial summaries recorded by social work staff and coded the extent of family involvement into one of three categories: Involved in treatment (60.3 percent), only moderately involved (18.7 percent), and not involved (20.5 percent). The psychometric properties of this rating scheme were not assessed.

Demographics. Records kept by the psychiatric hospital were accessed for basic demographic information (e.g. ethnicity, educational level, date of birth).

Data Analysis

First, a series of analyses were conducted to compare those individuals with missing data on one or more of the 25 study variables (approximately 180 cases) with those individuals having complete longitudinal data for Baseline, Time 2, and Time 3 data. These analyses help provide an understanding of potential biases resulting from

nonresponse error and are commonly reported (Wasylenki, Goering, Lemire, Lindsey, & Lancee, 1993, for example).

The panel model proposed in the introduction will be tested using path analysis. The path coefficients for this model were determined using hierarchical multiple regression, which allows variables to be entered in blocks specified by the user. Any demographic variables significantly correlated with the dependent variables were used as covariates that were entered in the first block along with experimental group condition, length of stay, and family involvement in treatment. In the second block, for example, variables were entered in the following order: Mean level of Sobriety Support, Network Member Drug Use, Intimate Social Network Members, and Psychiatric Distress.

There are four different dependent variables and therefore four different sets of regression analyses. First, separate analyses were conducted for alcohol and for other drugs, which is fairly common in the substance abuse literature (see Ellickson & Hays, 1992). Furthermore, for both substances, analyses were conducted for relapse (based on the 30 days prior to the 6-month follow-up interview) and also for the extent of substance abuse problems as measured by the Addiction Severity Index. Logistic regression was used for predicting whether relapse occurred, whereas linear multiple regression was used for the ASI composite scores.

CHAPTER 3

RESULTS

Several analyses were conducted to test the hypotheses about the relationships between substance use outcomes and social networks, social support, and psychiatric distress. A brief overview of the data analysis plan is provided here. First, descriptive statistics are presented on the social network variables at both follow-up periods. Next, a series of analyses were conducted to compare individuals with missing data with those individuals having complete data on all study variables. A correlation matrix of all 25 study variables is then presented and discussed. The hierarchical multiple regression and logistic regression analyses that were used to obtain the standardized path coefficients for the model are then presented to provide more detail about the relationships between the predictor variables and the substance use outcome variables. Figures of the four path models, trimmed of nonsignificant pathways, are then presented. Finally, the significant direct and indirect pathways leading to substance use at follow-up are discussed.

Descriptive Characteristics of Social Networks

Descriptive characteristics of the social networks at follow-up are provided in Table 6. The social network variables were fairly stable from the 2- to the 6-month follow-up. The typical social network was fairly small in size. The social networks of this dually diagnosed sample were composed of approximately five members at both the

2- and 6-month follow-up. Eleven participants (2.8 percent) at both follow-up periods were complete isolates, that is they reported having no members in their social network. In contrast, a subset of over 10 percent of the participants reported having networks composed of 10 or more members at the first follow-up .

The number of intimate network members was based on responses to the first network enumeration question, which asked about the number of individuals with whom the respondent can discuss their personal problems. About two of the five network members at each follow-up period were intimate members, or confidants. Relatives constituted just over half of the network members, on average. At both time periods, over 40 percent of respondents had networks composed of at least two-thirds relatives.

The majority of network members were not users of alcohol or drugs. On average, about one-fourth of the network members were reported by the respondent to consume alcohol or drugs. Thus, the typical network would have about one alcohol or drug user out of the five network members. A high proportion of networks were composed entirely of "clean and sober" members at both the 2-month (44.8%) and 6-month (39.6%) follow-ups. Furthermore, less than six percent of the networks were composed entirely of alcohol and drug-using members.

Table 6

Descriptive Statistics on Social Network Characteristics at 2-month (Time2) and 6-month (Time3) Follow-up

	Time 2				Time 3			
Variable	Value	Frequency	%	Mean ± SD	Value	Frequency	%	Mean ± SD
Overall Network Size	0	11	2.8	4.98 ± 3.14	0	11	2.8	4.85 ± 2.88
	1	30	7.6		1	21	5.4	
	2	44	11.1		2	41	10.5	
	3	59	14.9		3	68	17.4	
	4	50	12.6		4	68	17.4	
	5	68	17.1		5	47	12.1	
	6	35	8.8		6	41	10.5	
	7	29	7.3		7	32	8.2	
	8	20	5.0		8	20	5.1	
	9	11	2.8		9	14	3.6	
	10+	40	10.1		10+	27	6.9	
No. of Intimate Members[a]	0	51	12.8	1.92 ± 1.48	0	42	10.8	1.93 ± 1.40
	1	127	32.0		1	119	30.5	
	2	106	26.7		2	129	33.1	
	3	67	16.9		3	59	15.1	
	4	27	6.8		4	20	5.1	
	5+	19	4.8		5+	21	5.5	

Table 6 (Cont.)

	Time 2				Time 3			
Variable	Value	Frequency	%	Mean ± SD	Value	Frequency	%	Mean ± SD
Proportion Relatives	0.00	43	11.1	0.56 ± 0.31	0.00	47	12.4	0.56 ± 0.31
	.01-.33	63	16.4		.01-.33	56	14.8	
	.34-.66	109	28.2		.34-.66	106	27.9	
	.67-.99	103	26.7		.67-.99	114	30.1	
	1.00	68	17.6		1.00	56	14.8	
Proportion Alcohol or Drug Users	0.00	173	44.8	0.24 ± 0.28	0.00	150	39.6	0.26 ± 0.29
	.01-.33	102	26.4		.01-.33	115	30.3	
	.34-.66	72	18.7		.34-.66	67	17.7	
	.67-.99	25	6.5		.67-.99	28	7.4	
	1.00	14	3.6		1.00	19	5.0	

[a] Based on the first network enumeration question - people with whom they can discuss personal problems.

Missing Data Analyses

In this study, missing data was caused by participant refusals, participant deaths, and the inability of the interviewer to locate the participant. Most of the attrition was caused by the latter cause, which is typical of most panel studies dealing with similar populations (i.e. persons with substance abuse or psychiatric problems). Eight participants were deceased over the course of follow-up data collection based on reports of relatives and records maintained by the Wayne County Morgue and the Michigan Department of Public Health. Substantial amounts of missing data can reduce sample size, thereby lowering statistical power, and also introduce nonresponse error if participants with missing data differ from participants with complete data. Therefore, a series of analyses were undertaken to provide a better understanding of potential sources of nonresponse error in this investigation.

Of the original 467 participants interviewed at baseline, 395 and 391 were interviewed at Time 2 and Time 3, respectively. In addition to unit nonresponse caused by this participant attrition, item nonresponse was caused by respondents refusing to answer particular interview questions. Moreover, item nonresponse can be caused by interviewers neglecting to record participants' responses and also by errors made during data keypunching. One significant source of item nonresponse in this study was incomplete data (53 cases missing) for the race variable that was coded from existing NRPH records. Finally, some participants were interviewed only at the 2-month follow-up and not the 6-month follow-up, or the reverse, which further contributed to listwise missing data.

Table 7

Comparison Among Participants Having Complete and Missing Data on Demographic and Substance Use Variables

	Level of Data Completeness[a]					
	Missing 1 or more variables n = 184 (39.4%)		Complete Data n = 283 (60.6%)		Totals[b] (N = 467)	
	n	%	n	%	n	%
Sex						
Male	137	74.5	210	74.2	347	74.3
Female	47	25.5	73	25.8	120	25.7
	χ^2 (1) = .00, n.s.					
Race						
White	31	23.7	66	23.3	97	23.4
African American	100	76.3	217	76.7	317	76.6
	χ^2 (1) = .01, n.s.					
Marital status						
Not married	165	90.7	259	91.5	424	91.2
Married	17	9.3	24	8.5	41	8.8
	χ^2 (1) = .10, n.s.					
Employment status						
Not employed	89	49.4	126	44.5	215	46.4
Employed	91	50.6	157	55.5	248	53.6
	χ^2 (1) = 1.07, n.s.					
Experimental condition						
Usual care	71	38.6	94	33.2	165	35.3
Experimental	113	61.4	189	66.8	302	64.7
	χ^2 (1) = 1.41, n.s.					

	Level of Data Completeness[a]					
	Missing 1 or more variables n = 184 (39.4%)		Complete Data n = 283 (60.6%)		Totals[b] (N = 467)	
	n	%	n	%	n	%
Age						
Mean ± Standard Deviation (SD)	33.8 ± 7.5		33.1 ± 7.1		33.4 ± 7.3	
	F (1, 465) = .90, n.s.					
Treatment duration (Number of Days)						
Mean ± SD	44.8 ± 38.8		43.2 ± 25.8		43.8 ± 31.4	
	F (1, 456) = .27, n.s.					
ASI Alcohol Composite at baseline						
Mean ± SD	0.41 ± 0.25		0.41 ± 0.26		0.41 ± 0.26	
	F (1, 464) = .00, n.s.					
ASI Drug Composite at baseline						
Mean ± SD	0.17 ± 0.11		0.20 ± 0.13		0.19 ± 0.12	
	F (1, 464) = 6.22, p <.05					

[a]There were 25 study variables; individuals with valid values for all 25 variables were considered to have complete data. [b]Totals for some variables may be less than 467 as a result of missing data.

Participants were divided into two groups depending upon the completeness of their interview responses. There were 283 individuals who had complete data for all of the 25 study variables; 184 respondents had missing data for one or more variables. Comparisons between these two groups were made using Chi-square analysis and oneway ANOVAs. These analyses, featured in Table 7, revealed no significant differences between the two groups on the five demographic variables (i.e. sex, race, marital status, employment status, and age). Furthermore, experimental condition and treatment duration were unrelated to level of data completeness. Thus, individuals in the usual care condition or who spent more time in treatment, possible indicators of poorer prognosis, were no more likely to have missing data.

Two substantive variables, baseline alcohol and drug problems, were also related to the missing data variable. Surprisingly, individuals with greater drug abuse problems, as measured by the ASI, were more likely to have complete data ($F(1, 464) = 6.22$, $p < .05$). However, the magnitude of the difference in ASI scores was quite modest ($.17 \pm .11$ versus $.20 \pm .13$).

Intercorrelations Among the Study Variables

The zero-order correlations among all 25 study variables are featured in Table 8. The intercorrelations among the demographic variables are displayed in the first triangle (Variables 1 - 6) off the diagonal. The next triangle is composed of the predictor variables (7 - 17) followed by the substance use outcomes (18 - 25). The sample size for this matrix was $n = 283$ because correlations were calculated using listwise deletion of cases. Therefore, correlations were statistically significant with absolute values greater than $r > .098$ (.05 level, one-tailed) and $r > .14$ (.01 level, one-tailed).

As part of the analysis plan, any demographic variables that were significantly correlated to the substance use outcomes were included as covariates in the regression analyses. Those significant correlations are discussed here. Being married was associated with lower ASI alcohol composite scores at both follow-up periods. The ASI alcohol composite at Time 3 was related to both gender and age, with males and older participants having greater alcohol problems. Married individuals were less likely to relapse using alcohol. Educational level was associated with a greater likelihood of alcohol relapse at Time 2 and marital status was the only variable related to Time 3 alcohol relapse.

Women had greater ASI drug composite scores at both follow-up periods and African Americans had greater ASI drug scores only at Time 2. Furthermore, at Time 2, ASI Drug composite scores were lower and the probability of drug relapse lower among individuals whose typical pre-admission employment pattern was to be working part- or full-time. Married participants were less likely to relapse with drugs. At Time 3, the only demographic variable related to either ASI Drug composite scores or drug relapse was age, with older participants more likely to relapse.

Table 8. Zero-Order Correlations of All Demographic Variables, Predictor Variables, and Outcome Variables in the Hierarchical Regressions

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1.Sex[a]	--																								
2 Race[a]	-.02	--																							
3 Age	.08	.11	--																						
4. Education	-.06	.06	.12	--																					
5 Employment[a]	.15	-.11	-.09	.13	--																				
6. Marital[a]	-.05	-.07	.05	-.07	-.01	--																			
7 Tx Condition[a]	-.06	.02	-.08	.07	.06	.05	--																		
8 No Days in Treatment	.02	.01	.11	.01	-.02	-.09	.34	--																	
9. Family Involvement	-.14	-.13	-.11	-.10	.05	.06	-.13	-.20	--																
10 Sobriety Support2	-.07	.10	-.04	.03	.01	.03	.03	.04	.09	--															
11 Network Member Use2	.06	-.17	-.02	-.04	.00	.04	-.06	-.11	-.06	-.17	--														
12 No. Intimate Members2	-.03	-.10	-.11	.02	.06	-.01	.00	.01	.10	.21	.05	--													
13 Psychiatric Distress2	-.08	.03	.08	.02	-.05	-.14	-.05	.04	-.05	-.04	-.01	-.10	--												
14 Sobriety Support3	-.11	.04	-.12	.10	.10	.06	-.05	-.02	.08	.49	-.13	.16	-.08	--											
15. Network Member Use3	.04	-.20	.09	-.04	-.04	.03	.02	-.07	.00	-.09	.38	-.05	.00	-.22	--										
16. No. Intimate Members3	-.10	-.02	-.10	-.06	.03	-.03	.05	.01	.01	.09	.04	.37	.08	.16	.05	--									
17 Psychiatric Distress3	-.07	-.03	.06	-.04	-.04	-.13	-.05	.04	-.11	-.04	.03	-.05	.50	-.09	.05	-.02	--								
18 Alcohol Relapse2[a]	.09	-.02	.08	.10	-.04	-.08	-.10	-.14	-.04	-.18	.25	-.17	.14	-.17	.17	-.09	.14	--							
19 ASI Alcohol Composite2	.09	.02	.07	.10	.02	-.13	-.13	-.09	-.09	-.09	.16	-.16	.41	-.03	.10	-.01	.19	.54	--						
20 Drug Relapse2[a]	-.06	.06	.01	-.01	-.20	-.14	-.13	.03	-.01	-.10	.09	-.13	.25	-.09	.12	-.04	.15	.19	.13	--					
21 ASI Drug Composite2	-.07	.09	-.07	.03	-.15	-.10	-.01	.03	-.16	.01	-.04	-.09	.35	-.01	.03	-.03	.21	.16	.40	.54	--				
22 Alcohol Relapse3[a]	.07	.01	-.02	.01	.01	-.11	-.03	-.12	-.04	-.11	.22	.03	.08	-.09	.17	.03	.19	.42	.31	.13	.09	--			
23 ASI Alcohol Composite3	.11	.07	.11	.06	.02	-.10	-.14	-.17	.01	-.13	.21	-.09	.27	-.09	.07	.01	.29	.41	.59	.06	.13	.55	--		
24. Drug Relapse3[a]	-.03	.03	.11	.08	-.07	.02	-.09	.00	-.11	.01	-.01	.03	.15	-.03	.15	-.04	.22	.10	.00	.40	.25	.12	.04	--	
25 ASI Drug Composite3	-.06	.06	.10	.01	-.08	-.06	.01	.00	-.16	-.01	-.01	.03	.26	-.02	.06	.05	.38	.07	.15	.26	.44	.05	.21	.48	--

Note n = 283. r's > .098 are significant at the p < .05 level (1-tailed) and r's > .14 are significant at the p < .01 (1-tailed) (See text). [a]The direction of coding for these dichotomous variables is: Sex 0=Female, 1=Male; Race 0=White 1=African American; Employment 0=Not working 1=Employed, Marital 0=Not currently married 1=Married, Treatment Condition 0=Usual Care 1=Experimental; Alcohol and Drug Relapse 0=Abstaining 1=Relapsed.

Among the predictor variables, individuals randomly assigned to the experimental ward spent more days in treatment and experienced fewer alcohol problems at follow-up. Many of the social support variables were significantly correlated, indicating some overlap among these constructs. For instance, individuals reporting greater amounts of sobriety support also had fewer substance users in their networks and a larger number of intimate network members. However the magnitude of most of these relationships was usually rather modest (most r's $< .10$).

Of the predictor variables, psychiatric distress was most consistently related to the substance use outcome measures. Psychiatric distress at Time 2 was significantly related to three of the four cross-sectional substance use outcomes (the exception being alcohol relapse at Time 3) and all four prospective outcomes. Psychiatric distress at Time 3 was significantly related to all four cross-sectional substance use outcomes. Some of the social support/network variables were significantly correlated to outcomes, but less consistently and of smaller magnitudes. For instance, individuals with greater family involvement had lower ASI Drug composite scores and individuals with greater sobriety support were less likely to relapse with alcohol. Having substance using network members at Time 2 was positively related to ASI Alcohol Composite scores and an increased probability of alcohol relapse for both follow-up periods. Finally, the number of Time 2 intimate network members was negatively related to Time 2 alcohol and drug relapse.

The intercorrelations of the substance use measures suggest that the ASI Alcohol and the ASI Drug Composite scores were fairly independent constructs, but there is considerable overlap between the two indicators (ASI scores and relapse) of each

substance. For example at Time 2, the correlation between ASI Alcohol Composite score and alcohol relapse ($r = .54$, $p < .01$) was higher than the correlation between alcohol relapse and either drug relapse ($r = .19$, $p < .01$) or alcohol relapse and the ASI Drug Composite score ($r = .16$, $p < .01$).

Regression of Substance Use Outcomes on Study Variables

Standardized path coefficients for the demographic, social network, and social support measures used to predict substance use were obtained using hierarchical multiple regression (see Cohen & Cohen, 1983). All of the path coefficients are presented for the four different versions of the model tested. These coefficients are presented in Appendix C (Tables C-1 to C-4) because the figures (presented later) are trimmed of all nonsignificant paths and because it is not essential to present these data in the results section. Data from these tables are not discussed in detail because study findings relating to the ASI composite scores and relapse are discussed in the next section describing the regression analyses.

Path analysis was conducted using hierarchical multiple regression and logistic regression. Two-month substance use measures (Time 2) were predicted using two blocks of predictor variables and 6-month substance use (Time 3) was predicted with four predictor blocks. The first block contained any demographic control variables and the pre-discharge variables (experimental condition, treatment duration, family involvement in treatment). Recall that it was hypothesized that more positive outcomes would be associated with receiving the experimental condition, receiving longer treatment, and having greater family involvement in treatment. The second block contained the social network/support variables (sobriety support, network member substance use, number of

intimate members) along with psychiatric distress. It was hypothesized that network member substance use would be the best predictor of outcomes among the social support/network variables and that greater psychiatric distress would lead to poorer outcomes. The third block for the 6-month substance use variables consisted of 2-month substance use, which controls for the autocorrelation between the two variables. Finally, the fourth block was composed of the 6-month (cross-sectional) social network/support variables and psychiatric distress. The advantage of using hierarchical regression was the ability to control the impact of pre-discharge variables and determine whether the social variables and psychiatric distress provided additional predictive power at each step.

Hierarchical multiple regression. Table 9 contains the hierarchical regressions for the ASI Alcohol and Drug Composite scores at each follow-up period. It should be noted that the beta weights featured in this table are from the full model after all variables have been entered and not the beta weights after each step. Regression results for the Time 2 ASI Alcohol Composite scores (first column in Table 9) are discussed first.

None of the pre-discharge variables (i.e. marital status, treatment condition, treatment duration, family involvement) in the first step emerged as a significant predictor of the Time 2 ASI Alcohol Composite scores. Nonetheless, the R^2 (.03) of the complete predictor set was significant ($p < .05$). The block of social network/support variables and psychiatric distress, which were entered in the second step, significantly contributed to the R^2 of the equation (R^2 change = .19, $p < .01$) predicting the ASI Alcohol Composite score. Within this block, Time 2 Network member substance use (β = .20, $p < .01$) and greater psychiatric distress (β = .37, $p < .01$) were significantly

related to ASI alcohol scores after controlling for all pre-discharge variables that were entered in the first step.

For Time 3 ASI Alcohol Composite scores, age ($\beta = .10$, $p < .05$) and treatment duration ($\beta = -.17$, $p < .01$) emerged as significant predictors, with older participants and individuals spending less time in treatment reporting more alcohol problems. In the second step, network member use ($\beta = .09$, $p < .05$) was related to greater alcohol problems. The ASI Alcohol score at Time 2, the only variable entered in the third step, was highly related to the ASI score at Time 3 ($\beta = .55$, $p < .01$). In the fourth step, greater psychiatric distress was associated with higher ASI alcohol scores ($\beta = .26$, $p < .01$), even after controlling for the pre-discharge and social network variables, and Time 2 ASI Alcohol Composite scores. The final model predicted a respectable amount of total variance in Time 3 ASI alcohol scores ($R^2 = .43$, $p < .01$, Adjusted $R^2 = .41$).

Table 9. Hierarchical Multiple Regressions of ASI Alcohol and Drug Composite Scores on Demographic and Social Network Variables

	ASI Alcohol Composite				ASI Drug Composite			
	Time 2 (n = 372)		Time 3 (n = 299)		Time 2 (n = 324)		Time 3 (n = 319)	
Predictor	b ± SE	β	b ± SE	β	b ± SE	β	b ± SE	β
Step 1 - Pre-Discharge								
Sex*	--	--	.02 ± .02	.05	--	--	--	--
Race*	--	--	--	--	--	--	--	--
Age	--	--	.00 ± .00	.10*	--	--	--	--
Education	--	--	--	--	--	--	--	--
Employment*	--	--	--	--	-.01 ± .01	-.06	--	--
Marital*	-.05 ± .03	-.08	-.01 ± .03	-.02	--	--	--	--
Treatment Condition*	-.04 ± .02	-.09	9.83 ± .00	-.01	.00 ± .01	.01	.01 ± .01	.03
No. Days in Treatment	-1.21 ± 2.87	-.02	-9.90 ± 2.64	-.17**	-1.77 ± 1.38	-.07	-1.77 ± 1.28	-.07
Family Involvement	-.01 ± .01	-.06	.02 ± .01	.08	-.01 ± .01	-.14**	-.01 ± .01	-.07
R^2 at Step 1	.03*		.07**		.03*		.02	
Adjusted R^2 at Step 1	.02*		.05		.02		.01	
Change in R^2 at Step 1	.03*		.07**		.03*		.02	
Step 2 - Time2 Variables								
Sobriety Support2	.01 ± .01	.04	-.01 ± .01	-.05	.01 ± .00	.10*	.00 ± .00	-.03
Network Member Use2	.13 ± .03	.20**	.06 ± .03	.09*	-.02 ± .02	-.05	-.02 ± .02	-.07
No. of Intimates2	-.02 ± .01	-.11	.00 ± .01	-.03	.00 ± .00	-.07	.00 ± .00	.05
Psychiatric Distress2	.04 ± .01	.37**	-.01 ± .01	-.12*	.02 ± .00	.34**	.00 ± .00	-.04
R^2 at Step 2	.22**		.16**		.17**		.09**	

	ASI Alcohol Composite				ASI Drug Composite			
	Time 2 (n = 372)		Time 3 (n = 299)		Time 2 (n = 324)		Time 3 (n = 319)	
Predictor	b ± SE	β	b ± SE	β	b ± SE	β	b ± SE	β
Adjusted R^2 at Step 2	.20		.14		.15		.07	
Change in R^2 at Step 2	.19**		.09**		.14**		.07**	
Step 3 - Substance Use Time2								
ASI Alcohol Comp.2	--	--	.56 ± .05	.55**	--	--	--	--
ASI Drug Comp.2	--	--	--	--	--	--	.36 ± .05	.37**
R^2 at Step 3	--		.38**		--		.20**	
Adjusted R^2 at Step 3	--		.36		--		.18	
Change in R^2 at Step 3	--		.22**		--		.11**	
Step 4 - Time3 Variables								
Sobriety Support3	--	--	-.01 ± .01	-.03	--	--	.00 ± .00	.02
Network Member Use3	--	--	-.03 ± .03	-.05	--	--	.02 ± .02	.05
No. of Intimates3	--	--	.01 ± .01	.07	--	--	.00 ± .00	.03
Psychiatric Distress3	--	--	.03 ± .01	.26**	--	--	.02 ± .00	.36**
Constant	.28 ± .04		.03 ± .06		.17 ± .03		.09 ± .03	
Final R^2	See Step 2		.43**		See Step 2		.30**	
Final Adjusted R^2	--		.41		--		.27	
Final Change in R^2	--		.05**		--		.10**	

Note. "--" Indicates variable was not entered in the model. All weights displayed are from the full model after all variables have been entered. Net. = Network; Comp. = Composite Score.
'The direction of coding for these dichotomous variables is: Sex 0=Female, 1=Male; Race 0=White 1=African American; Employment 0=Not working 1=Employed; Marital 0=Not currently married 1=Married; Treatment Condition 0=Usual Care 1=Experimental; Alcohol and Drug Relapse 0=Abstaining 1=Relapsed.
*$p < .05$ **$p < .01$

In the third and fourth columns of Table 9, study variables were regressed on the ASI Drug Composite scores. For Time 2 ASI Drug Composite scores, Family involvement (β = -.14, p < .01) and psychiatric distress (β = .35, p < .01) emerged as significant predictors, with greater family involvement and less psychiatric distress being associated with fewer drug problems. Surprisingly, none of the social network/support variables were related to either Time 2 or Time 3 ASI Drug Composite scores, although the increment in R^2 attributed to the block was significant (R^2 Change = .06, p < .05). The only significant predictors of Time 3 ASI Drug Composite scores were Time 2 ASI scores (β = .37, p < .01), and Time 3 (cross sectional) psychiatric distress (β = .36, p < .01). The final model for Time 3 ASI Drug composite scores predicted less total variance (R^2 = .30, p < .01, Adjusted R^2 = .27) than the model for the ASI Alcohol composite scores (R^2 = .43, p < .01, Adjusted R^2 = .41).

The multiple regression analyses discussed thus far have addressed the hypotheses about pre- and post-discharge variables predicting substance use outcomes. However, a research question also was proposed whereby 2-month substance use measures were used to predict 6-month network variables. The beta coefficients for these paths are featured in tables C-1 (ASI Alcohol composite), C-2 (ASI Drug composite), C-3 (alcohol relapse), and C-4 (drug relapse). None of these paths are featured in any of the four figures because none of the coefficients reached statistical significance. Furthermore, the magnitude of the coefficients was minuscule for the ASI variables (β's ranging from .00 to .02) and small for the relapse variables (β's ranging from -.03 to .06).

Logistic regression results. The ability of the proposed model to predict alcohol or drug relapse was also tested. Logistic regression, which requires fewer statistical

assumptions than discriminant function, was used to predict relapse. These results are featured in Table 10. Blocks of predictor variables were entered in sequential steps, identical to the hierarchical regression analyses. Instead of yielding statistics on the amount of variance explained by the model (i.e. R^2), the fit of the model at each step is assessed along with its ability to predict both of the dichotomous outcomes. In this investigation the probability of alcohol relapse was .44 at Time 2 and .45 at Time 3. The odds of alcohol relapse are defined as the ratio of the probability of relapse to the probability that it does not occur. Therefore, the odds of alcohol relapse at Time 2 were .79 (0.44 / (1 - 0.44)) and .83 (0.45 / (1 - 0.45)) at Time 3. The probability (and odds) of drug relapse at Time 2 were .61 (1.56) and .61 (1.56) at Time 3. Alcohol relapse was not defined simply as any use of alcohol in the prior 30 days (the definition used for drug relapse), but referred to any use of alcohol to the point of intoxification in the 30 days before the follow-up interview. At both Time 2 and Time 3, 57 percent of participants reported any use of alcohol on one or more days in the 30 days prior to their follow-up interview. Alcohol use to intoxication was chosen as the outcome measure instead of any alcohol use because for participants who only needed treatment for their problem drug use, low or moderate alcohol consumption should not be problematic.

The second column (with the heading b ± SE) in Table 10 features the logistic coefficients. The logistic coefficient is interpreted as the amount of change in the log odds of relapse that is associated with a one-unit change in the independent variable. For example, for Time 2 alcohol relapse, the coefficient for experimental condition is -.42. This coefficient indicates that when experimental condition changes from 0 (usual care condition) to 1 (experimental condition) and all other independent variables are held

constant, the log odds of alcohol relapse occurring are decreased by .42. The third column (R) features the partial correlation between each independent variable and relapse.

The pre-discharge variables were entered in the first step of the Time 2 alcohol relapse logistic regression significantly enhanced the ability of the model to predict relapse. The model was better at predicting abstainers (84.6 percent accuracy) than relapsers (25.8 percent accuracy). This model, using only three pre-discharge variables, was overall able to correctly classify the relapse status of about three out of five (59.5 percent) participants. After the addition of the next block of variables, which contained the social network/support and psychiatric distress variables, the overall prediction ability improved slightly (62.7 percent), but significantly ($p < .01$). For Time 3 alcohol relapse, the only significant predictors were Time 2 alcohol relapse and Time 3 psychiatric distress. The final model for Time 3 alcohol relapse predicted 78.1 percent of abstainers, an improvement over the base rate of 54.6 percent, and predicted 67.3 percent of alcohol relapsers, an improvement over the 45.4 percent base rate.

Table 10

Logistic Regressions of Alcohol and Drug Relapse on Demographic and Social Network Variables

	Alcohol Relapse				Drug Relapse			
	Time 2 (n = 373)		Time 3 (n = 334)		Time 2 (n = 372)		Time 3 (n = 336)	
Predictor	b ± SE	R	b ± SE	R	b ± SE	R	b ± SE	R
Step 1 - Pre-Discharge								
Sex[a]	--	--	--	--	--	--	--	--
Race[a]	--	--	--	--	--	--	--	--
Age	--	--	--	--	--	--	.03 ± .02	.05
Education	.01 ± .00	.02	--	--	--	--	--	--
Employment[a]	--	--	--	--	-.63 ± .23	-.11**	--	--
Marital[a]	--	--	-.59 ± .49	.00	-.47 ± .39	.00	--	--
Treatment Condition[a]	-.42 ± .25	-.04	.09 ± .29	.00	-.36 ± .26	.00	-.30 ± .30	.00
No. Days in Treatment	-.01 ± .00	-.04	-.01 ± .01	-.05	.00 ± .00	.00	.00 ± .00	.00
Family Involvement	-.04 ± .14	.00	-.03 ± .16	.00	-.01 ± .14	.00	-.29 ± .17	-.05
Classification Ability of Model								
Predicting - Abstainers	84.6% Correct		70.8% Correct		7.0% Correct		9.5% Correct	
Predicting - Relapsers	25.8% Correct		44.2% Correct		96.5% Correct		95.7% Correct	
Overall Predictions	59.5% Correct		58.4% Correct		62.4% Correct		63.4% Correct	
Model $\chi^2(3)$	11.0*		10.89*		15.32**		11.52*	
Model $\chi^2(3)$ Improvement	11.0*		10.89*		15.32**		11.52*	

	Alcohol Relapse				Drug Relapse			
	Time 2 (n = 373)		Time 3 (n = 334)		Time 2 (n = 372)		Time 3 (n = 336)	
Predictor	b ± SE	R	b ± SE	R	b ± SE	R	b ± SE	R
Step 2 - Time2 Variables								
Sobriety Support2	-.15 ± .10	-.02	-.07 ± .13	.00	.04 ± .10	.00	.04 ± .14	.00
Network Member Use2	1.55 ± .42	.15**	.89 ± .53	.05	.72 ± .43	.04	-1.22 ± .55	-.09*
No. of Intimates2	-.15 ± .09	-.05	.10 ± .10	.00	-.10 ± .09	.00	.11 ± .10	.00
Psychiatric Distress2	.18 ± .06	.12**	-.09 ± .08	.00	.29 ± .07	.19**	.02 ± .08	.00
Classification Ability of Model								
Predicting - Abstainers	76.6% Correct		70.2% Correct		40.1% Correct		27.8% Correct	
Predicting - Relapsers	44.0% Correct		50.6% Correct		83.0% Correct		89.5% Correct	
Overall Predictions	62.7% Correct		61.1% Correct		66.7% Correct		66.4% Correct	
Model $\chi^2(4)$	33.0**		18.62**		25.55**		8.28	
Model $\chi^2(4)$ Improvement	33.0**		18.62**		25.55**		8.28	
Step 3 - Substance Use Time2								
Alcohol Relapse 2	--	--	1.72 ± .27	.32**	--	--	--	--
Drug Relapse 2	--	--	--	--	--	--	1.69 ± .27	.31**
Classification Ability of Model	--							
Predicting - Abstainers	--		77.0% Correct		--		55.6% Correct	
Predicting - Relapsers	--		64.7% Correct		--		81.4% Correct	
Overall Predictions	--		71.3% Correct		--		71.7% Correct	

	Alcohol Relapse				Drug Relapse			
	Time 2 (n = 373)		Time 3 (n = 334)		Time 2 (n = 372)		Time 3 (n = 336)	
Predictor	b ± SE	R	b ± SE	R	b ± SE	R	b ± SE	R
Model $\chi^2(1)$	--		47.16**		--		43.04**	
Model $\chi^2(1)$ Improvement	--		47.16**		--		43.04**	
Step 4 - Time3 Variables								
Sobriety Support3	--	--	-.01 ± .13	.00	--	--	.05 ± .13	.00
Network Member Use3	--	--	.68 ± .50	.00	--	--	1.57 ± .56	.13*
No. of Intimates3	--	--	.09 ± .10	.00	--	--	-.10 ± .10	.00
Psychiatric Distress3	--	--	.21 ± .08	.11*	--	--	.23 ± .09	.11**
Constant	-.02 ± .83		-.91 ± .74		1.02 ± .59		-1.14 ± 1.04	
Classification Ability of Model								
Predicting - Abstainers	See Step 2		78.1% Correct		See Step 2		58.7% Correct	
Predicting - Relapsers			67.3% Correct				83.3% Correct	
Overall Predictions			73.1% Correct				74.1% Correct	
Model $\chi^2(3)$	--		9.49*		--		17.16**	
Model $\chi^2(3)$ Improvement	--		9.49*		--		17.16**	

Note. "--" Indicates variable was not entered in the model. All weights displayed are from the full model after all variables have been entered. Net. = Network; Comp. = Composite Score.

*The direction of coding for these dichotomous variables is: Sex 0=Female, 1=Male; Race 0=White 1=African American; Employment 0=Not working 1=Employed; Marital 0=Not currently married 1=Married; Treatment Condition 0=Usual Care, 1=Experimental; Alcohol and Drug Relapse 0=Abstaining 1=Relapsed.

*p < .05 **p < .01

The logistic models were far better at predicting drug relapsers than abstainers, in contrast to the models predicting alcohol relapse. For instance, after the first step in both Time 2 and Time 3 drug relapse, the models could correctly predict who would relapse with over 95 percent accuracy. Employment status was significantly related to Time 2 alcohol relapse ($R = -.11$, $p < .01$). Individuals with a history of not being employed were more likely to relapse. In addition, greater psychiatric distress at Time 2 was related to an increased likelihood of relapse at Time 2 ($R = .19$, $p < .01$), just as Time 3 psychiatric distress was related to Time 3 relapse ($R = .11$, $p < .01$). Finally, greater Time 2 network member substance use was paradoxically related to a decreased probability of relapse at Time 3. However, when the total effect of Time 2 Network Member Substance Use upon drug relapse is considered, this effect is no longer significant (discussed in next section). The final model for Time 3 drug relapse predicted 58.7 percent of abstainers, an improvement over the base rate of 39.4 percent, and predicted 83.3 percent of alcohol relapsers, an improvement over the base rate of 60.6 percent. The results of these regression analyses were used to generate Figures 2 - 5.

Direct and Indirect Pathways Leading to Substance Use

One of the great advantages of using path analysis as a data analytic method is that the path model can be used to generate the indirect effects of the predictor variables (Ritter, 1988). Although the direct impact (i.e. the beta weight) of one variable upon the substance use outcomes may be very minor, the indirect effect might be sizable. Thus, by computing the indirect effects of all of the variables in the four models, the most accurate accounting of each variables' impact upon the dependent variables can be assessed. The direct, indirect, and total effects of each independent variable are featured

for the ASI variables (Table 11) and for the relapse variables (Table 12). Every possible indirect effect could not be presented because of the vast number of indirect effects. For example, there are 16 indirect paths leading from experimental condition to Time 3 substance use and experimental condition is only one of at least 13 variables featured in the four models. Therefore, only the most important paths are presented in the tables. The decision rule for including an indirect path in the table was that the magnitude of the indirect path must be at least equal to .04. This criterion was chosen because indirect effects are the product of direct paths and the product of two small effect size (.20) paths (Cohen, 1988) would be .04. However, all of the direct effects and the sum of the indirect effects are presented for each predictor variable.

Each indirect effect was computed by simply multiplying the path coefficients for each variable pair along the path. The total indirect effect is the sum of all indirect paths. For example, the indirect effect of Network Substance Use2 on the Time 3 Alcohol Composite can be assessed by summing the effect of the six indirect paths. Only one of the six paths had a sizable effect, the path via ASI Alcohol Composite2. This indirect path has an effect of .11, which is the product of the two beta weights .20 and .55. The sum of the other five paths is quite negligible and equals -.02. Finally, the total effect is the sum of the direct effect (.09) and the sum of all indirect effects (.09), which equals .18. This example illustrates that the total effect of a variable can be more substantial than just the direct effect. The value for the total effect of Network Substance Use2 (.18) is also similar to its zero-order correlation (r = .20) with ASI Alcohol Composite2.

The total effect (-.12) of family involvement during treatment upon Time 3 ASI Drug Composite scores is larger than the direct effect (-.07, n.s.) alone. The positive

impact of greater family involvement, therefore, is underestimated by examining only its direct effect. In this case, the indirect effect (i.e. the remaining -.05) was mediated by the Time 2 ASI Drug Composite. In fact, in every case where the indirect effect exceeded the .04 cutoff, the indirect pathway, which ended in a Time 3 variable, included that same variable measured at Time 2. This occurred because the autocorrelation between the Time 2 and Time 3 measures was typically very high, indicating stability between measurements. Similarly, the direct effects of Time 2 psychiatric distress upon Time 3 ASI Alcohol and Drug Composite scores (-.08 and -.04, respectively) are both negative and fail to reach statistical significance. However, the indirect effects of these variables are quite large. Psychiatric distress at Time 2 is associated with greater Time 2 ASI scores, which in turn are related to greater Time 3 ASI scores. The total effect of psychiatric distress measured at the 2-month follow-up is .21 upon 6-month ASI Alcohol Composite scores and .27 upon 6-month ASI Drug Composite scores.

The indirect effects for the relapse variables are typically quite modest because so many of the path coefficients were minute or nil (0.00). However, one inconsistency noted earlier with the regression findings is cleared up when the indirect effects are computed. It was noted earlier that Network Member Substance Use2 was related to a reduced likelihood of drug relapse at Time 3 (β = -.09, $p < .05$). However, once the indirect effects are combined with this direct effect, the total effect was no longer significant (total effect = -.02). Therefore, this analysis was able to remedy the only unexpected and counterintuitive finding, that being surrounded by substance users actually decreases drug relapse risk prospectively. The results for the psychiatric distress variable again demonstrate that although the direct effect upon relapse is nonsignificant,

the total effect suggests that greater psychiatric distress at the 2-month interview is related to a greater probability of relapse at six months.

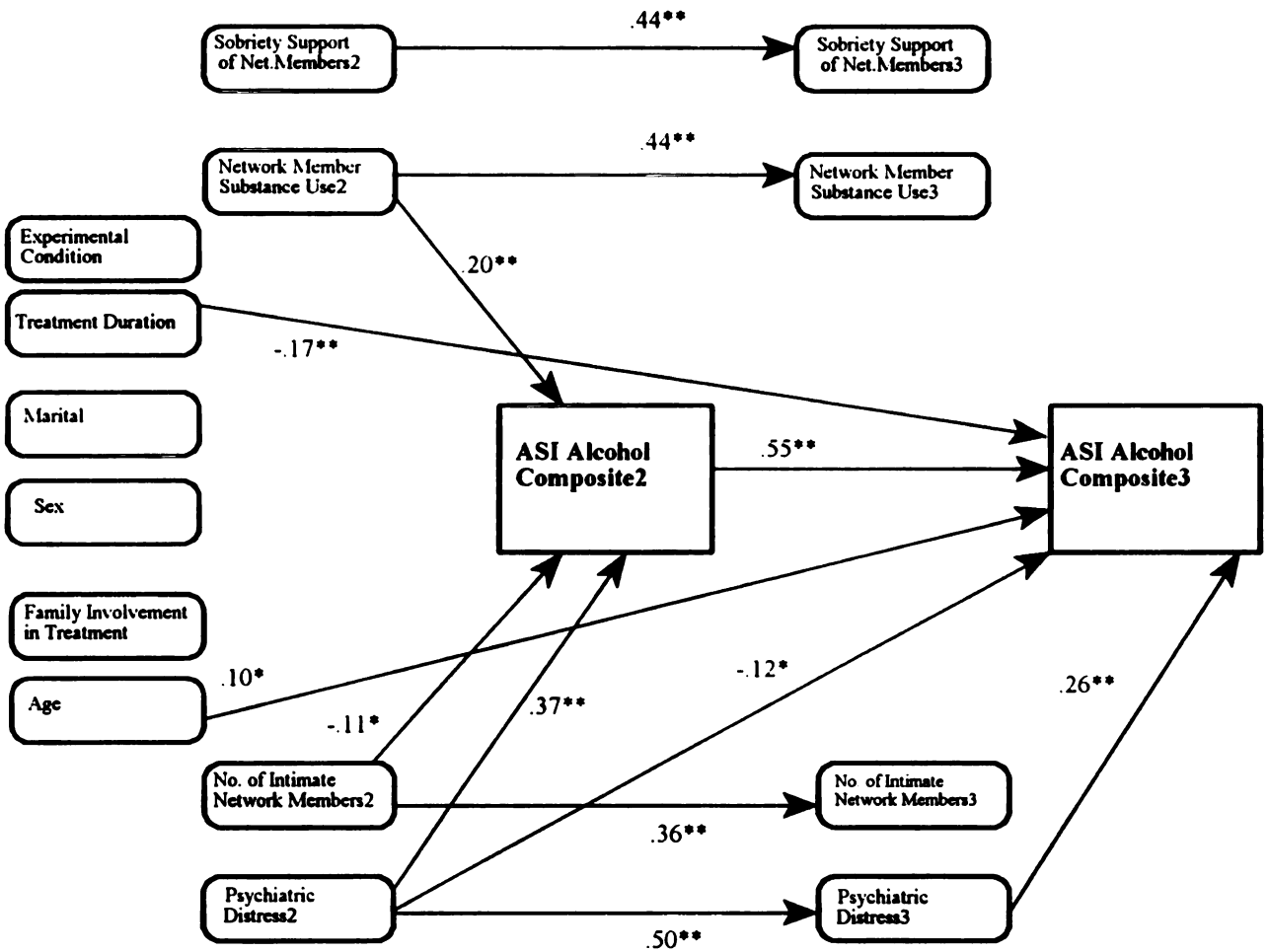

Figure 2. Trimmed panel model predicting ASI Alcohol Composite score. Time2 is 2-month follow-up and Time3 is 6-month follow-up. Key: Net. = Network. Race is coded 0 = White, 1 = African American.

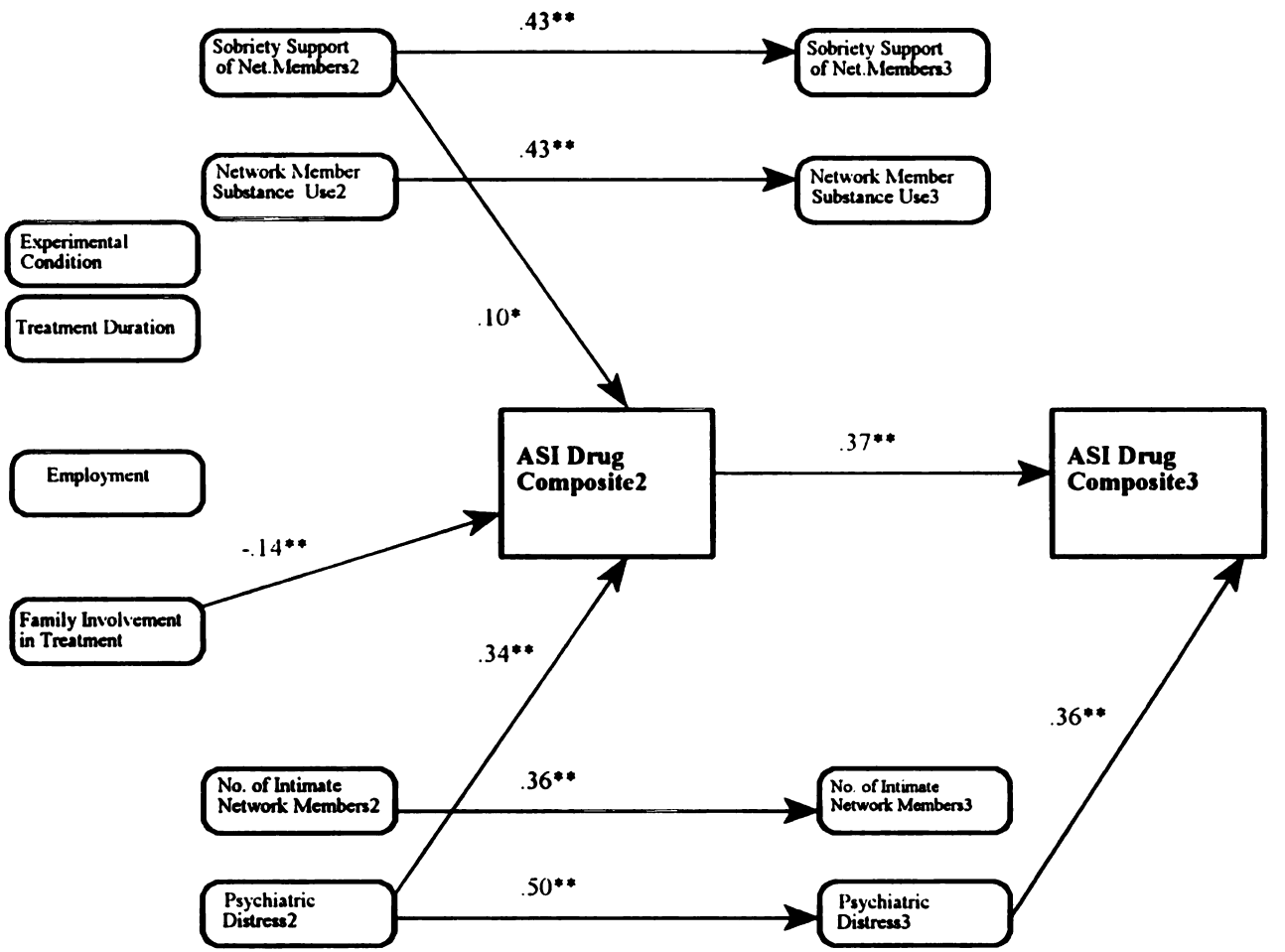

Figure 3. Trimmed panel model predicting ASI Drug Composite score. Time2 is 2-month follow-up and Time3 is 6-month follow-up. Key: Net. = Network.

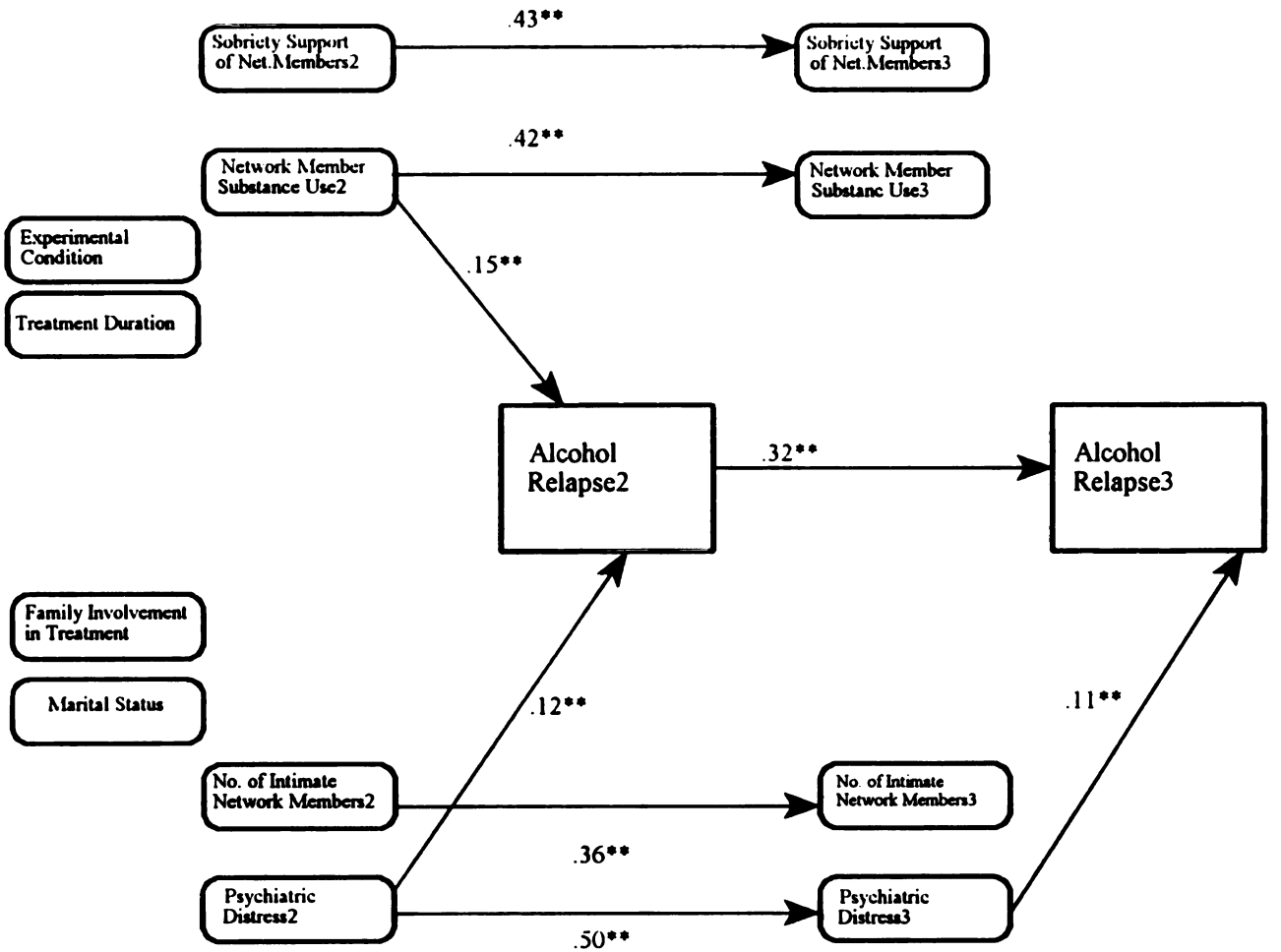

Figure 4. Trimmed panel model predicting alcohol relapse. Time2 is 2-month follow-up and Time3 is 6-month follow-up. Key: Net. = Network.

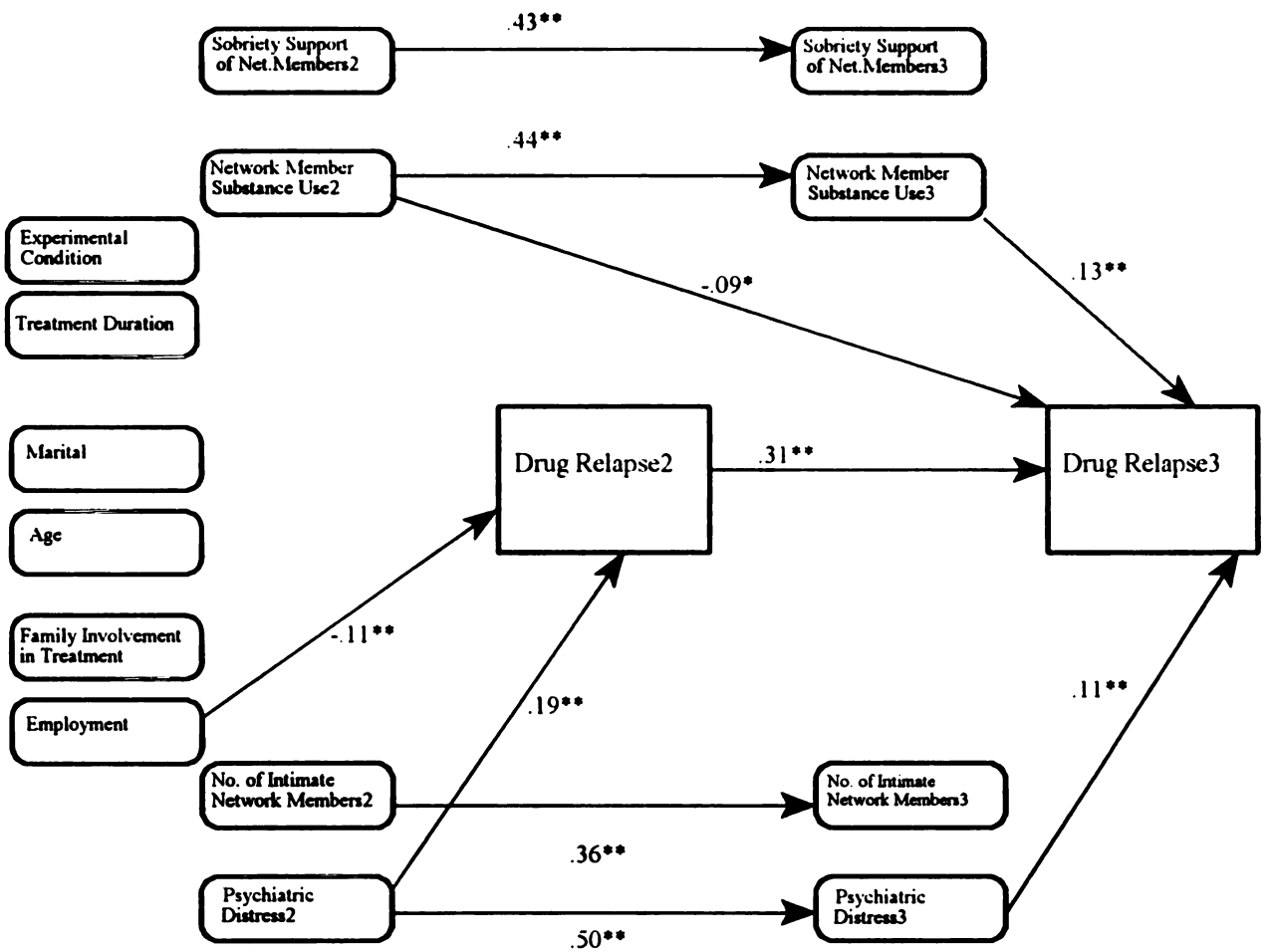

Figure 5. Trimmed panel model predicting drug relapse. Time2 is 2-month follow-up and Time3 is 6-month follow-up. Key: Net. = Network. Employment is coded 0 = Not employed, 1 = Employed.

Table 11

Direct, Indirect, and Total Effects on ASI Substance Use Outcomes

	Outcome Variable			
Independent Variables	ASI Alcohol Composite2	ASI Alcohol Composite3	ASI Drug Composite2	ASI Drug Composite3
Experimental Condition				
Direct Effect	-.09	.00	.02	.03
Indirect Effect	.00		.00	.01
Via ASI Alcohol 2	--	-.05	--	--
Via other paths	--	.00	--	--
Total Effect	-.09	-.05	.02	.04
Treatment Duration				
Direct Effect	-.02	-.17	-.07	-.07
Indirect Effect	--	-.01	--	-.03
Total Effect	-.02	-.18	-.07	-.10
Family Involvement				
Direct Effect	-.06	.08	-.14	-.07
Indirect Effect	--	-.03	--	
Via ASI Drug2	--	--	--	-.05
Via other paths	--	--	--	.00
Total Effect	-.06	.05	-.14	-.12
Demographics - Marital				
Direct Effect	-.08	-.02	--	--
Indirect Effect	--	-.04	--	--
Total Effect	-.08	-.06	--	--
Demographics - Age				
Direct Effect	--	.10	--	--
Indirect Effect	--	--	--	--

Independent Variables	Outcome Variable: ASI Alcohol Composite2	ASI Alcohol Composite3	ASI Drug Composite2	ASI Drug Composite3
Total Effect	--	.10	--	--
Demographics - Employment				
Direct Effect	--	--	-.06	--
Indirect Effect	--	--	--	-.02
Total Effect	--	--	-.06	-.02
Demographics - Sex				
Direct Effect	--	.05	--	--
Indirect Effect	--	--	--	--
Total Effect	--	.05	--	--
Sobriety Support2				
Direct Effect	.04	-.05	.10	-.03
Indirect Effect	--	.01	--	
Via Sobriety Support2	--	--	--	.04
Via other paths	--	--	--	.01
Total Effect	.04	-.04	.10	.02
Network Substance Use2				
Direct Effect	.20	.09	-.05	-.07
Indirect Effect	--		--	.00
Via ASI Alcohol Composite2	--	.11	--	--
Via other paths	--	-.02	--	--
Total Effect	.20	.18	-.05	-.07
No. of Intimates2				
Direct Effect	-.11	-.03	-.07	.05
Indirect Effect	--		--	-.02
Via ASI Alcohol Composite2	--	-.06	--	--

Independent Variables	Outcome Variable: ASI Alcohol Composite2	ASI Alcohol Composite3	ASI Drug Composite2	ASI Drug Composite3
Via other paths	--	.03	--	--
Total Effect	-.11	-.06	-.07	.03
Psychiatric Distress2				
Direct Effect	.37	-.12	.34	-.04
Indirect Effect	--		--	
Via ASI Composite Score2	--	.20	--	.13
Via Psychiatric Distress3	--	.13	--	.18
Via other paths	--	.00	--	.00
Total Effect	.37	.21	.34	.27

Note. The total direct and indirect effects are featured for all variables in the models. The indirect path is individually labelled (see row beginning "Via...") if the path effect ≥ .04.
-- Indicates that the path was either not tested or the path effect was <.04.

Table 12

Direct, Indirect, and Total Effects on Substance Use Relapse Outcomes

	Outcome Variable			
Independent Variables	Alcohol Relapse2	Alcohol Relapse3	Drug Relapse2	Drug Relapse3
Experimental Condition				
Direct Effect	-.04	.00	.00	.00
Indirect Effect	.00	-.01	.00	.00
Total Effect	-.04	-.01	.00	.00
Treatment Duration				
Direct Effect	-.04	-.05	.00	.00
Indirect Effect	--	-.01	--	.00
Total Effect	-.04	-.06	.00	.00
Family Involvement				
Direct Effect	.00	.00	.00	-.05
Indirect Effect	--	.00	--	.00
Total Effect	.00	.00	.00	-.05
Demographics - Education				
Direct Effect	--	--	--	--
Indirect Effect	--	.01	--	--
Total Effect	--	.01	--	--
Demographics - Employment				
Direct Effect	--	--	-.11	--
Indirect Effect	--	--	--	-.03
Total Effect	--	--	-.11	-.03

Independent Variables	Outcome Variable: Alcohol Relapse2	Alcohol Relapse3	Drug Relapse2	Drug Relapse3
Sobriety Support2				
Direct Effect	-.02	.06	.00	.00
Indirect Effect	--	-.01	--	.00
Total Effect	-.02	.05	.00	.00
Network Substance Use2				
Direct Effect	.15	.05	.04	-.09
Indirect Effect	--		--	
Via Relapse3	--	.05	--	--
Via Network Member Substance Use2	--	.00	--	.06
Via other paths	--	.00	--	.01
Total Effect	.15	.10	.04	-.02
No. of Intimates2				
Direct Effect	-.05	.00	.00	.00
Indirect Effect	--	-.02	--	.00
Total Effect	-.05	-.02	.00	.00
Psychiatric Distress2				
Direct Effect	.12	.00	.19	.00
Indirect Effect	--		--	
Via Relapse2	--	.04	--	.06
Via Psychiatric Distress3	--	.06	--	.06
Via other paths	--	.00	--	.00
Total Effect	.12	.10	.19	.12

Note. The total direct and indirect effects are featured for all variables in the models. The indirect path is individually labelled (see row beginning "Via...") if the path effect ≥ .04.
-- Indicates that the path was either not tested or the path effect was <.04.

CHAPTER 4

DISCUSSION

The findings of this investigation affirm previous studies suggesting that social networks are related to substance use following treatment completion. The magnitude of the network's impact, however, was quite modest in this study. Furthermore, the most important network dimension appeared to be the substance use of other members, with substance use by other members jeopardizing abstinence. Support for maintaining sobriety and family involvement during treatment, interestingly, were related to only Time 2 ASI Drug Composite scores. Thus, the negative behaviors of a handful of network members may exert more influence upon resolution of substance abuse problems than the provision of support provided by concerned relatives and friends. Psychiatric distress, however, clearly emerged as the strongest predictor of negative outcomes in this study. The relationship between psychiatric distress and substance use outcomes was consistent for both alcohol and other drugs and the impact was robust.

Network Characteristics

The social networks of the dually diagnosed participants in this study were quite small in comparison to other studies of the general population, substance users, and persons with psychiatric problems. Participants' social networks contained about five members, on average. This contrasts with prior studies of the general population who

have around 25 to 50 members and around 40 members on average (Hammer, Makiesky-Barrow, & Gutwirth, 1978). Among substance users, opoid abusers have reported to have an average of 12.7 members (Fraser & Hawkins, 1984b) and an average of 8.5 members for alcoholics in treatment (Gordon & Zrull, 1991). Direct comparisons, however, between the social network sizes in this study and other studies are not possible because different measures have been used to identify network members.

Psychiatric populations, similarly, have reduced social networks, with some indication that these networks shrink with more treatment experience. For instance, Lipton (1981) found that first admission schizophrenic participants had an average of 15.5 members in contrast to 6.3 members for persons with multiple admissions. Sokolovosky (1978) discovered that schizophrenics with residual symptoms had networks containing an average of 10.3 members, but individuals without residual symptoms had 14.8 members. Holmes-Eber (1990) reported network sizes closest in size to this investigation - individuals reporting 3.1 average members. Relatives constituted about 46 percent of the network, similar to the 56 percent figure observed in this study.

Given the small size of the personal networks reported in this study and the difficult life circumstances facing this dual diagnosis population, it is possible that the networks' impact may have been muted. In addition, because the networks were so small, perhaps the impact of any particular member was actually amplified. These hypotheses cannot be tested in this study, but are worthy of consideration in future studies.

Role of Pre-Discharge Factors

The discussion of the different model components and hypotheses should begin with the pre-discharge factors from the model. In general, the impact of these variables

(i.e. treatment condition and duration, demographics, family involvement in treatment) was quite limited. This confirms prior work by Cronkite and Moos (1980) showing that post-treatment factors appear to be better predictors of outcomes than pre-treatment and treatment factors. The paths leading from experimental condition to sobriety support and network member use were not significant. That is, the possibility that the treatment program may do a better job than the usual care condition of mustering a more supportive post-discharge environment for participants was not supported. As mentioned earlier, participants in the experimental condition spent more time in treatment, thereby confounding treatment condition and treatment duration. Although, treatment condition was not significantly related to substance use outcomes, treatment duration was.

Longer treatment duration was related to fewer alcohol problems at the 2-month follow-up. This supports earlier studies (Goehl, Nunes, Quitkin, & Hilton, 1993; Simpson & Sells, 1983) that longer treatment duration is related to more positive outcomes. The role of treatment duration appears, however, to be quite modest when one considers that there were eight opportunities (or direct paths) for significant relationships with the outcome variables. For example, there were four outcomes (alcohol relapse, drug relapse, alcohol problems, and drug problems), all of which were measured at two different follow-up periods (2- and 6-months post-discharge).

Similarly, family involvement during treatment appeared to be another modest predictor. Greater family involvement was associated with fewer drug problems at the 6-month follow-up. It should be noted that this measure was the only predictor variable coded from existing records; all other variables were based on the self-report of the respondent. The advantages of using different data sources is obvious and observing a

significant predictive relationship with this measure would have helped establish the role of family involvement in affecting outcome. Limitations in the way this variable was conceptualized are evident - only one item was used to assess this construct and hospital staff did not always know how much support was provided by family and how significant that support was. One psychologist who had worked at Northville Regional Psychiatric Hospital mentioned that staff did not always know when family members visited patients because the staff were on the wards during particular hours or days.

Social Networks, Sobriety Support, and Psychiatric Distress

It was hypothesized that the social network and support variables would be related to improved outcomes and the impact of having network members who abused substances was hypothesized to have the greatest impact. Sobriety support was quite limited in guarding against relapse or problem substance use. Of all eight opportunities for significant relationships with outcomes, only one significant association was observed. It may be possible that the method of assessing this construct may have hindered its impact. Although only one question was used to assess this construct, it was asked for each network member. Therefore, the average individual would have approximately five ratings for this measure. Prior studies in which both support and network measures have been administered, typically have shown that network member use is a better predictor of outcome. Thus, the findings observed here confirm prior work in non-dually diagnosed populations and support the hypothesis that sobriety support may be less influential than network member use.

Of the three social factors assessed (i.e. sobriety support, network substance use, number of intimates), network member substance was most strongly tied to outcomes as

hypothesized. For instance, individuals reporting greater network member substance use at Time 2 were more likely to relapse using alcohol (Time 2) and had higher Time 2 ASI Alcohol Composite scores. Time 3 Network Member Substance Use was related to an increased probability of drug relapse. However, greater Time 2 network substance use was also associated with a lower likelihood of drug relapse at Time 3, a counterintuitive finding that no longer held once the indirect effects analyses were conducted. Overall, the direct effects of this social network measure upon either cross-sectional (2-month) or longitudinal (6-month) substance use measures were quite nominal. In contrast, the indirect effects of network member substance use suggested that this construct is a viable prospective predictor of outcome. These findings are not necessarily unexpected. For instance, Tausig (1992) noted that when network structural properties are related to health outcomes, small or insignificant effects are likely. However, it is often the indirect effects through mediating variables that are ultimately more important.

The number of intimate members, or confidants, was only related to Time 2 ASI Alcohol Composite scores. Having more confidants was associated with fewer alcohol problems. The number of confidants may be more strongly related to the psychiatric measures than to substance use. At the 2-month follow-up the zero-order correlation between the number of confidants and psychiatric distress was significant, indicating that lower distress was associated having more confidants. Although, at the 6-month follow-up, the correlation was not statistically significant.

In summary, these network and support measures were modestly related to the outcomes. Other studies that have observed more robust findings typically did not assess (and control) for as many extraneous variables. For instance, demographic variables or

prior substance use were not controlled (i.e. statistically) in any of the other studies cited. The other explanation for the modest impact of the social network characteristics may be that the sparse social networks for this dual diagnosis population may only modestly affect substance use.

Psychiatric distress, as measured by a combination of the SCL-10 and the ASI Psychiatric Composite score, demonstrated strong cross-sectional relationships with the substance use outcomes. In fact, all eight of the eight cross-sectional paths were statistically significant. Furthermore, the magnitude of the coefficients was notable for the ASI composite scores, with betas ranging from .26 to .37. Prior studies have shown that severity of psychiatric problems is related to substance outcomes (McLellan, Luborsky, Woody, & Druley, 1983; Powell, et al., 1992; Rounsaville, Dolinsky, Babor, & Meyer, 1987). However, the role of specific diagnoses in affecting outcomes is unclear. Powell et al. (1992) found that specific diagnoses were not related to substance use outcomes, but Rounsaville, Dolinsky, Babor, and Meyer (1987) did. Psychiatric diagnoses were not used in the present study because the hospital diagnoses were not obtained using standardized assessment instruments.

Perhaps such strong relationships with outcomes were observed because the psychiatric distress variable was created by forming a composite of two variables with excellent psychometric properties. The SCL-10 has excellent internal consistency and both the SCL-10 and ASI Psychiatric Composite score had strong evidence for their construct validity. However, these effects could also be the result of method variance since both constructs were based upon participant self-report. Moreover, these two constructs could be assessing the same underlying construct. This latter proposition,

however, seems unlikely because these variables do not show strong external parallelism. That is, the pattern of correlations between study variables and the psychiatric distress measures differs from the pattern between study variables and the alcohol and drug outcomes.

These consistent cross-sectional relationships, however, do not prove that greater psychiatric distress causes more substance use problems. The reverse may also be true. There is widespread speculation in the dual diagnosis literature about which is the "primary" of the dual problems. Dackis and Gold (1992) for instance, assert that psychiatric problems are more likely to result from addiction. It is unknown whether some individuals are attempting to self-medicate their psychiatric problems with drugs or if both problems are caused by the same underlying mechanism (Brown, Ridgely, Pepper, Levine, & Ryglewicz, 1989). The link between substance use causing psychiatric distress was not tested in the present study; however, the question is certainly worthy of further study. Kessler and Price (1993) noted, for instance, that the primary disorder may create a context for the secondary disorder to develop. These authors noted that chronic depression may lead to the erosion of social networks thereby increasing the risk of numerous other conditions.

One possibility tested by the model was that substance use may shape the content and composition of the social network. This idea was tested with the three paths leading from substance use to (a) sobriety support, (b) network member substance use, and (c) number of intimate members. None of these three paths were significant in any of the four models tested (12 total tests), thereby disconfirming this hypothesis. These findings among a treatment population confirm earlier longitudinal research on drug use among

adolescents. It appears that drug use is more influenced by friends introducing substance use to each other than by individuals actively seeking friends who share common beliefs and behaviors (Kandel, 1978). Finally, it should be noted that the autocorrelations of the variables across the two time frames were assessed along with the substance use variables. These autocorrelations were typically quite high (β's in the .40's and .50's) accounting for much of the variance in the social support/network variables.

Limitations of the Current Study

Although many of the methodological limitations of prior studies were remedied in this investigation, this study still has several limitations. All of the variables assessed in this study were based on participant self-report with the exception of the family involvement in treatment variable. The accuracy of self-report network data has been questioned by some (Fraser & Hawkins, 1984a). However, a review by Marsden (1990) has concluded that the types of network measurements that were used in the current study have demonstrated adequate reliability and validity. The network measures were all administered to persons receiving treatment for some form of mental illness, a group that some would argue might have difficulty providing accurate responses. Although there is more data on the validity of social network measures for the general population, some studies have been conducted with psychiatric patients. According to a study of 29 clients with psychiatric disorders by Moxley (1988), core membership and social network structure can be reliably reported. Attempting to establishing the validity of social network data, however, is often difficult because other informants have been shown to underestimate a person's network because they do not know all of the focal person's acquaintances.

The measures of substance use in this study, like the social network measures, may have suffered from some form of self-report bias. Biochemical verification techniques such as hair, urine, and blood testing are available, but were not used in the present study. On the positive side, the substance use measures based on the Addiction Severity Index are well validated and have been shown to be related to independent indicators of substance use problems. Standardized substance use instruments, however, have been shown to have poor sensitivity and specificity when used with schizophrenic patients (Drake, et al., 1990). Thus these authors urge other researchers to supplement self-report and interview data with information obtained using behavioral observations and through reports from collaterals and case managers.

In addition, there is some controversy over using a simple dichotomous relapse coding scheme. Marlatt (1985b) has criticized this dichotomous approach where relapse is seen as "an end state: the end of the road; a dead end" (p. 31, italics in original). This approach, argues Marlatt, may set up a self-fulfilling prophesy for patients who may believe that any return to substance use is a violation of abstinence and could then lead to a full-blown relapse. Moreover, this dichotomous view of relapse suggests that there is a return to the disease state, which Marlatt felt is not very accurate.

The social network measures used for this study were based on the most basic social network indicators, such as the number of intimate members, the substance use of members, and the provision of sobriety support. Several morphological network characteristics, such as network density, reciprocity, and linkages, were not measured in this study. These morphological network measurements can help elucidate the processes by which networks influence the resolution of substance use problems or their escalation.

Furthermore, the study results are generalizable only to an urban, predominantly lower socioeconomic status population. Compared to other dual diagnosis investigations, the study population has more African American participants and fewer schizophrenics (Kay, Kalathara, & Meiner, 1989; Lyons & McGovern, 1989).

Future Research

Future research in this area should explore the events surrounding the relapse episodes to understand how network members facilitated this process. Also, nearly half of the participants had abstained from alcohol or other drug use prior to their follow-up interview -- what factors influenced these individuals to maintain their sobriety? A detailed accounting of the role each network member played in either relapse or abstinence would greatly add to our understanding of the relapse process. Asking the length of time that the participant knew each network member can be useful to see if the network membership is evolving. The change in the network could be assumed if the average time the focal person knew network members decreased as new members are absorbed into the network.

Psychiatric distress was also a strong predictor of relapse and should be studied further. Prior studies have shown that negative emotional states are related to relapse (Marlatt, 1985c), thus future research should clarify these factors in light of the co-existing psychiatric problems facing dually diagnosed individuals. Assessing substance use outcomes with urine samples or hair samples may help alleviate concerns that these findings were solely based on method variance.

Future studies might assess the exact date of the first relapse (or lapse) following treatment. By knowing the number of days until this event occurred (or did not occur),

sophisticated techniques such as survival analysis or random regression can be used to generate relapse curves for individuals with different network configurations. Also, these analyses might be conducted using different subgroups of substance users to test whether alcohol abusers might differ from crack cocaine abusers in how networks influence their substance use.

Conclusions

The results of the current study suggest that psychiatric distress and contact with substance using network members can subvert attempts at recovery from substance use problems. The negative impact of contact with substance using members was greater than the positive impact of greater family involvement during treatment and sobriety support provided by network members. Therefore, as part of aftercare it is critical to stress to patients that they must avoid former substance-using contacts. Traditionally, however, most treatment professionals have focused solely upon intrapersonal issues while neglecting how interpersonal issues can affect relapse (Smith, Frawley, & Howard, 1991). In addition, the dually diagnosed individuals must actively monitor their emotional health once discharged and seek assistance from family, friends or treatment professionals as needed. This recommendation parallels the wisdom of self-help organizations, whereby addicts are warned that relapse can be caused by HALT - becoming Hungry, Angry, Lonely, or Tired (Narcotics Anonymous, 1988). Dealing with emotional states has also been incorporated into relapse prevention programs, which acknowledge that changes in mood, attitudes, and thoughts are all warning signs for relapse (Daley & Marlatt, 1992).

One of the most encouraging aspects of conducting social network research is knowing that social networks can be modified -- networks are not immutable characteristics such as demographics or genetics. For helping substance abusing populations, several interventions, often termed network therapy (Galanter, 1987; Galanter, 1993; Sorensen & Gibson, 1983) are available to shape the social network and work with network members to facilitate the recovery of the focal person. Hawkins and Catalano (1985) noted that the first efforts to assist families and network members of addicted persons began in the early 1970's and have since grown in number and influence. Many of these efforts have been based on self-help group models, such as Alcoholics Anonymous, Narcotics Anonymous, or Al-Anon. Also, in the area of mental health, interventions involving patient's social network have already been developed and shown encouraging evidence for their effectiveness (Kleiner & Drews, 1992; Schoenfeld, Halevy, Hemley-van der Velden, & Ruhf, 1986). Moreover, assertive case management has been shown to improve social functioning and increase network size for homeless mentally ill persons (Wasylenki, Goering, Lemire, Lindsey, & Lancee, 1993).

In conclusion, the social network and psychiatric measures accounted for a sizable amount of the variance in post-treatment functioning. These findings may be useful for developing specific interventions for dually diagnosed persons, who often have poorer prognoses than individuals with either psychiatric or substance abuse problems. Furthermore, the network enumeration methodology employed in the present study may be useful for other studies involving dual diagnosis populations or persons with substance abuse problems. Further work should investigate the psychometric properties of the

instrument and other researchers may choose to incorporate more detailed network questions.

APPENDICES

APPENDIX A

SAMI Project Participant Consent Form

APPENDIX A

SAMI Project Participant Consent Form

MICHIGAN STATE UNIVERSITY
SAMI RESEARCH PROJECT
PARTICIPANT CONSENT FORM

PURPOSE

There are two main purposes of the SAMI research project. The first is to collect information about the Chemical Dependency Unit at Northville Regional Psychiatric Hospital and the second is to find out what happens to people after they leave the hospital. We will be contacting and interviewing participants periodically for up to 2 years after discharge from Northville.

PROCEDURES

Participating in this research study involves the following:

Amount of Contact With You:

We would like to interview you several times throughout the next 2 years. In the hospital we will be asking you for 3 interviews: right after you consent to participate, after you have been in the hospital for a short while, and right before you are discharged. These interviews will take approximately 1 hour to complete.

Once you leave Northville, we want to interview you every 4 months for a total of 5 times. These interviews will take approximately 2 hours to complete. Together we will choose where we will conduct the interviews so it will be convenient for you. Also, we would like to be in touch with you by mail or telephone every 2 months just to make sure we can locate you for your next interview.

Ward Assignment:

By agreeing to participate in the project, you are also agreeing to accept one of two possible future ward assignments. The alternatives are assignment to the Chemical Dependency Unit (CDU, A-5-1) or remaining on the ward to which you are currently assigned or another ward to which the hospital would normally assign you. This ward assignment will continue throughout the course of the study. The choice of these alternatives will be determined solely by lottery. This means that one-half of the people in this study will be in the CDU and the other half will be assigned the way the hospital typically assigns people to wards. The choice of treatment unit assignment in this study is strictly random.

Interviews:

During interviews with you we will ask a lot of questions. Your answers will be kept strictly confidential. We will want to know about many aspects of your life. Specifically we will ask about your alcohol and drug use, your physical and emotional health, your social relationships and the kinds of activities you do, your job, legal problems, your living situation, your attitudes about substance use, your goals in life, and the mental health or substance abuse services you have used.

Additionally, while you are in the hospital we will want to know how you felt about the services your received at the hospital, which activities you participated in while on the ward(s), and what your plans are for the future. We will also ask you questions about your knowledge of substance abuse and mental health problems.

Locating You:

We will ask you to give us permission to contact a few people you know and agencies you may be receiving services from to ask them if they know how to locate you if we cannot find you. We will tell them that you are participating in a research project concerning your treatment at Northville Regional Psychiatric Hospital. We will only ask them to help us contact you. We will not ask friends, family, or significant others any other questions.

Interviewing Others:

We would also like to obtain information from staff at agencies you receive treatment from after you leave Northville Regional Psychiatric Hospital. In addition, we would like to have access to your clinical records and management information systems data at Detroit/Wayne County Community Mental Health Board and its contractual service providers for the purposes of obtaining information on 1) any information that may aid us in locating you, 2) access to the dates, the number of times, and the types of services you have used, and 3) answering questions regarding your community adaptation. During the various interviews that we have with you, we will ask you for names of agencies that have provided services to you from community mental health, substance abuse, or other service agencies. We will then contact one or more of them to ask if they will answer some general questions about how well things are going for you. They do not have to participate if they do not want to be involved.

Benefits To You:

In the past, many people have found participating in this type of study an interesting and educational experience. For your participation in the study you will receive monetary compensation for each interview. For completing the 3 interviews while you are in the hospital, you will receive $15. For the 2 hour interviews in the community you will receive $10 for each. If you complete all of the interviews you will receive a bonus of $15, which makes the total you can receive $80. Additionally, you will be asked to send us updated addresses and will receive small gift coupons as compensation.

Risks:

We anticipate no risks to you from participating in this study. Some of the questions we will ask you may be about difficult or emotional subjects. If you are feeling uneasy about any of the questions, please tell the interviewer that you choose not to talk about that subject.

Voluntary Participation:

Your participation in this study is completely voluntary. Whether you agree to participate will have no effect on the services you will receive from the Department of Mental Health. You are free to withdraw from participating at any time. You do not have to respond to any questions you do not want to answer.

Confidentiality:

All information you give to us during an interview will be kept completely confidential. Instead of using your name, we will use a code number to identify your responses. The only people who will have access to your answers will be the research staff. We will be interviewing approximately 450 people and the data will be compiled and presented together, not on an individual basis.

Your identity will be protected under our Confidentiality Certificate issued by the Department of Health and Human Services. The persons authorized by the Confidentiality Certificate to protect the identity of research subjects may not be compelled to identify research subjects in any civil, criminal, administrative, legislative, or other proceeding whether Federal, State or local. If either of the following conditions exist the Confidentiality Certificate does not authorize refusal to reveal identifying information concerning research subjects: 1) The subject consents in writing to disclosure to identifying information, or 2) authorized personnel of DHEW request identifying information for audit or program evaluation of a research project funded by DHEW or for investigation of DHEW grantees or contractors and their employees or agents carrying out such a project. The Confidentiality Certificate does not govern the voluntary disclosure of identifying characteristics of research subjects. The Confidentiality Certificate does not represent an endorsement of the research project by the Secretary.

Questions or Concerns:

If you have any questions or concerns regarding this project, please call Ms. Marjorie Ebejer, at (313) 349-1800 ext. 2895, Dr. Douglas Luke, at (517)353-0871, or Dr. Carol T. Mowbray at (313) 577-8806.

CONSENT STATEMENT

I understand all of the information written on this form. I have had an opportunity to raise questions and have them answered. By signing this consent form I am agreeing to participate in the study under the conditions listed above. A copy of this form will be provided to me.

_____

Participant Name (PRINT)

_____ _____ _____

Participant Signature Date Interviewer Signature

APPENDIX B

Social Network Measure

APPENDIX B

Social Network Measure

Social Network Section - Instructions

1. Begin by asking probe question #1 at the bottom of the page. For each name that the respondent mentions, turn to the next page and write down their first name and first letter of their last name. Continue recording responses for this question until the respondent is finished and prompt the respondent by asking, "Is there anyone else...?".

2. Next, for the first column of the table, "Probe Number," record the number of the question you have been asking (In this first instance you would write "1" for Question 1). If the same individual is mentioned twice, then DO NOT write their name down again, but write down that question number in the Probe Number column next to where that person's name was first mentioned.

3. Continue asking questions 2 - 5. When you have recorded all of the names of the individuals for the remaining questions and the probe number for each one, then proceed to fill in the remaining columns (e.g. Sex, Know from Northville, etc.). For each name go across the row asking each of the questions for that one individual. Do this until the chart is completely filled in for each person.

Read:
For this next section, I will be asking you questions about your friends and people who you are close to. I will be asking you to list some of the names of your friends; however, I will not ask you their full name, just their first name and the first letter of their last name. This way you can protect their identity. Do you have any questions?

Probe Questions:

(1) When you are concerned about a personal matter--for example, something you are worried about or you are concerned about someone you are close to--who do you talk with?
<PROMPT-for each question>

(2) Who do you spend your time with, that is - who do you hang out with?

(3) Who would you ask if you needed to borrow some money?

(4) Do you attend any support groups such as AA/NA meetings?

NO-------> {IF NO, THEN SKIP TO #5)
YES------> {IF YES, THEN *Who are your good friends in this group?}*

(5) Is there anyone else important in your life who you have not mentioned? <PROBE>

No.	**SN01** Probe Number	**SN02** What is the first name & first letter of last name for this person?	**SN03** What is the sex of this person? 1=M 2=F	**SN04** What is your relation to this person? 1=Relative 2=Sig other (sex partner/spouse) 3=Coworker 4=Professional 5=Housemate 6=Support Grp. 7=Other, Friend 8=Nonhuman (God, pets)	**SN05** Know from meeting at NRPH? 1=Yes 2=No	**SN06** How often do you have contact with ______? 1=Yearly/less 2=Few/year 3=Monthly 4=Weekly 5=Daily	**SN07** How important is ______ to you? 1=Not at all 2=A little bit 3=Moderately 4=Quite a bit 5=Extremely	**SN08** How satisfied are you with your contacts? 1=Not at all 2=A little bit 3=Moderately 4=Quite a bit 5=Extremely	**SN09** Does _________ currently drink any alcohol or do drugs? 1=None 2=Alc.only 3=Drugs only 4=Drugs/alc.	**SN10** How much support does _____ give you in helping you stay clean? 1=Not at all 2=A Little bit 3=Moderately 4=Quite a bit 5=Extremely
A										
B										
C										
D										
E										
F										
G										
H										
I										
J										
K										
L										
M										
N										
O										

APPENDICES C-1 to C-4

Four Tables of Standardized Path Coefficients

Table C - 1

Standardized Beta Coefficients for the Path Model Predicting Addiction Severity Index Alcohol Composite Scores

	Follow-up Period							
	Time 2 (n = 372)			Time 3 (n = 299)				
Predictor	Sobriety Support 2	Network Member Use2	ASI Alcohol Comp.2	Sobriety Support3	Network Member Use3	No. of Intimates3	Psychiatric Distress3	ASI Alcohol Comp.3
Pre-Discharge								
Sex[a]	--	--	--	--	--	--	--	.05
Race[a]	--	--	--	--	--	--	--	--
Age	--	--	--	--	--	--	--	.10*
Education	--	--	--	--	--	--	--	--
Employment[a]	--	--	--	--	--	--	--	--
Marital[a]	--	--	-.08	--	--	--	--	-.02
Treatment Condition[a]	03	-.02	-.09	--	--	--	--	.00
No. Days in Treatment	--	--	-.02	--	--	--	--	-.17**
Family Involvement	--	--	-.06	--	--	--	--	.08
Time2 Variables								
Sobriety Support2	--	--	.04	.44**	--	--	--	-.05
Network Member Use2	--	--	.20**	--	.44**	--	--	.09
No. of Intimates2	--	--	-.11*	--	--	.36**	--	-.03
Psychiatric Distress2	--	--	.37**	--	--	--	.50**	-.12*
Time3 Variables								
Sobriety Support3	--	--	--	--	--	--	--	-.03
Network Member Use3	--	--	--	--	--	--	--	-.05
No. of Intimates3	--	--	--	--	--	--	--	.07
Psychiatric Distress3	--	--	--	--	--	--	--	.26**
Substance Use Time2								
ASI Alcohol Comp.2	--	--	--	.01	.00	.02	--	.55**
Alcohol Relapse2	--	--	--	--	--	--	--	--
ASI Drug Comp.2	--	--	--	--	--	--	--	--
Drug Relapse2	--	--	--	--	--	--	--	--

Note. "--" Indicates path was not hypothesized. Net. = Network; No. = Number; Comp. = Composite Score.

[a]The direction of coding for these dichotomous variables is: Sex 0=Female, 1=Male; Race 0=White 1=African American; Employment 0=Not working 1=Employed; Marital 0=Not currently married 1=Married; Treatment Condition 0=Usual care 1=Experimental; Alcohol and Drug Relapse 0=Abstaining 1=Relapsed.

*$p < .05$ **$p < .01$

Table C - 2

Standardized Beta Coefficients for the Path Model Predicting Addiction Severity Index Drug Composite Scores

	Follow-up Period							
	Time 2 (n = 324)			Time 3 (n = 319)				
Predictor	Sobriety Support 2	Network Member Use2	ASI Drug Comp.2	Sobriety Support3	Network Member Use3	No. of Intimates3	Psychiatric Distress3	ASI Drug Comp.3
Pre-Discharge								
Sex*	--	--	--	--	--	--	--	--
Race*	--	--	--	--	--	--	--	--
Age	--	--	--	--	--	--	--	--
Education	--	--	--	--	--	--	--	--
Employment*	--	--	-.06	--	--	--	--	--
Marital*	--	--	--	--	--	--	--	--
Treatment Condition*	03	-.02	.02	--	--	--	--	.03
No. Days in Treatment	--	--	-.07	--	--	--	--	-.07
Family Involvement	--	--	-.14**	--	--	--	--	-.07
Time2 Variables								
Sobriety Support2	--	--	.10*	.43**	--	--	--	-.03
Network Member Use2	--	--	-.05	--	.43**	--	--	-.07
No. of Intimates2	--	--	-.07	--	--	.36**	--	.05
Psychiatric Distress2	--	--	.34**	--	--	--	.50**	-.04
Time3 Variables								
Sobriety Support3	--	--	--	--	--	--	--	.02
Network Member Use3	--	--	--	--	--	--	--	05
No. of Intimates3	--	--	--	--	--	--	--	.03
Psychiatric Distress3	--	--	--	--	--	--	--	.36**
Substance Use Time2								
ASI Alcohol Comp.2	--	--	--	--	--	--	--	--
Alcohol Relapse2	--	--	--	--	--	--	--	--
ASI Drug Comp.2	--	--	--	.02	00	.02	--	.37**
Drug Relapse2	--	--	--	--	--	--	--	--

Note. "--" Indicates path was not hypothesized. Net. = Network; No. = Number; Comp. = Composite Score.

*The direction of coding for these dichotomous variables is: Sex 0=Female, 1=Male; Race 0=White 1=African American; Employment 0=Not working 1=Employed; Marital 0=Not currently married 1=Married; Treatment Condition 0=Usual care 1=Experimental; Alcohol and Drug Relapse 0=Abstaining 1=Relapsed.

*$p < .05$ **$p < .01$

Table C - 3
Partial Correlations for the Path Model Predicting Alcohol Relapse

	Follow-up Period							
	Time 2 (n = 374)			Time 3 (n = 334)				
Predictor	Sobriety Support 2	Network Member Use2	Alcohol Relapse	Sobriety Support3	Network Member Use3	No. of Intimates3	Psychiatric Distress3	Alcohol Relapse
Pre-Discharge								
Sex[a]	--	--	--	--	--	--	--	--
Race[a]	--	--	--	--	--	--	--	--
Age	--	--	--	--	--	--	--	--
Education	--	--	.02	--	--	--	--	--
Employment[a]	--	--	--	--	--	--	--	--
Marital[a]	--	--	--	--	--	--	--	.00
Treatment Condition[a]	.03	-.02	-.04	--	--	--	--	.00
No. Days in Treatment	--	--	-.04	--	--	--	--	-.05
Family Involvement	--	--	00	--	--	--	--	.00
Time2 Variables								
Sobriety Support2	--	--	-.02	.43**	--	--	--	.00
Network Member Use2	--	--	.15**	--	.42**	--	--	.05
No. of Intimates2	--	--	-.05	--	--	.36**	--	.00
Psychiatric Distress2	--	--	.12**	--	--	--	.50**	.00
Time3 Variables								
Sobriety Support3	--	--	--	--	--	--	--	.00
Network Member Use3	--	--	--	--	--	--	--	.00
No. of Intimates3	--	--	--	--	--	--	--	00
Psychiatric Distress3	--	--	--	--	--	--	--	.11**
Substance Use Time2								
ASI Alcohol Comp.2	--	--	--	--	--	--	--	--
Alcohol Relapse2	--	--	--	-.03	.06	-.02	--	.32**
ASI Drug Comp.2	--	--	--	--	--	--	--	--
Drug Relapse2	--	--	--	--	--	--	--	--

Note. "--" Indicates path was not hypothesized. Net. = Network; No. = Number; Comp. = Composite Score.

[a]The direction of coding for these dichotomous variables is: Sex 0=Female, 1=Male; Race 0=White 1=African American; Employment 0=Not working 1=Employed; Marital 0=Not currently married 1=Married; Treatment Condition 0=Usual care 1=Experimental; Alcohol and Drug Relapse 0=Abstaining 1=Relapsed.

*$p < .05$ **$p < .01$

Table C - 4
Partial Correlations for the Path Model Predicting Drug Relapse

	Follow-up Period							
	Time 2 (n = 372)			Time 3 (n = 336)				
Predictor	Sobriety Support 2	Network Member Use2	Drug Relapse	Sobriety Support3	Network Member Use3	No. of Intimates3	Psychiatric Distress3	Drug Relapse
Pre-Discharge								
Sex[a]	--	--	--	--	--	--	--	--
Race[a]	--	--	--	--	--	--	--	--
Age	--	--	--	--	--	--	--	.05
Education	--	--	--	--	--	--	--	--
Employment[a]	--	--	-.11**	--	--	--	--	--
Marital[a]	--	--	.00	--	--	--	--	--
Treatment Condition[a]	.03	- 02	.00	--	--	--	--	.00
No. Days in Treatment	--	--	00	--	--	--	--	.00
Family Involvement	--	--	.00	--	--	--	--	-.05
Time2 Variables								
Sobriety Support2	--	--	.00	.43**	--	--	--	.00
Network Member Use2	--	--	.04	--	.44**	--	--	-.09*
No. of Intimates2	--	--	.00	--	--	.36**	--	.00
Psychiatric Distress2	--	--	.19**	--	--	--	.50**	.00
Time3 Variables								
Sobriety Support3	--	--	--	--	--	--	--	.00
Network Member Use3	--	--	--	--	--	--	--	.13**
No. of Intimates3	--	--	--	--	--	--	--	.00
Psychiatric Distress3	--	--	--	--	--	--	--	.11**
Substance Use Time2								
ASI Alcohol Comp.2	--	--	--	--	--	--	--	--
Alcohol Relapse2	--	--	--	--	--	--	--	--
ASI Drug Comp.2	--	--	--	--	--	--	--	--
Drug Relapse2	--	--	--	-.02	.01	.00	--	.31**

Note. "--" Indicates path was not hypothesized. Net. = Network; No. = Number; Comp. = Composite Score.

[a]The direction of coding for these dichotomous variables is: Sex 0=Female, 1=Male; Race 0=White 1=African American; Employment 0=Not working 1=Employed; Marital 0=Not currently married 1=Married; Treatment Condition 0=Usual care 1=Experimental; Alcohol and Drug Relapse 0=Abstaining 1=Relapsed.

*p < .05 **p < .01

LIST OF REFERENCES

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Akers, R. L., Krohn, M. D., Lanza-Kaduce, L., & Radosevich, M. (1979). Social learning and deviant behavior: A specific test of a general theory. American Sociological Review, 44, 636-655.

Bachrach, L. (1986-1987). The context of care for the chronic mental patient with substance abuse problems. Psychiatric Quarterly, 58(1), 3-14.

Berkman, L. F. (1986). Social networks, support, and health: Taking the next forward. American Journal of Epidemiology, 123, 559-562.

Billings, A. G., & Moos, R. H. (1983). Psychosocial processes of recovery among alcoholics and their families: Implications for clinicians and program evaluators. Addictive Behaviors, 8, 205-218.

Booth, B. M., Russell, D. W., Soucek, S., & Laughlin, P. R. (1992). Social support and outcome of alcoholism treatment: An exploratory analysis. American Journal of Drug and Alcohol Abuse, 18, 87-101.

Boyd, C. J., & Mieczkowski, T. (1990). Drug use, health, family and social support in "crack" cocaine users. Addictive Behaviors, 15, 481-485.

Brown, S. A., Vik, P. W., & Creamer, V. A. (1989). Characteristics of relapse following adolescent substance abuse treatment. Addictive Behaviors, 14, 291-300.

Brown, V. B., Ridgely, M. S., Pepper, B., Levine, I. S., & Ryglewicz, H. (1989). The dual crisis: Mental illness and substance abuse. American Psychologist, 44, 565-569.

Cohen, C. I., & Kochanowicz, N. (1989). Schizophrenia and social network patterns: A survey of black inner-city outpatients. Community Mental Health Journal, 25, 197-207.

Cohen, E. H., Mowbray, C. T., Bybee, D., Yeich, S., Ribisl, K., & Freddolino, P. P. (1993). Tracking and follow-up methods for research on homelessness. Evaluation Review, 17, 331-352.

Cohen, J. (1988). Statistical power analysis for the behavioral sciences. (2nd ed.). Hillsdale, NJ: Lawrence Earlbaum.

Cohen, J., & Cohen, P. (1983). Applied multiple regression/correlation analysis for the behavioral sciences. (2nd ed.). Hillsdale, NJ: Earlbaum.

Coppotelli, H. C., & Orleans, C. T. (1985). Partner support and other determinants of smoking cessation maintenance among women. Journal of Consulting and Clinical Psychology, 53, 455-460.

Cronkite, R. C., & Moos, R. H. (1980). Determinants of posttreatment functioning of alcoholic patients: A conceptual framework. Journal of Consulting and Clinical Psychology, 48, 305-316.

Curry, S., Thompson, B., Sexton, M., & Omenn, G. S. (1989). Psychosocial predictors of outcome in a worksite smoking cessation program. American Journal of Preventive Medicine, 5(1), 2-7.

Dackis, C. A., & Gold, M. S. (1992). Psychiatric hospitals for treatment of dual diagnosis. In J. H. Lowinson, P. Ruiz, & R. B. Millman (Ed.), Substance Abuse: A Comprehensive Textbook(pp. 467-485). Baltimore: Williams & Wilkins.

Daley, D. C., & Marlatt, G. A. (1992). Relapse prevention: Cognitive and behavioral interventions. In J. H. Lowinson, P. Ruiz, R. B. Millman, & J. G. Langrod (Ed.), Substance Abuse: A comprehensive textbook(pp. 533-542). Baltimore, MD: Williams & Wilkins.

Davidson, W. S., Redner, R., Amdur, R. L., & Mitchel, C. M. (1990). Alternative treatments for troubled youth: The case of diversion from the justice system. New York: Plenum.

Derogatis, L., Lipman, R., & Covi, L. (1973). The SCL-90: An outpatient rating scale (Preliminary report). Psychopharmacology Bulletin, 9, 13-29.

Drake, R. E., Osher, F. C., Noordsy, D. L., Hurlbut, S. C., Teague, G. B., & Beaudett, M. S. (1990). Diagnosis of alcohol use disorders in schizophrenia. Schizophrenia Bulletin, 16, 57-67.

El-Guebaly, N. (1990). Substance abuse and mental disorders: The dual diagnoses concept. Canadian Journal of Psychiatry, 35, 261-267.

Ell, K. (1984). Social networks, social support, and health status: A review. Social Service Review, 58, 133-143.

Ellickson, P. L., & Hays, R. D. (1992). On becoming involved with drugs: Modeling adolescent drug use over time. Health Psychology, 11, 377-385.

Everingham, S. S., & Rydell, C. P. (1994). Modeling the demand for cocaine. Santa Monica, CA: Rand.

Favazza, A. R., & Thompson, J. J. (1984). Social networks of alcoholics: Some early findings. Alcoholism: Clinical and Experimental Research, 8, 9-15.

Fraser, M., & Hawkins, J. D. (1984a). Social network analysis and drug misuse, Social Service Review(Vol. March, pp. 81-97).

Fraser, M. W., & Hawkins, J. D. (1984b). The social networks of opioid abusers. The International Journal of the Addictions, 19, 903-917.

Galanter, M. (1987). Social network therapy for cocaine dependence. Advances in Alcohol and Substance Abuse, 6, 159-175.

Galanter, M. (1993). Network therapy for alcohol and drug abuse: A new approach in practice. New York, NW: BasicBooks.

Goehl, L., Nunes, E., Quitkin, F., & Hilton, I. (1993). Social networks and Methadone treatment outcome: The costs and benefits of social ties. American Journal of Drug and Alcohol Abuse, 19, 251-262.

Goldstein, P. J., Abbott, W., Paige, W., Sobel, I., & Soto, F. (1977). Tracking procedures in follow-up studies of drug abusers. American Journal of Drug and Alcohol Abuse, 4(1), 21-30.

Gordon, A. J., & Zrull, M. (1991). Social networks and recovery: One year after inpatient treatment. Journal of Substance Abuse Treatment, 8, 143-152.

Gottheil, E., Thornton, C. C., Skoloda, T. E., & Alterman, A. I. (1982). Follow-up of abstinent and non-abstinent alcoholics. American Journal of Psychiatry, 139, 560-565.

Gottlieb, B. H. (1985). Social networks and social support: An overview of research, practice, and policy implications. Health Education Quarterly, 12, 5-22.

Grey, C., Osborn, E., & Reznikoff, M. (1986). Psychosocial factors in outcome in two opiate addiction treatments. Journal of Clinical Psychology, 42, 185-189.

Hammer, M. (1983). Core and 'extended' social networks in relation to health and illness. Social Science and Medicine, 17, 405-411.

Hammer, M., Makiesky-Barrow, S., & Gutwirth, L. (1978). Social networks and schizophrenia. Schizophrenia Bulletin, 4, 522-545.

Hansen, W. B., Tobler, N. S., & Graham, J. W. (1990). Attrition in substance abuse prevention research: A meta-analysis of 85 longitudinally followed cohorts. Evaluation Review, 14, 677-685.

Hawkins, D. J., Catalano, R. F., & Y., M. J. (1992). Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: Implications for substance abuse prevention. Psychological Bulletin, 112, 64-105.

Hawkins, J. D., & Catalano, R. F. (1985). Aftercare in drug abuse treatment. International Journal of the Addictions, 20, 917-945.

Hawkins, J. D., & Fraser, M. W. (1987). The social networks of drug abusers before and after treatment. International Journal of the Addictions, 22, 343-355.

Higgins, S. T., Budney, A. J., Bickel, W. K., & Badger, G. J. (1994). Participation of significant others in outpatient behavioral treatment predicts greater cocaine abstinence. American Journal of Drug and Alcohol Abuse, 20(1), 47-56.

Hoffman, G. W., Jr., DiRito, D. C., & McGill, E. C. (1993). Three-month follow-up of 28 dual diagnosis inpatients. American Journal of Drug and Alcohol Abuse, 19(1), 79-88.

Holden, M. G., Brown, S. A., & Mott, M. A. (1988). Social support network of adolescents: Relation to family alcohol abuse. American Journal of Drug and Alcohol Abuse, 14, 487-498.

Holmes-Eber, P., & Riger, S. (1990). Hospitalization and the composition of mental patients' social networks. Schizophrenia Bulletin, 16, 157-164.

Hunt, W. A., Barnett, L. W., & Branch, L. G. (1971). Relapse rates in addiction programs. Journal of Clinical Psychology, 27, 455-456.

Institute for Health Policy (1993). Substance abuse: The nation's number one health problem - Key indicators for policy. Waltham, MA: Brandeis University.

Israel, B. A. (1983). Social networks and health status: Linking theory, research, and practice. Patient counselling and health education, 4(2), 65-79.

Joe, G. W., & Simpson, D. D. (1983). Social factors related to the follow-up status of opoid addicts. Journal of Psychoactive Drugs, 15, 207-217.

Josephson, E., & Rosen, M. A. (1978). Panel use in a high school drug study. , 115-133.

Kandel, D. B. (1978). Convergences in prospective longitudinal surveys of drug use in normal populations. In D. B. Kandel (Ed.), Longitudinal research on drug use:

Empirical findings and methodological issues(pp. 3-38). New York: John Wiley & Sons.

Kay, G. R., Kalathara, M., & Meiner, A. E. (1989). Diagnostic and behavioral characteristics of psychiatric patients who abuse substances. Hospital and Community Psychiatry, 40, 1062-1064.

Kessler, R. C., & Price, R. H. (1993). Primary prevention of secondary disorders: A proposal and agenda. American Journal of Community Psychology, 21, 607-633.

Kleiner, R. J., & Drews, D. (1992). Community-based treatment of psychiatric disorders in the U.S.A. and Norway: Insights for new service delivery systems. International Journal of Social Psychiatry, 38(2), 95-106.

Kosten, T. R., Rounsaville, B. J., & Kleber, H. B. (1983). Concurrent validity of the addiction severity index. The Journal of Nervous and Mental Illness, 171, 606-610.

Laumann, E. O., & Schumm, L. P. (March 1992). Measuring social networks using samples: Is network analysis relevant to survey research? Paper presented at the Frontiers of social measurement, Chicago, IL.

Lex, B. W. (1991). Some gender differences in alcohol and polysubstance users. Health Psychology, 10, 121-132.

Lipton, F. R., Cohen, C. I., Fischer, E., & Katz, S. E. (1981). Schizophrenia: A network crisis. Schizophrenia Bulletin, 7, 144-151.

Longabaugh, R., & Lewis, D. C. (1988). Key issues in treatment outcome studies. Alcohol, Health & Research World, 12, 168-175.

Lyons, J. E., & McGovern, M. P. (1989). Use of mental health services by dually diagnosed patients. Hospital and Community Psychiatry, 40, 1067-1069.

Macdonald, J. G. (1987). Predictors of treatment outcome for alcoholic women. International Journal of the Addictions, 22, 235-248.

Marlatt, G. A. (1985a). Cognitive factors in the relapse process. In G. A. Marlatt & J. R. Gordon (Ed.), Relapse Prevention(pp. 128-200). New York, NY: Guilford.

Marlatt, G. A. (1985b). Relapse prevention: Theoretical rationale and overview of the model. In G. A. Marlatt & J. R. Gordon (Ed.), Relapse Prevention(pp. 3-70). New York, NY: Guilford.

Marlatt, G. A. (1985c). Situational determinants of relapse and skills-training interventions. In G. A. Marlatt & J. R. Gordon (Ed.), Relapse Prevention(pp. 71-127). New York, NY: Guilford.

Marlatt, G. A., Baer, J. S., Donovan, D. M., & Kivlahan, D. R. (1988). Addictive behaviors: Etiology and treatment. Annual Review of Psychology, 39, 223-252.

Marlatt, G. A., & Gordon, J. R. (1985). Relapse prevention: Maintenance strategies in the treatment of addictive disorders. New York, NY: Guilford.

Marsden, P. V. (1990). Network data and measurement. Annual Review of Sociology, 16, 435-63.

McCallister, L., & Fischer, C. S. (1983). A procedure for surveying personal networks. In R. S. Burt & M. J. Minor (Ed.), Applied network analysis: A methodological introduction(pp. 75-88). Beverly Hills, CA: Sage.

McGinnis, J. M., & Foege, W. H. (1993). Actual causes of deaths in the United States. Journal of the American Medical Association, 270, 2207-2212.

McLellan, A. T., Luborsky, L., Woody, G. E., & Druley, K. A. (1983). Predicting response to drug and alcohol treatments: Role of psychiatric severity. Archives of General Psychiatry, 40, 620-625.

McLellan, A. T., Luborsky, L., Woody, G. E., & O'Brien, C. P. (1980). An improved diagnostic evaluation instrument for substance abuse patients: The Addiction Severity Index. The Journal of Nervous and Mental Disease, 168, 26-33.

Mermelstein, R., Lichtenstein, E., & McIntyre, K. (1983). Partner support and relapse in smoking-cessation programs. Journal of Consulting and Clinical Psychology, 51, 465-466.

Minkoff, K. (1989). An integrated treatment model for dual diagnosis of psychosis and addiction. Hospital and Community Psychiatry, 40, 1031-1036.

Mitchell, J. C. (1969). The concept and use of social networks. In J. C. Mitchell (Ed.), Social networks in urban situations: Analysis of personal relationships in Central African towns. Manchester, England: Manchester University Press.

Mitchell, R. E., & Trickett, E. J. (1980). Task force report: Social networks as mediators of social support: An analysis of the effects and determinants of social networks. Community Mental Health Journal, 16(1), 27-44.

Moos, R., & Bliss, F. (1978). Difficulty of follow-up and outcome of alcoholism treatment. Journal of Studies on Alcohol, 39, 473-490.

Moos, R. H., Finney, J. W., & Chan, D. A. (1981). The process of recovery from alcoholism: 1. Comparing alcoholics patients and matched community controls. Journal of Studies on Alcohol, 42, 383-402.

Moxley, D. P. (1988). Measuring the social support networks of persons with psychiatric disabilities: A pilot investigation. Psychosocial Rehabilitation Journal, 11(3), 19-27.

Mueller, D. P. (1980). Social networks: A promising direction for research on the relationship of the social environment to psychiatric disorder. Social Science and Medicine, 14A, 147-161.

Narcotics Anonymous (1988). Narcotics Anonymous. (5th ed.). Van Nuys, CA: World Service Office.

National Institute on Drug Abuse (1991). Dual diagnosis: Drug abuse and psychiatric illness, Drug Abuse and Drug Abuse Research (DHHS Report ADM 91-1704). Rockville, MD: U. S. Government Printing Office.

Newcomb, M. D., & Bentler, P. M. (1988). Impact of adolescent drug use and social support on problems of young adults: A longitudinal study. Journal of Abnormal Psychology, 97, 64-75.

Nguyen, T. D., Atikisson, C. C., & Stegner, B. L. (1984). Assessment of patient satisfaction. Evaluation of Program Planning, 6, 299-314.

Ohannessian, C. M., & Hesselbrock, V. M. (1993). The influence of perceived social support on the relationship between family history of alcoholism and drinking behaviors. Addiction, 88, 1651-1658.

Osher, F. C., & Kofoed, L. L. (1989). Treatment of patients with psychiatric and psychoactive substance abuse disorders. Hospital and Community Psychiatry, 40, 1025-1030.

Oyabu, N., & Garland, T. N. (1987). An investigation of the impact of social support on the outcome of an alcoholism treatment program. International Journal of the Addictions, 22, 221-234.

Perkins, K. A., Simpson, J. C., & Tsuang, M. T. (1986). Ten-year follow-up of drug abusers with acute or chronic psychosis. Hospital and Community Psychiatry, 37, 481-484.

Phillips, S. L. (1981). Network characteristics related to the well-being of normals: A comparative base. Schizophrenia Bulletin, 7, 117-123.

Polich, J. M., Armor, D. J., & Braiker, H. B. (1980). The course of alcoholism: Four years after treatment (No. R-2433-NIAAA). Santa Monica, CA: Rand.

Powell, B. J., Penick, E. C., Nickel, E. J., Liskow, B. I., Riesenmy, K. D., Campion, S. L., & Brown, E. F. (1992). Outcomes of co-morbid alcoholic men: A 1-year follow-up. Alcoholism: Clinical and Experimental Research, 16, 131-138.

Regier, D. A., Farmer, M. E., & Rae, D. S. (1990). Comorbidity of mental disorders with alcohol and other drug abuse. Journal of the American Medical Association, 264, 2511-2518.

Rhoads, D. L. (1983). A longitudinal study of life stress and social support among drug abusers. The International Journal of the Addictions, 18, 195-222.

Ries, R. K., & Ellingson, T. (1990). A pilot assessment at one month of 17 dual diagnosis patients. Hospital and Community Psychiatry, 41, 1230-1233.

Ritter, C. (1988). Social supports, social networks, and health behaviors. In D. S. Gochman (Ed.), Health behavior: Emerging research perspectives(pp. 149-161). New York, NY: Plenum.

Robins, L., & Smith, E. M. (1980). Longitudinal studies of alcohol and drug problems: Sex differences. In O. J. Kalant (Ed.), Alcohol and drug problems in women (Vol. 5). New York, NY: Plenum Press.

Rosenberg, H. (1983). Relapsed versus non-relapsed alcohol abusers: Coping skills, life events, and social support. Addictive Behaviors, 8, 183-186.

Ross, H. E., Glaser, F. B., & Germanson, T. (1988). The prevalence of psychiatric disorders in patients with alcohol and other drug problems. Archives of General Psychiatry, 45, 1023-1031.

Rounsaville, B. J., Dolinsky, Z. S., Babor, T. F., & Meyer, R. E. (1987). Psychopathology as a predictor of treatment outcome in alcoholics. American Journal of Psychiatry, 44, 505-513.

Rumptz, M. H., Sullivan, C. M., Davidson, W. S., II, & Basta, J. (1991). An ecological approach to tracking battered women over time. Violence and Victims.

Rydell, C. P., & Everingham, S. S. (1994). Controlling cocaine: Supply versus demand programs . Santa Monica, CA: Rand.

Schoenfeld, P., Halevy, J., Hemley-van der Velden, E., & Ruhf, L. (1986). Long-term outcome of network therapy. Hospital and Community Psychiatry, 37, 373-376.

Selzer, M. L. (1971). The Michigan Alcoholism Screening Test: The quest for a new diagnostic instrument. American Journal of Psychiatry, 127, 1653-1658.

Shattuck, A. L., White, E., & Kristal, A. R. (1992). How women's adopted low-fat diets affect their husbands. American Journal of Public Health, 82, 1244-1250.

Siddall, J. W., & Conway, G. L. (1988). Interactional variables associated with retention and success in residential drug treatment. International Journal of the Addictions, 23, 1241-1254.

Simpson, D. D., & Sells, S. B. (1983). Effectiveness of treatment for drug abuse: An overview of the DARP research program. Advances in Alcohol and Substance Abuse, 2(1), 7-29.

Smith, E. M. (1993). Race or racism? Addiction in the United States. Annals of Epidemiology, 3(2), 165-170.

Smith, J. W., Frawley, J. P., & Howard, M. O. (1991). Environmental risks to be considered in substance user treatment planning, implementation, and assessment. International Journal of the Addictions, 26, 371-375.

Sobell, L. C., Sobell, M. B., Toneatto, T., & Leo, G. I. (1993). What triggers the resolution of alcohol problems without treatment? Alcoholism: Clinical and Experimental Research, 17, 217-224.

Sokolovsky, J., Cohen, C., Berger, D., & Geiger, J. (1978). Personal networks of ex-mental patients in a Manhattan SRO hotel, Human Organization(Vol. 37, pp. 5-15).

Sorensen, J., & Gibson, D. (1983). Community network approach to drug abuse treatment. Bulletin of the Society of Psychologists in Addictive Behaviors, 2, 99-102.

Stephens, R., & Cottrell, E. (1972). A follow-up study of 200 narcotic addicts committed for treatment under the Narcotic Addict Rehabilitation Act (NARA). British Journal of Addiction, 67, 45-53.

Strug, D. L., & Hyman, M. M. (1981). Social networks of alcoholics. Journal of Studies on Alcohol, 42, 855-885.

Tausig, M. (1992). Caregiver network structure, support and caregiver distress. American Journal of Community Psychology, 20, 81-96.

Thoits, P. (1982). Conceptual, methodological and theoretical problems in studying social support as a buffer against life stress. Journal of Health and Social Behavior, 23, 145-159.

Tuchfeld, B. S. (1981). Spontaneous remission in alcoholics: Empirical observations and theoretical implications. Journal of Studies on Alcohol, 42, 626-641.

Van der Poel, M. G. M. (1993). Delineating personal support networks. Social Networks, 15, 49-70.

Wallace, B. C. (1989). Psychological and environmental determinants of relapse in crack cocaine smokers. Journal of Substance Abuse Treatment, 6, 95-106.

Wasylenki, D. A., Goering, P. N., Lemire, D., Lindsey, S., & Lancee, W. (1993). The hostel outreach program: Assertive case management for homeless mentally ill persons. Hospital and Community Psychiatry, 44, 848-853.

Westermeyer, J. (1989). Nontreatment factors affecting treatment outcome in substance abuse. American Journal of Drug and Alcohol Abuse, 15(1), 13-29.

Westermeyer, J., & Neider, J. (1988). Social networks and psychopathology among substance abusers. American Journal of Psychiatry, 145, 1265-1269.

Ziedonis, D. M., Rayford, B. S., Bryant, K. J., & Rounsaville, B. J. (1994). Psychiatric comorbidity in white and African-American cocaine addicts seeking substance abuse treatment. Hospital and Community Psychiatry, 45, 43-49.

Zimmerman, R. S., & Connor, C. (1989). Health promotion in context: The effects of significant others on health behavior change. Health Education Quarterly, 16, 57-75.

Zobeck, T. S., Stinson, F. S., Grant, B. F., & Bertoluci, D. (1993). Trends in alcohol-related fatal traffic crashes, United States: 1979-91. Rockville, MD: National Institute of alcohol abuse and alcoholism.