To the Graduate Council:

I am submitting herewith a dissertation written by Richard N. Cloud entitled "Prediction of Alcoholics Anonymous Affiliation From Pretreatment Factors: Methods and Theory to Inform Provider Referrals." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Social Work.

John G. Orme, Major Professor

We have read this dissertation
and recommend its acceptance:

Accepted for the Council:

Associate Vice Chancellor and
Dean of The Graduate School

PREDICTION OF ALCOHOLICS ANONYMOUS AFFILIATION FROM PRETREATMENT FACTORS: METHODS AND THEORY TO INFORM PROVIDER REFERRALS

A Dissertation
Presented for the
Doctor of Philosophy
Degree
The University of Tennessee, Knoxville

Richard N. Cloud
December, 1999

Copyright © Richard N. Cloud, 1999

All rights reserved

DEDICATION

This dissertation is dedicated to my brother, Dan Cloud, who has endured great suffering and loss throughout his lifetime from the insidious effects of alcoholism. His suffering and the anguish that alcohol-use disorders have brought upon my family have inspired and motivated this dissertation and my study of substance abuse treatment. Knowledge derived from studies of substance abuse treatment hold the promise of radically improving the lives of many who suffer from alcoholism, reducing the torment and anguish of their families, and contributing to the functioning of society.

A Monologue of a Mother to Her Alcoholic Son:

While you were gone,
... I lost all hope.
Not knowing where you were
... imprisoned, infirmed... or worse.
Such relief to see you, my son
... to know you're alive.

By now, you must know
... alcohol's destructive effects
Good spirit for most.
But for you bad spirit, parasitic,
... you are the host.

Some say you weak, hedonistic,
... engaged in self-destruction
I think you... possessed, infested
... unable to flee
... the call of the spirit
... possession too great.

For years it was harmless.
Then pleasantly numb, chronically smitten,
... you welcomed, no cherished the spirits.
As you were consumed,
... the losses ensued.
First spirit, then joy,
... then all precious or good.
Towards death it does lead you, my son.

Oh beloved, still part of me,
... can't you see, what I see.
You must run from your friend,
... before its too late, you must flee!

But, you cannot see,
... you cannot hear,
... you cannot break free.
From the grips of seduction,
... of your ravenous friend.

I give up on you son
... this is all I can stand
All hope, all effort is futile,
... no more tears!
Those like you must go this course.
That is, I am told, save few,
... who awake and see,
... and go free!

I plead to you son,
... there are some who break free,
... you can if you will, don't you see!
Must I be made to watch while you die,
... a bit more with each day?
Stand helpless, no hopeless,
... in this wretched despair?
Aren't you able, can you hear me,
... there are some who are free?

In the silence, that follows
... helpless and weary
... she accepts as she weeps.
No one, knows,
... who must suffer,
... who must die,
...while some go free

ACKNOWLEDGEMENTS

I wish to express my appreciation to all of those who have contributed to this dissertation project. Special thanks are extended to the following individuals:

To my beloved Mary, and our children, Tricia, Christie, Brent and Lesley. This achievement was made possible by your encouragement, love and support. Mary deserves a medal for her unwavering support, patience and tolerance.

To my brother Jim, and my parents, Edna and James (Sonny). This would not have been possible without your emotional and financial support. I thank you for your contributions.

To my committee members, John Orme, Ph.D., Ron Hopson, Ph.D, Bill Nugent, Ph.D. and Charles, Glisson, Ph.D., who have contributed to my doctoral education. I thank you, and hope to remain connected to all of you in a special way by virtue of this shared experience. In addition, a debt of gratitude is acknowledged to Dr. David Patterson, who provided significant mentoring, support, inspiration and encouragement throughout my doctoral education.

To esteemed substance abuse researchers, Scott Tonigan, Ph.D., Ernest Kurtz, Ph.D., Linda Kurtz, Ph.D. and Fran DelBoca, Ph.D., who freely gave of their valuable time, and in so doing have accelerated and advanced my understanding of research and substance-use disorders. I was the benefactor of your attention and support, which has been both stimulating and flattering.

To my good friend Hank Shemwell. I would not have come this way without your encouragement and support both before and during my doctoral education. You were instrumental in this achievement.

ABSTRACT

Introduction: Treatment providers commonly emphasize and teach Alcoholics Anonymous (AA) philosophies and beliefs in treating alcohol disorders. The high rate of post-treatment relapse into harmful drinking suggests a need for extended care beyond initial treatment, and practitioners commonly refer clients to AA for aftercare. Although an abundance of correlational research suggests that greater AA affiliation is moderately and consistently associated with improved drinking outcomes, the vast majority of those who try AA drop out or substantially curtail affiliation ("disaffiliation") within a year. Despite this, AA generally is believed to represent an affordable and effective adjunct and extension of initial treatment. Objective: The purpose of this study is to predict AA affiliation using information available at treatment and to advance knowledge surrounding affiliative processes. Literature from previous research and theory is used to develop hypotheses and a model of affiliation involving domains of motivation, coping skills and cultural fit. Methods: Using the Project MATCH data, two classification methods (binary logistic regression and artificial neural networks) are used to test hypotheses and predict AA affiliation at one-year post-treatment. Affiliation was operationalized to include dimensions of (1) meeting attendance or exposure, and (2) level of involvement or participation in AA activities. The affiliation construct was measured using the Alcoholics Anonymous Involvement scale (AAI) administered at 12 months post-treatment ($N = 1,506$). The study attempts to optimize classification accuracy on a dichotomous response variable that includes "disaffiliates" or "moderate to high affiliates" class membership. Results: Significance tests of 58 predictor variables suggested that the pretreatment AAI, divorced and separated marital statuses, age,

treatment assignment, treatment site (representing inpatient or outpatient subjects), guilt/worry surrounding drinking and religiosity are significant predictors of affiliation. Prior affiliation (the pretreatment AAI) is a good predictor of affiliation. Despite considerable prior theory and empirical evidence, motivation, severity, self-efficacy and external help-seeking measures were not significant predictors. Results are explained using theories borrowed from the organizational culture and climate literature. Attempts to predict affiliation were moderately successful (*kappa* = .42, *sensitivity* = 74%, *specificity* = 68%).

TABLE OF CONTENTS

CHAPTER I: INTRODUCTION AND STATEMENT OF THE PROBLEM 1

Overview 1

Prominence and Controversy 3
AA's Effectiveness 4
Under Utilization and Attrition 6
Possible Harm 7

Alcohol Dependence: The Population Served by AA 8
Diagnostic Prevalence 10
Etiology and Models of Alcohol Dependence 11
Treatment Goal 17
Abstinence Based Treatment Methods 19

Effectiveness of AA 20

Theories of Curative Processes 21
Stress and Coping Theory 22
AA Internal Theory 23
Curative Effects of Spirituality 26
Faith Development 28
Cognitive, Behavioral and Affective Components 29
Psychodynamic and Group Processes 30
Stages of Change and Motivation 31

Review of the AA Effectiveness Literature 34
Nature and Extent of Effectiveness Studies 36
Early Literature Reviews 37
Meta-Analytic Literature Reviews 38
More Recent Studies 42

Problem Statement 45

Purpose and Objectives of Research 48

CHAPTER II: REVIEW OF THE AFFILIATION LITERATURE 49

Membership Survey 49

Theories of AA Affiliation 52

Organizational Climate and Culture 53

Affiliative Need and Fear of Drinking 55

Stages of Change and Motivation 56

Stress and Coping Theory 62

Affiliation Studies: Review of the Literature 64

Prior Reviews of the Literature 64
Meta-Analyses Study Quality 66
Meta Analytic Methods 68
Prior Literature Reviews 69
Meta-Analytic Study Findings 69
Moderating Effects of Study Quality and Sample Origin 73
More Recent Studies and Synthesis 74
Study Quality 74
Personality Factors 81
Severity Measures and Treatment Modality 82
Motivation and Stages of Change 85
Stress and Coping Theory 88
Social Competency and Comfort 89
Religion, Spirituality, and Purpose in Life 90
Locus of Control/Self-Efficacy/External Help-Seeking 92
History of Affiliation 94
Discussion 95
Hypotheses of AA affiliation 97
A Model of AA Affiliation 99
CHAPTER III: METHODOLOGY 105
Subjects: Project MATCH 106
Context: Treatment Matching Hypothesis and Project MATCH 107
Treatment Groups 108
Primary and Secondary Matching Hypotheses 110
Pretreatment Data Collection 112
Sampling and Group Assignment 113
Follow-up and Outcome Measures 116
Project MATCH Summary Findings 116
Study Design and Data Collection 117
Operationalization of the AA Affiliation Response Variable 118
Operationalization of Explanatory Variables 123
Data Analysis: 134
Alternative Classification Algorithms 136
Artificial Neural Networks 137
Neural Network Functioning 140
The Radial Basis Function (RBF) ANN 143
Data Preparation, Testing and Analysis 145
Variable Selection 147

CHAPTER IV: RESULTS 150

Samples 150

Data Preparation and Testing 150

Tests of Individual Variables Using BLR 153

Summary of Tests of Individual Variables *159*

Classification Accuracy 160

Selection of the ANN Algorithm *162*

Review of Classification Accuracy Results *163*
Results of Kappa 163
Results of Sensitivity and Specificity 165
Summary of Significant Classification Results 166

CHAPTER V: DISCUSSION 168

Major Study Findings 168

Tests of Individual Variables *168*
Pretreatment History of Affiliation 168
Treatment Influences 171
Personal Characteristics 175

Cultural Model of Long-Term Affiliation *177*

Predictive Accuracy *181*

Unexpected Findings and Limitations 183

Implications for Practice 186

Clinical Decision Support Systems *186*

Need for Extended Care *189*

Suggestions for Research 191

BIBLIOGRAPHY 194

VITA 208

LIST OF TABLES

TABLE		PAGE
1	Relationship Between Affiliation Measures and Drinking Behavior Outcomes	39
2	Relationship Between AA Attendance and Criteria Other Than Drinking	41
3	Weighted Meta Analytic Correlates of AA Affiliation from Multiple Studies	71
4	Single Study Correlations of AA affiliation	72
5	Summary of the Affiliation Literature	75-77
6	Relationships Hypothesized to Predict Greater AA Affiliation	98
7	Affiliative Domains and Major Factors	103
8	Personal and Demographic Characteristics by Treatment Arm	114
9	List of Questions and Exploratory Factor Analysis of the AAI	119
10	Descriptive Statistics for 12 Month AAI Scores	122
11	Review of PM Baseline Measures for Hypothesized Constructs	124-133
12	Sample Demographics	151
13	Results of Tests of Individual Variables Using BLR	154-157
14	Results of Classification Trials (Sample #1 Trials)	164

LIST OF FIGURES

FIGURE		PAGE
1	AA Affiliation Model	104
2	AAI Histogram	121
3	Typical Representation of an Artificial Neural Network Model	142
4	Revised Model of Affiliation	181

CHAPTER I: INTRODUCTION AND STATEMENT OF THE PROBLEM

This study was initiated to develop a model that predicts future Alcoholics Anonymous (AA) affiliation from information available at treatment. Affiliation is defined as an AA dose measure with primary domains of attendance and involvement (Emrick, Tonigan, Montgomery & Little, 1993; Tonigan, Connors & Miller, 1996). Level of involvement commonly is defined in terms of AA participation beyond meeting attendance (e.g. working AA's 12 steps, having a sponsor, being a sponsor, studying the AA literature, leading meetings) (Emrick et al., 1993; Tonigan, Connors & Miller, 1996). While historical research has tended to define affiliation in terms of attendance, studies generally have found more consistent and larger positive correlations between post-treatment abstinence and measures of AA involvement (Emrick et al., 1993; Tonigan, Connors & Miller, 1996).

This introduction compiles contextual information related to the AA organization, provides summary information on the population generally served (i.e. alcohol dependent individuals), provides a review of the AA effectiveness literature, and concludes with a problem statement.

Overview

Alcohol dependence (or alcoholism) is widely recognized as a major problem in the U.S. adversely affecting millions of Americans, their families and society (U.S. Secretary of Health and Human Services, 1997). A wide range of adverse effects are associated with alcohol dependence contributing to losses in many areas of functioning, disease, mortality and economic cost. In response, theories of the disorder have spawned

many treatment approaches during the 20th century, and considerable research evidence supports the effectiveness of many of these interventions at reducing or eliminating excessive consumption and improving psychosocial functioning (e.g. Miller & Hester, 1995; Donovan & Mattson, 1994). Despite its critics, few would argue that AA has played a significant role in contributing to treatment knowledge.

An abstinence based self-help program, AA describes its purpose and membership requirements in its literature and posits curative processes that may accrue to alcoholic affiliates. This literature states that, AA has "one primary purpose, to carry its message to the alcoholic who still suffers," and more broadly defines membership in stating that, "the only requirement for AA membership is a desire to stop drinking" (AA World Services, 1976, p. 564). AA generally posits that development and maintenance of a "spiritual condition" enables the victim to remain sober (AA World Services, 1976), although the necessary spiritual condition required for sobriety is not clearly defined within the literature. The 12 steps of AA and "fellowship" with other recovering alcoholics are primary mechanisms aiding the alcoholic in maintaining sobriety and creating the needed spiritual conversion (AA World Services, 1976, 1981). Other authors suggest a variety of other mechanisms may account for AA's effectiveness (e.g. providing coping resources [Humphreys, Finney & Moos, 1994], activating curative group processes [Machell, 1992] and facilitating change processes [DiClemente, 1993]).

Alcoholics Anonymous has proliferated since its inception in 1935, growing to over 96,000 groups (AA World Services, 1997) in 150 countries and over 1.7 million members worldwide (Miller & McCrady, 1993). Perhaps more significant is the status and influence that AA enjoys, which are apparent in its impact on addiction treatment

(e.g. Humphreys, 1997; Miller & McCrady, 1993). In this regard, Miller and McCrady (1993, p. 3) comment that "it is difficult to find an American alcohol/drug abuse treatment program that does not embrace a 12-step approach and recommend AA attendance", and noting that courts commonly mandate AA attendance for alcohol-related offenses (Miller & McCrady, 1993). Researchers (e.g. Humphreys 1997; Bradley, 1988; Emrick et al., 1993) observe that AA's partnership with treatment professionals has flourished, contending that AA attendance is a common component of aftercare contracts. Authors (e.g. Miler & McCrady, 1993; Emrick et al., 1993) acknowledge that most people are aware of AA and hold strong opinions either for or against AA's effectiveness and its role in treatment for addictions.

Although there is evidence that many of those who do affiliate and involve themselves volitionally benefit (e.g. Emrick et al., 1993; Tonigan, Toscova & Miller, 1996), surveys suggest that 50% of those who attend AA drop out within 90 days (AA World Services, 1990a), and the attrition rate at one year may approach 90% (Miller & McCrady, 1993; AA World Services, 1990b). In spite of this high rate of dropout, AA's most recent triennial survey reports that mean sobriety among members is more than 6 years with 73% of its members having more than one year of sobriety (AA World Services, 1997).

Prominence and Controversy

AA has attained a high level of public awareness among problem drinkers and their families, often representing the first, and sometimes the only form of intervention attempted (e.g. Humphreys, Kaskutas & Weisner, 1998; Timko, Finney, Moos, Moos &

Steinman, 1993). Room (1993) reviews surveys estimating a high prevalence of AA meeting attendance among U.S. adults and concludes that AA is best characterized as a social movement, compared to other categories that have been applied to it including organization, religion and cult. Other authors (e.g. Room & Greenfield, 1993; Emrick et al., 1993) also describe AA as a social movement and suggest that it continues to grow in size and significance, greatly influencing government programs, treatment providers and the general public. Despite AA's prominence, growth, status and public awareness, evidence suggests that it is utilized by a relatively small proportion of alcohol dependent individuals (Bean-Bayog, 1993; Room, 1993; U.S. Secretary of Health and Human Services, 1997). The following discussion introduces some of the issues that may contribute to low utilization of AA and other controversies that call into question the appropriateness of wide-scale referral practices.

AA's Effectiveness

While the effectiveness literature is described in much greater detail in a subsequent section of this document, it is summarized here to introduce a controversy. In general, considerable correlational evidence (e.g. Emrick et al., 1993; Tonigan, Toscova & Miller, 1996; Humphreys, Moos & Cohen, 1997) suggests moderate and consistently favorable drinking outcomes (e.g. measures of days sober during a period, or drinks per drinking day) associated with affiliation. In spite of this evidence, AA has consistently failed to demonstrate favorable drinking outcomes in studies using random assignment. Critics of these studies point out that meeting attendance was coerced by employers (Walsh et al. 1991) or madated by courts (Brandsma, Maultsby & Welsh, 1980; Ditman,

Crawford, Forgy, Moskowitz & MacAndrew, 1967). A more recent study corroborated these findings using random assignment and therapist persuasion (e.g. goal setting and routine monitoring of AA attendance) to encourage AA attendance. This study found no significant difference in abstinence measures at 90 days between two therapy-only groups, compared to a group receiving both therapy and AA (McCrady, Epstein & Hirsch, 1996). Unfortunately, the McCrady, Epstein and Hirsch (1996) study lacked sufficient statistical power to detect a small effect size ($n = 90$; *groups* = 3). The failures of AA to demonstrate its effectiveness in studies using random assignment have contributed to skepticism and criticism regarding its effectiveness and its role as an intervention for alcohol dependence.

Some researchers have responded to this criticism by noting that studies consistently have found that level of participation or involvement (e.g. 12 step work, involvement in sponsorship, leading meetings, studying the AA literature, etc.), rather than attendance, is the strongest predictor of positive drinking outcomes, even when controlling for attendance (e.g. Montgomery, Miller & Tonigan, 1995; Emrick et al. 1993; Tonigan, Connors & Miller, 1996). These same researchers suggest that volitional attendance is associated with greater involvement, whereas mandated or coerced attendance is believed to negatively influence the level of involvement. Similarly, the AA literature emphasizes working the 12 steps as the key to successful recovery, not meeting attendance (AA World Services, 1981, 1976). Unfortunately, the one study that did not involve coerced attendance (McCrady, Epstein & Hirsch, 1996) measured AA dosage in terms of attendance rather than involvement.

Speiglman (1997) observes that AA was designed and intended for people who

are motivated to make changes in their drinking. In spite of this, criminal justice officials commonly sentence drug and alcohol offenders to AA attendance (Speiglman, 1997). Speiglman argues that this practice may result in harm both to AA and the potential client. For example, newly sober alcoholics hearing the stories of "low-bottom drunks" may conclude that they do not have a problem, which could reduce the therapeutic effects of the conviction. In addition, and despite AA's open cooperation, it is suggested that the sheer volume of DUI offenders sentenced to AA may dilute and adversely effect the nature of AA for volitional members (Speiglman, 1997). Speiglman reviews studies and contends that court mandated attendance has little or no effect on drinking, and suggests research on more effective interventions for DUI offenders.

Under Utilization and Attrition

While it is common practice for treatment professionals, primary care physicians and the courts to refer people to AA, little is known about who actually affiliates or disaffiliates (Emrick, 1989, 1994). As previously noted, despite AA's prominence, Bean-Bayog (1993) contends that only a minority of those suffering from alcohol dependence utilize it. In addition, researchers have estimated that approximately 50% of those who sample AA drop out within 90 days, and that 75% to 90% drop out within one year of initial attendance (AA World Services, 1990a; AA World Services, 1990b; Emrick et al., 1993; Miller & McCrady, 1993). Unfortunately, research fails to follow and explain reasons and outcomes among the dropouts.

Possible Harm

The large rate of attrition and the failure of controlled trials using random assignment to find AA effective have contributed to questions regarding potential harm caused by AA. While no empirical evidence of deleterious or iatrogenic effects was found in this review, many authors raise the question of possible harm (DiClemente, 1993; Emrick, 1989, 1994; Glaser, 1993; Peele, 1989). Smith (1993) describes how fear of drinking or relapse may create and reinforce AA group dependence, while Bufe (1991) characterized AA as a cult. Still others have more generally advocated more wide-scale adoption of naturalistic recoveries as a first line of treatment, with minimal formal interventions or AA referrals (Peele, 1989; Emrick, 1994).

Emrick (1994) notes that AA is not always helpful or necessary and frequently rejected by alcoholics. Consequently, only a qualified endorsement of AA is possible based upon a comprehensive review of the outcome literature. Emrick suggests that providers should generally encourage participation in AA, but avoid indiscriminant and generalized prescription, which is common among treatment professionals. The author argues that any intervention has the potential to harm some while helping others, and contends that AA attendance could increase depressive symptoms, helplessness, guilt or inadequacy. In addition, Emrick contends that AA involvement is frequently unnecessary, noting that brief and minimal interventions are commonly found effective at helping problem drinkers, citing one study that found well over 30% of problem drinkers improve without any treatment. Emrick concludes that natural healing processes are frequently adequate and that only when it becomes clear that such processes are not effective, should a clinician refer a patient to formal treatment or AA. Emrick concludes

that clinicians should "never require, (but) always encourage" AA.

AA's first step, i.e. "we admitted we were powerless over alcohol—that our lives had become unmanageable" (AA World Services, 1976, p. 59), remains the source of controversy. Many believe that acknowledging powerlessness and unmanageability are contra-indicated and reduce self-efficacy (Morgenstern & McCrady, 1993). In this regard, Morgenstern and McCrady (1993) note that the behavioral model and the disease model propose extremely different causal mediators for change. The behavioral model posits that the key to positive outcome is increasing self-efficacy, whereas the disease model focuses on powerlessness.

Alcohol Dependence: The Population Served by AA

The AA literature (AA World Services, 1976) characterizes the "true alcoholic" whom the organization was developed to aid as those with years of routine and chronic drunkenness resulting in suffering, loss of functioning, and repeated failed attempts to control or abstain from drinking. AA World Services (1976) recognized and contrasted this severely dependent alcoholic with less severe problem drinkers who are able to regain control of their drinking or quit entirely with little or no assistance, and suggested that the AA program was for the former and not the latter. Despite the more severe profile of the founders of AA, it was hoped that earlier involvement might arrest future suffering (AA World Services, 1976). AA envisioned the possibility of "higher-bottom" problem drinkers being aided by the organization, and therefore left membership open to any individual who had a "desire to stop drinking" (AA World Services, 1976). The

unintended consequence of this open membership tradition has been to attract people who do not need AA.

Contemporary treatment providers (Project MATCH Research Group, 1993), courts (Speiglman, 1997), and primary care physicians routinely have referred a broad range of alcohol dependent, and to a lesser extent, less severe problem drinkers (alcohol abuse) to AA, assuming that most problem drinkers are aided by AA. This practice occurs despite the AA group's stated primary purpose of carrying its message to the alcoholic that still suffers (AA World Services (1976). The "primary purpose" also is consistent with the very name of *Alcoholics* Anonymous. This focus on the alcoholic also is corroborated by the vast majority of studies where Emrick et al. (1993) describe subjects as either alcohol dependent or alcoholic. Accordingly, although this review acknowledges that some alcohol abusers are referred to AA, this review focuses on the alcohol dependent population predominantly served by AA.

Alcohol dependence is the diagnostic term for alcoholism (American Psychiatric Association, 1994) and is characterized by the following: (1) heavier or more prolonged use than intended, or "persistent desire or unsuccessful efforts to cut down or control" drinking; (2) chronic intoxication causing problems in life; (3) increased tolerance for alcohol (must drink more to achieve the same effect); (4) physical dependence marked by withdrawal symptoms including restlessness, irritability, sweating, and the "shakes", which may include hallucinations or delirium tremens; and (5) use of alcohol or sedatives to alleviate withdrawal symptoms. Early signs of dependence include an increase in tolerance, which causes the drinker to require more to attain the same level of "high," and contributes to the body's eventual physical dependency on alcohol. Once physical

dependency is established, the drinker may unconsciously (or consciously) drink to alleviate withdrawal symptoms such as irritability, restlessness, discontent or the "shakes", thereby maintaining and reinforcing the dependence.

The DSM (American Psychiatric Association, 1994) diagnostic requirement for alcohol dependence is heterogeneous, containing considerable variation in the types and severity of alcoholics included (Grant, Harford, Dawson, Chou, Dufour & Pickering, 1994; Hasin & Glick 1992; Polcin, 1997). The concept of levels of severity is an important construct in treating alcoholism. For example, researchers have found that the extent and duration of heavy drinking are good predictors of who is able to successfully return to controlled drinking (Miller, Leckman, Delaney & Tincom, 1992; Sobell & Sobell, 1993), and severity is a critical consideration in treatment planning.

Diagnostic Prevalence

Anthropologists have traced habitual drunkenness throughout antiquity. For example, it is in Egyptian hieroglyphics and Roman and Indian texts where problem drinking was chronicled as a problem for some individuals and society (Wilcox, 1998). Likewise the use of alcoholic beverages was prevalent in human cultural systems, and frequently part of rituals, ceremonies and social life (Wilcox, 1998).

More recently, per capita alcohol consumption data indicate a rise from 1.2 gallons of alcohol per year in 1935, through a peak of 2.7 in the early 80's, and then a reduction to around 2.25 gallons by 1995 (U.S. Secretary of Health and Human Services, 1997). However, it is impossible to make valid inferences from per capita consumption regarding the prevalence of alcohol dependence. Some believe that the recent advocacy

of Mothers Against Drunk Driving, increased enforcement of intoxication laws, and increased stigmatization of drunkenness may have reduced alcohol abuse and dependence in the U.S. (U.S. Secretary of Health and Human Services, 1997).

The U.S. Department of Health and Human Services (1997) published alcohol dependence prevalence estimates from four recent national surveys. The average prevalence (using DSM-III-R diagnostic criteria) was 5.6%, while the average (using DSM-IV) was slightly less at 4.7%. Similarly, the average current prevalence of alcohol dependence across the four national surveys, including both DSM-III-R and DSM-IV criteria, was 7.2% for men and 2.5% for women (U.S. Department of Health and Human Services, 1997). Grant et al. (1994) present a breakdown of the prevalence of DSM-III-R alcohol dependence from the National Longitudinal Alcohol Epidemiological Survey of 1992, depicting a strong reduction in prevalence across the life span. This survey suggests a total population prevalence of 4.4%, distributed by age as follows: 9.4% for ages 18 to 29, 4.3% between ages 30-44, 2.1% for ages 45-64, and only 0.4% over age 65. A further breakdown of dependence by Black versus non-Black respondents suggests similar prevalence rates across race (Grant et al., 1994).

Etiology and Models of Alcohol Dependence

There are many diverse theories and research findings, with no present consensus on the etiology of alcohol dependence (Miller & Hester, 1995). In general, the etiology of alcohol disorders is believed to involve a variety of factors including genetic, biological, psychological, environmental, and developmental phenomena, according to research summarized in the two consecutive and comprehensive reviews of literature

conducted by the U.S. Secretary of Health and Human Services (U.S. Department of Health and Human Services, 1993, 1997). This research suggests a genetic link or predisposition and an environmental component, which interact. Whether genetically or environmentally influenced, there is substantial agreement among researchers that people with a close alcoholic blood relative (or family history) are at greater risk for heavy drinking and alcoholism (U.S. Department of Health and Human Services, 1993, 1997).

This limited discussion does not begin to capture the complexity of theories on genetic and environmental influences and ignores a variety of competing explanatory theories, (e.g. biochemical abnormalities, social learning, family pathology, sociocultural and personal choice [Miller & Hester, 1996]). Some theorists suggest more functional models depicting drinking in response to painful internal states. For example, Monti, Abrams, Kadden and Cooney (1989) depict drinking as an adaptive response to cope with environmental stressors, and support this contention with an impressive collection of theoretical support including social learning, cognitive-behavioral, operant conditioning, stress and coping theory, evolutionary, and psychoanalytic theories. Similarly, qualitative researchers studying the addictive experience have suggested that chronic and intense emotional discomfort may contribute to habitual relief drinking (Hopson & Beaird-Spiller, 1995; Hopson, 1993).

As a practical matter, anyone (even those without a family history of alcohol disorders) who chronically and routinely drinks to intoxication, will over time develop alcohol dependence (alcoholism). It is a gradual process usually taking months or years, culminating in a physical dependence or addiction to alcohol. Abstinence then results in

withdrawal symptoms, then continued drinking is reinforced by alleviating withdrawal symptoms.

Research on motivation to drink alcohol corroborates alcohol as differentially reinforcing for certain individuals, and as related to drinking expectancies (U.S. Department of Health and Human Services, 1997). These drinking expectancies appear to be shaped by a variety of influences including genetics, culture, friends and family. In addition, people with limited coping skills and those holding positive cognitive expectations about alcohol's ability to control stress are at increased risk (U.S. Secretary of Health and Human Services, 1997). Chronic environmental stressors are believed to have a bigger impact on some people than on others (U.S. Secretary of Health and Human Services, 1997).

Polcin (1997) reviews the major controversies and disagreements in substance abuse research, including etiology, diagnosis, controlled drinking versus abstinence, personality versus learned behavior, disease versus syndrome, and the relative value and role of AA versus professional treatments. Polcin notes that explanatory etiology and models of alcoholism have been debated routinely. Once a widely accepted model of alcoholism, the disease model is challenged increasingly by opponents who argue that there is no apparent natural course of drinking problems, that is many of those who have met diagnostic requirements for alcohol dependence have been shown to return to asymptomatic drinking or attain stable abstinence without any form of treatment (Polcin, 1997). Proponents of the disease model suggest that the diagnosis of alcohol dependence is far too broad, following Jellinek's theory that only severe alcoholics follow the natural course of destruction (Polcin, 1997).

Miller and Hester (1995) summarize a variety of prominent conceptual models of alcoholism, contending that the model one adopts greatly influences the treatment strategies implemented. These models vary greatly in terms of cause and suggested treatment for alcoholism and include moral, temperance, spiritual, dispositional disease, educational, characterological, classic learning or conditioning, social learning, cognitive, socio-cultural, general systems and biological. Relevant to this discussion, Miller and Kurtz (1994) observe that alcoholism professionals and researchers commonly attribute false or ambiguous statements to the AA model of alcoholism. The authors summarize three prominent models of alcoholism, which are related and often confused with AA's model of alcoholism, including the moral-volitional, personality and dispositional/disease models. These models posit cause and prescribe treatment, and are selected for summary since they are the most germane to the discussion of AA.

Moral volitional model. The moral volitional model is the oldest model reviewed herein (Miller & Hester, 1995; Miller & Kurtz, 1994). According to this model, alcoholism is caused by flawed character, while drunkenness is a matter of choice or willful misconduct. The authors describe a 1988 U.S. Supreme Court case where alcoholism was characterized as "willful misconduct," as depicting recent application of this model. Under this model, drunkenness is best treated through punishment and social sanctions.

Personality models. Personality models originated with early 20th century psychoanalysts (Miller & Kurtz, 1992). According to this model, an immature alcoholic personality exists, which is caused by oral fixations created in early infant development. Researchers (e.g. Miller & Kurtz, 1994; Tuite & Luiten, 1986; Reigle, 1997) suggest that

personality theories persist, despite repeated failures to replicate studies designed to find common dimensions of personality. According to this model, the alcoholic is plagued with ego defense mechanisms such as denial, rationalization, and minimization. Dysfunctional families contribute to addictive behaviors, and both alcoholics and family members commonly suffer from a personality disturbance (codependency). Under this model, psychodynamic psychotherapy is the most appropriate treatment for alcoholic and family members, with an emphasis on reparenting.

Dispositional disease model. Miller and Kurtz (1994) suggest that the dispositional disease model was advanced by the medical community in the 1930s and 1940s, and that it has become prominent in recent years. Certain core criteria exist in establishing alcoholism as a disease, including: (1) the cause is solely biological only effecting biologically predisposed individuals, (2) the psychosocial dysfunction is a symptom of an underlying physical disease, (3) the lack of control over intake after introduction of the chemical ethanol is the definitive symptom, (4) the condition is incurable, and (5) the disease is progressive with a somewhat predictable natural course unless abstinence is initiated. In this view, the alcoholic should be "exonerated" from irrational behaviors and provided interventions to aid in initiating and maintaining stable abstinence. Given the biological nature of the disease psychotherapy is inappropriate, and treatment should consist of detoxification, education about the disease, and abstinence from all addictive chemicals.

AA model. Miller and Kurtz describe the AA model of alcoholism, where alcoholism is viewed as a disease, while certain personality tendencies are acknowledged, (e.g. immature, emotionally overly sensitive, grandiose, narcissistic and ego-driven

[overactive ego functioning]). The AA model also integrates social, behavioral and cognitive components. According to the AA model, alcoholism is a spiritual malady (causal). Consistent with the volitional model, the alcoholic has a choice about drinking in an earlier stage, but not after some threshold of lifetime drinking, or some hypothetical "invisible line" has been exceeded. Moderation therefore is not viewed as a viable alternative for "true" alcoholics. Recovery in AA requires a spiritual conversion, along with maintenance and growth of a spiritual condition. The twelve steps are designed to create this requisite spiritual conversion or awakening. AA is not denominational or theological, and the spiritual awakening can be achieved based upon a "higher power" or a God of the individual's own understanding (AA World Services, 1976).

Miller and Kurtz acknowledge that the promulgated model often is misunderstood and misrepresented by its own members. AA does not believe in coercion and does not perceive membership as aiding all problem drinkers, especially those who believe they can still control their drinking. AA's stated outreach policy is based upon "attraction rather than promotion" (AA World Services, 1976). The AA literature defines membership for those who are convinced that they cannot control drinking, and who have a desire to quit drinking.

Proceeding from the above, Miller and Kurtz depict several common myths falsely attributed to AA: (1) AA is a single form of alcoholism or alcohol problem; (2) controlled drinking is impossible for all problem drinkers; (3) interventions involving confrontation and coercion are effective at motivating problem drinkers into treatment; (4) alcoholics are immersed in denial and other defense mechanisms; (5) alcoholism can only be viewed as a disease; (6) alcoholism is hereditary; (7) AA is the only successful

method for recovery; and (8) alcoholics should not be held responsible for their conditions or actions.

Treatment Goal

The drinking goal used in the treatment of alcoholism, abstinence or controlled drinking, historically has been a subject of controversy among both researchers and practitioners. Watson et al. (1997) note that AA may have contributed to an inappropriate influence over treatment professionals in mandating a goal of abstinence in cases where it is not necessary. Watson et al support this contention, noting that moderation is far more accepted in Canada and England, where AA has had less impact on treatment.

Many people who have had difficulties with drinking are able to return to "controlled drinking," with little (e.g. Bien, Miller & Tonigan, 1993) or no help (e.g. Sobell, Sobell & Toneatto, 1992; Sobell, Sobell, Toneatto & Leo, 1993; Peele, 1989; Vaillant, 1995). Exceptions seem to be those previously diagnosed or treated for alcoholism where any of the following exist: (1) greater severity of drinking, (2) longer duration of problem drinking, or (3) positive family history of addiction (e.g. Miller, Leckman, Delaney & Tinkcom, 1992; Miller & Munoz, 1982). In addition, those who have been treated previously or diagnosed for alcohol problems, or who are unsuccessful within the first year in a rigorous controlled drinking trial (i.e. with the help of a counselor or a self-help manual), are more likely to fail in control drinking studies (Miller, Leckman, Delaney & Tinkcom, 1992).

There is also considerable evidence (e.g. Sobell, Sobell & Toneatto, 1992; Sobell,

Sobell, Toneatto & Leo, 1993; Peele, 1989; Vaillant, 1995) that many people who develop harmful drinking problems abstain or control drinking without any professional aid. One such study suggested that compared to those who do seek help, 3 to 13 times as many problem drinkers never seek professional treatment (Sobell, Sobell & Toneatto, 1992).

In a classic prospective longitudinal study that followed problem drinkers over many years, Vaillant (1995) provides some perspective on this issue:

> ...return to asymtomatic drinking was common among the alcohol abusers...however, resumption of asymtomatic drinking was achieved more often by return to controlled drinking rather than to less structured drinking patterns...(Vaillant later cautions)...that when middle aged alcoholics who had required detoxification attempted to return to asymptomatic drinking their situation was analogous to driving a car without a spare tire—disaster was usually only a matter of time...by the time an alcoholic is ill enough to require clinical treatment, return to asymptomatic drinking was the exception, not the rule (p. 383).

It is clear that individuals who have severe dependence symptoms, a history of prior treatment, and a family history of alcoholism are at greater risk for relapse into abusive drinking and should therefore consider a goal of abstinence (Miller, Leckman, Delaney & Tinkcom, 1992). However, there are enough exceptions to make hard and fast rules impossible. In general, Miller and Munoz (1982) suggest that the "farther individuals have progressed along the continuum of problem drinking, the less are his or her chances of becoming a moderate and non-problem drinker." This general statement is consistent with research findings from several controlled drinking studies reviewed by Miller, Leckman, Delaney and Tinkcom (1992).

Abstinence Based Treatment Methods

A wide variety of abstinence based treatments have been developed for alcohol dependence in the 20th century, using both inpatient and outpatient modalities (Miller et al. 1995). A review of alcoholism treatment effectiveness studies conducted by the Institute of Medicine (1990) concluded that alcoholism treatment research has demonstrated the effectiveness of alcohol treatments in general. Reviews of treatment effectiveness further have suggested that there is no single best treatment for alcohol dependence, rather a number of treatment protocols seem to work well (Donovan & Mattson, 1994).

It should be noted, that despite frequently being mistreated as an alternative treatment, AA is better characterized as a social support group (Humphreys, Finney & Moos, 1994), a type of self-help or mutual help, and an adjunct to professional treatment. There are, however, a variety of treatment programs that integrate AA meetings and beliefs into the treatment approach. These treatment approaches, more generally labeled twelve-step facilitation methods (TSF), teach AA practices, philosophies and beliefs as promulgated in prominent AA literature (e.g. meeting attendance, working the steps, and sober living). Unfortunately, the content of TSF programs varies considerably among programs, making consistent operationalization, comparisons and generalizations of research findings difficult or impossible (Miller et al., 1995).

Nowinski, Beker and Carroll, (1994) developed the treatment guide for the TSF treatment protocol used in the Project MATCH study, a multi-site study of patient-treatment matching effects sponsored by the National Institute of Alcohol Abuse and Alcoholism. The authors acknowledge the diverse nature of TSF treatments, noting that

"the general therapeutic principles underlying TSF can be applied in many ways other than those delineated here" (p. xii). Following is a general description of the TSF treatment protocol used in Project MATCH (Nowinski, Beker & Carroll, 1994), suggested as a TSF specimen approach to treatment:

> This therapy is grounded in the concept of alcoholism as a spiritual and medical disease. The content of this intervention is consistent with the 12 steps of Alcoholics Anonymous, with primary emphasis given to steps 1 through 5. In addition to abstinence from alcohol, a major goal of the treatment is the foster the patients' commitment to participation in AA. During the course of the program's 12 sessions, patients are actively encouraged to attend AA meetings and in to maintain journals of their AA attendance and participation. Therapy sessions are highly structured, following a similar format each week that includes symptoms inquiry, review and reinforcement for AA participation, introduction and explication of the weeks theme, and setting goals for AA participation for the next week. Material introduced during the treatment sessions is complemented by reading assignments from AA literature. (p. x)

Nowinski, Beker and Carroll (1994) are careful to delineate important distinctions between the organization of AA and TSF treatments. This distinction is true of all varieties of TSF:

> The therapeutic approach underlying this manual is grounded in the principles and 12 steps of AA. It is important to note, however, that this manual has no official relationship with or sanction from Alcoholics Anonymous. The fellowship of AA is described in its official literature and is realized through its worldwide meetings. Alcoholics Anonymous does not sponsor or conduct research into alcoholism or its treatment or endorse any treatment program. While intended to be consistent with AA principles, this treatment program is designed for use in a research project. It's goals are to educate clients regarding the AA view of alcoholism and facilitate their active participation in AA. (p. xii).

Effectiveness of AA

The relative effectiveness of AA as self-help, or an adjunct treatment for alcohol dependence, greatly influences the logic and implications for treatment providers. If AA is effective for all or most who affiliate, then providers should logically refer clients to

AA. If on the other hand, AA is seldom effective, it makes little sense to encourage post-treatment attendance. Lastly, if AA is effective for some, then it may be best to encourage and integrate AA into treatment planning for those assessed as most likely to benefit.

Theories and studies of AA's effectiveness are reviewed in the following section. AA has enjoyed considerable research attention in the last 30 years. Emrick et al. (1993) have reviewed and summarized most AA effectiveness study findings prior to 1991 using a meta-analysis. In addition, many theories of AA's mechanisms of change have been advanced. However, researchers observe that on the whole, empirical studies have rarely integrated theory into research design and discussions of findings (Emrick et al., 1993; Tonigan, Toscova & Miller, 1996). A more critical analysis of study strengths and weaknesses is conducted within the AA affiliation literature review that follows.

Theories of Curative Processes

Researchers observed that AA theory seldom influenced research design and model development in research studies prior to 1991 (e.g. Tonigan, Toscova & Miller, 1996; Emrick et al., 1993). While one might assume that this neglect is related to a lack of theory, this review found several theories explaining the curative processes of AA, although most were published after 1991.

Given little empirical guidance to inform selection of theory for review, the following selection of theory included the more recent and most cited theories found in this literature. Among these, the stress and coping model was integrated and advanced in several studies following a cohort of problem drinkers over eight years. Other theories

selected for review are related to the curative aspects of spirituality, consistent with the AA literature (e.g faith development theory). Lastly, theories involving more traditional psychological paradigms (e.g. cognitive-behavioral and psychodynamic) are introduced, as well as more contemporary substance abuse theories explaining change processes and motivation.

Stress and Coping Theory

Humphreys, Finney and Moos (1994) contend that researchers have erroneously viewed AA in a mental health service model, which is inappropriate and has created confusion. The authors suggest that AA is best viewed in terms of a mutual-help group or socially supportive group resource, much like a church group. The authors suggest that AA groups satisfy universal coping needs through friendship, social support, identity formation, and finding meaning, as described in the following citation:

> ...mutual help groups have potential to fill such needs in the long-term because they often become enduring features of People's lives. Some people stay in self-help groups for many years after dealing successfully with their "presenting problems", relying on the group to help manage chronic stressors and life events that occur over time and also to form new relationships. Long-term sober AA members, for example, sponsor newcomers, go to meetings, speak at treatment centers and jails, go to AA dances, socialize at Alanon social clubs, pray and meditate, and engage in other AA activities. AA and other self-help organizations can thus become long-term, positive social resources that are integrated into everyday life. This is not "outcome" in the recipient of service sense because such members never stop receiving the intervention. (p. 313)

Implicit in this theory is the idea that stressors (e.g. relational, financial, health) contribute to relapse and that interpersonal coping skills and social support can aid in managing stress. Humphreys, Moos and Finney (1996) observe that while AA is not commonly construed as a social resource among researchers, it is nonetheless a

supportive social network where lasting friendships abound, and stress relief is provided. In addition, AA participation has been found to increase active coping and decrease avoidant coping styles (Humphreys, Finney & Moos, 1994).

Interestingly, the authors found that greater involvement in work and partner relationships may satisfy coping needs, thereby reducing the need for the coping available in AA (Humphreys, Moos & Finney, 1996). More specifically, "persons who are incumbent in a variety of roles (including AA involvement) may be less vulnerable to stressors in any particular domain because they can derive alternative rewards in other domains" (Humphreys, Moos, & Finney, 1996; p. 475).

AA Internal Theory

AA holds that "the only requirement for membership is a desire to stop drinking." The AA "first step" requires that the alcoholic be convinced that s/he can no longer control and/or enjoy drinking (AA World Services, 1976, p. 30), and as such serves to screen those who do not fit the organizational goal of abstinence. AA World Services (1976) contends that sobriety is contingent upon a spiritual condition that must be maintained to ensure continued abstinence. According to AA's 12th step, the needed spiritual awakening occurs, "as the result of these (twelve) steps." Other AA literature describes the steps as a "design for living" (AA World Services, 1976) and "as a way of life, (that) can expel the obsession to drink and enable the sufferer to become happily and usefully whole" (AA World Services, 1981, p. 16). Hopson and Moses (1996) observe a curative departure from religious models of addiction, noting that AA exonerates the alcoholic from past behavior, alternatively blaming the drinking disorder itself for past

transgressions.

AA also suggests that the "root of the problem" is embedded in the alcoholic's self-centeredness, and over-involvement with his/her own needs and desires (over-active ego functioning; AA World Services, 1976, p. 62). Other AA literature explains that this ego-driven state arises from attempts to satisfy exaggerated needs or "instincts" for security (e.g. food, clothing, shelter), societal relations (e.g. belonging, companionship, prestige, respect), and coupling relations (e.g. romantic, sexual, partnering) (AA World Services, 1981). AA literature posits that obsession, attempts at control, fear and resentment directed at unmet needs and desires culminate in emotional discomfort. While this discomfort was once medicated through drinking, a spiritual remedy is prescribed as a remedy to alleviate this self-inflicted pain. Thus the spiritual condition is posited to contribute to both improved quality of life and maintenance of abstinence.

While the term spiritual awakening is never defined, a "supplement" and other references (AA World Services, 1976) provide guidance and meaning. In this text, the spiritual condition (1) is associated with a profound change in reaction to life, (2) is associated with the extent of an awareness or consciousness of a higher power, (3) involves intuitively discerning and bringing one's own will into conformity with a higher power's will (surrender and acceptance), (4) involves directing oneself at becoming useful and of greater service to others, (5) must be further developed and maintained to insure continued sobriety, and (6) is learned and developed slowly over time.

A secondary curative mechanism emerges from a careful reading of the literature, that of the AA fellowship. The literature describes a common bond and a program of identification (AA World Services, 1976). Both the newcomer and those already started

in recovery benefit from this fellowship with other recovering alcoholics. The newcomers take hope and find ways out of their addiction, and those already in recovery benefit from the healing effects of helping others. A metaphor involving the common bond found among survivors of a shipwreck is used to describe the strong bond and identification shared among recovering members of AA.

AA views recovery as a long-term process, which lasts a lifetime, but begins only when stable abstinence is established (AA World Services, 1976, 1981). A metaphor of a tornado catastrophe is used to depict the developmental nature of recovery (AA World Services, 1976, pp. 82-83). The "winds stop" and the storm victims emerge from the cellar, symbolizing initial abstinence from alcohol. This point marks the beginning of a much longer period of cleaning up storm damage followed by reconstruction. The clean up and reconstruction corresponds to the developmental nature of the recovery process.

Furthermore, the "Big Book" (AA World Services, 1976) suggests that atheism or agnosticism is not necessarily a barrier to recovery and spirituality. While the word "God" and prayer are used liberally throughout the AA literature, other references emphasize that it is "God as you understand him", or alternatively a "power greater than oneself." This is, however, inconsistent with scholarly literature (e.g. McCrady & Delaney, 1995; Connors & Dermen, 1996) that has chronicled the establishment of other mutual aid recovery groups that have been established to serve those who have been repelled by the spiritual nature and "God talk" implicit in AA. The AA literature (AA World Services, 1976) provides some guidance on who may/may not affiliate among problem drinkers suggesting that (1) some can abstain or control drinking on their own; (2) others may be able to control their drinking, prescribing repeated controlled drinking

trials for those who are not convinced (AA's first step) about loss of control; (3) still others may find alternative treatments effective; and (4) the AA program is only for those who have a desire to stop drinking and are attracted to the AA program of recovery.

Curative Effects of Spirituality

Many authors (e.g. Nealon-Woods, Ferrarr & Jason 1995; Miller, 1998; Hopson & Moses, 1996) note that there is "strong evidence" supporting the effectiveness of spiritual/religious involvement in reducing the risk of alcohol and drug problems, as well as enabling recovery from those already dependent. In this regard, interest in a causal link between spirituality and prevention or recovery from addiction spawned a recent research conference sponsored by the NIAAA. The legacy of AA is a testimony for favorable effects of spirituality on addiction recovery.

Others have theorized alternative curative processes associated with spirituality: (1) as an effective coping remedy from life stressors (e.g. Corrington, 1989; Brown & Peterson, 1991), (2) as facilitating "psychic development" or refining and redefining the value system (Brown & Peterson, 1991), (3) as a source of hope or faith aiding self-efficacy (Nealon-Woods, Ferrari & Jason, 1995), and (4) as an initiating factor marking the beginning of the recovery process (Nealon-Woods, Ferrari & Jason, 1995). Conversely, Nealon-Woods et al. (1995) acknowledge that spirituality has also been criticized as contributing to helplessness, powerlessness, reduction in self-acceptance and self-efficacy.

Carl Jung is attributed with having a heavy influence on Bill Wilson (cofounder of AA) and the AA program (Machell, 1992; Miller, 1998; Hopson & Moses, 1996). The

AA literature quotes Jung, depicting his beliefs and influence on the requirement for a spiritual awakening. In the following quote, Jung counsels a despairing alcoholic who has failed to recover despite repeated treatments (AA World Services, 1976):

> Exceptions to cases such as yours (remission) have been occurring since early times...alcoholics have had what are called vital spiritual experiences...They appear to be in the nature of huge emotional displacement and rearrangements. Ideas, emotions, and attitudes which were once the guiding forces of the lives of these men are suddenly cast to one side, and a completely new set of conceptions and motives begin to dominate them. (p. 27).

When this patient interprets Jung's statement as advice to engage in intense religious practice (AA World Services, 1976, p. 27), Jung seems to correct the patient by differentiating between religion and his use of the term *spirituality:* "while his religious convictions were very good, in his case they did not spell the necessary vital spiritual experience." In this context, religiosity is thus differentiated, and not a requirement for the curative spiritual condition. Others (e.g. Miller 1998) note that involvement in religion is different from spirituality, describing spirituality as more multidimensional, distinct from religion, yet difficult to delineate.

Dimensions of spirituality include beliefs, behaviors and experience (Miller, 1998). Interestingly, religiosity does not predict affiliation with AA (e.g. Brown & Peterson, 1991; Connors, Tonigan & Miller, 1996; Miller, 1998). One study (Connors, Tonigan & Miller, 1996) provides some clarity, suggesting that religiosity shares dimensions of spirituality, (e.g. prayer and meditation), but is distinguished in other dimensions, (e.g. scripture reading, attendance at religious services, and more vivid "experiences of God").

Religion, however, commonly is associated with spirituality, as well as healthy alcohol-use and abstinence. Drunkenness has long been viewed as a sin within most religions (e.g. biblical references), and religious involvement is negatively correlated with alcohol problems in research summarized by Miller (1998). Miller (1998) notes that religion commonly posits that the *spirits* of alcohol are believed to separate man from God; one cannot coexist with the other.

Faith Development

Fowler (1993) reviews AA literature and describes faith development as an essential aspect of AA spirituality. Faith development is defined secularly and broadly as "the dynamic human process of finding and creating meaning in one's life." Fowler later contends that faith involves living congruent with one's primary core values and beliefs, despite the inevitable temptation to deviate. He suggests that faith is not reducible to specific beliefs or religion, but rather defines faith in terms of awareness of and acting in accordance with the individual's unique core beliefs. These core values underlie the individual's frame of reference, give the individual coherence, provide meaning and shape in relationships with others and the universe (Fowler, 1993).

Fowler (1993) concludes that AA aids in faith development. The author endorses AA's (AA World Services, 1981, pp. 44-54) depiction of problems arising from excessive instincts (1) for love, sex and reproduction; (2) for social status; and (3) for security. Fowler characterizes these exaggerated instincts as inappropriate attachments that can distort and conflict with core values. Fowler describes the conversion achieved through working the twelve steps as a redirection of attachments consistent with core

values.

Fowler (1993) also recognizes other benefits accruing from AA involvement including: (1) maintaining quality of recovery and serenity, (2) recognizing individual limits, (3) trusting a higher power, and (4) deriving benefits from service to others. There is little evidence to support the allegation that AA induces or perpetuates undue dependence on the organization (e.g. substitution of one addiction for another), or that it is cultish in nature (Fowler). Alternatively, the he finds AA both democratic and pragmatic in nature.

Cognitive, Behavioral and Affective Components

Brown (1993) explains AA recovery as a cognitive-behavioral process that proceeds in terms of developmental stages and tasks. She begins by describing the development of alcoholism as involving behavioral, cognitive and affective components. The author attributes the use of alcohol as a "substitute for something missing in the structure of the self," with alcohol becoming a "condition of wholeness". Brown (1993, p. 146) posits that "the first three steps are a direct assault on pathological egocentrism or narcissism, a condition that includes an inflated unrealistic belief in self power."

Brown acknowledges the controversy surrounding "powerlessness" of AA's first step, but endorses the admission of loss of control, powerlessness or surrender as an effective paradoxical treatment, where surrender aids the alcoholic in accepting the reality that self-control has proven ineffective. Surrender also is viewed as necessary to deflate false pride, defiance and grandiosity, which emerge from a false or exaggerated belief in self-power, despite substantial evidence to the contrary. Having admitted

powerlessness, the second step instills hope, suggesting a *power* outside oneself that will provide the needed power to recover from the addiction. The author concludes that AA' s twelve-steps are a complex, multidimensional treatment model, influencing behavioral, cognitive and affective components of alcoholism.

Psychodynamic and Group Processes

Machell (1992) provides a psychodynamic explanation of AA affiliation or "fellowship" as a healing form of group treatment. The author reviews historical ego psychology literature and reports the significance of psychodynamic principles of identification, belonging (Maslaw, Freud, Adler), entropy (Jung) and curative group processes (Yalom) implicit in AA recovery. Machell (1992) reports several communications between Bill Wilson and Jung prior to the initiation of AA, in which Jung emphasized the significance of entropy as a recovery construct whereby recovered alcoholics could influence newly recovering individuals. Machell (1992) also suggests that unconditional acceptance is an important curative component present in AA, enhancing the individuals self-worth and creating an effective environment for healing, consistent with the unconditional positive regard of Carl Rogers.

Machell (1992) compiles a list of disease qualities prevalent in the psychodynamic literature and suggests curative factors from group treatment in a supporting theory for AA's effectiveness. Examples of curative factors of group treatment include: instilling hope to aid depression; imparting information that improves knowledge of alcoholism and reduces denial; creating group altruism that reduces guilt and shame; developing social skills that aid both rigid super ego and improve impaired

interpersonal skills commonly found in alcoholics; initiating stress management to aid with the overwhelmed feeling; instilling group cohesiveness that improves self-esteem and reduces pathologic inhibitions; initiating catharsis that reduces guilt, shame, overly rigid superego's, compulsiveness, over emphasis on order, and perfectionism.

Stages of Change and Motivation

Prochaska and DiClemente (1982, 1986, 1992) developed a trans-theoretical model of the stages in behavior change processes, which has been popularized in recent addiction literature and subjected to a number of studies. In general, the model posits that people pass through predictable stages when changing any problem behavior. Miller and Rollnick (1991) adapted the stages of change model to addiction treatment, matching specific treatment strategies with each stage of change, and developed an integrated approach designed to maintain client motivation. Motivation, defined as the probability that a client will engage and remain engaged in change strategies, is broadly recognized as a key element of successful treatment outcome (Miller & Rollnick).

DiClemente (1993) integrated and analyzed the processes of AA recovery within the framework of the stages of change. A general understanding of the stages of change is necessary for this discussion. Accordingly, the following discussion provides a conceptual summary of the stages of change theory (Prochaska & DiClemente, 1982, 1986, 1992), along with primary tasks required to successfully change drinking behaviors (Miller & Rollnick, 1991). This material is followed by a summary of DiClemente's integration of AA within the stages of change framework and related comments on motivation by Morgenstern, Labouvie, McCrady, Kahler and Frey (1997).

Precontemplation Stage. People who are actively drinking and not considering change are said to be in the precontemplative stage. Precontemplators are either (1) unaware of drinking as a problem that is negatively effecting their life, (2) aware, but unwilling to consider change at this time, or (3) lack self-efficacy, feel helpless, discouraged and unable to change. In order to consider change, Miller and Rollnick (1991) suggest that they must first be willing to consider how drinking negatively effects their life goals and values (e.g. family, money, health, job, etc.). Stated another way, they must become aware of the problem and the negative effects that drinking has on their goals. Among other strategies, Miller and Rollnick (1991) suggest that therapy can aid precontemplative drinkers by empathetically helping clients assess how drinking is interfering with their goals. This is necessary to heighten ambivalence, or create confusion surrounding their decision to drink.

Contemplative Stage. In this stage, the drinker begins to consider the possibilities of change, but is confused, uncertain or ambivalent about whether to change. This confusion or ambivalence is characterized by simultaneous good and bad feelings and/or thoughts about drinking, i.e. "on one hand I value my drinking, but on the other hand it is a problem." Miller and Rollnick (1991) suggest that the therapist's task is to aid the client in making a decision about changing drinking habits. This decision is required to alleviate ambivalence.

The decision process is facilitated by a comparison of the pros and cons of their drinking. A two column list is suggested by Miller and Rollnick with the "CONS", including: (a) an exhaustive list of all of the good aspects of drinking, and (b) aspects of drinking that would be missed or negative aspects of changing drinking patterns.

Conversely a "PROS" column consists of the following: (a) an exhaustive list of all of the things the client dislikes that are directly or indirectly associated with drinking, and (b) the client's perception of improvement to life given a change in drinking habits.

Determination (or preparation) Stage. Determination is the stage where the drinker has moved beyond a full awareness of the problem, recognizing overriding advantages to modifying drinking habits, and is both willing and committed to the change process. A decision has been made to proceed with managing one's drinking problem. The clinician's job is to collaborate on a treatment plan aimed at initiating change.

Action, Maintenance and Relapse Stages. Prochaska and DiClemente (1982) propose later stages of "action," where the plan of change is implemented, and "maintenance," where continued commitment and relapse prevention plans are developed to maintain the behavior change. This summary has abbreviated and simplified the stages of change; it is common for someone to be in two or more stages simultaneously, or to move backwards in the process, or to relapse. Relapse is viewed as a normal part of the change process.

DiClemente (1993) integrates AA processes within stages of change, contending that AA most aids those in higher stages of change, including determination, action and maintenance, compared to those in lower stages of precontemplative and contemplative. The author contends that AA may be inappropriate or overly intrusive for those in earlier stages, positing that (1) many precontemplators will be intolerant of AA's goal of abstinence, and (2) contemplators might find too little support for the "positive aspects of drinking" to effectively process ambivalence surrounding their drinking.

In addition, DiClemente finds the protracted or lifelong recovery period inherent

in AA philosophy impossible to reconcile with the stages of change model that posits a relatively short-term termination to the process of change. As such, DiClemente suggests that protracted involvement in recovery is unnecessary, but fails to provide guidance on when or how the maintenance stage terminates. Conversely, AA World Services (1976) views alcoholism as a chronic disorder, extending well beyond initial abstinence and requiring a lifetime of vigilance or "maintenance," which is inconsistent with the stages of change model.

Motivational theorists of alcohol change processes (e.g. Miler & Rollnick, 1991; Morgenstern, Labouvie, McCrady, Kahler & Frey, 1997) are consistent with DiClemente's (1993) contention that AA is most appropriate for those in higher stages of change including determination, action and maintenance. Motivational theories posit that higher stages of change are associated with greater levels of motivation to engage in change processes (Miller & Rollnick, 1991). In this regard, Morgenstern, Labouvie, McCrady, Kahler and Frey (1997) review studies finding positively for AA's effectiveness, but contend that AA is most effective for highly motivated patients. Morgenstern et al. (1997) generally posit that AA (1) activates mechanisms or processes that enhance self-efficacy, (2) promotes active coping, (3) sustains motivation among those previously motivated, (4) serves to maintain a commitment to the goal of abstinence, and (5) sustains a high appraisal of harm related to drinking.

Review of the AA Effectiveness Literature

Although there is a large body of empirical evidence (e.g. Project MATCH Research Group, 1997a; Emrick et al., 1993; Tonigan, Toscova & Miller, 1996)

suggesting a positive and moderate effect of AA affiliation on abstinence, experimental design studies that employed random assignment consistently have failed to find favorable effects from AA attendance (Brandsma, Maultsby & Welsh, 1980; Ditman, Crawford, Forgy, Moskowitz & MacAndrew, 1967; Walsh et al. 1991, McCrady, Epstein, Hirsch, 1996). In response, Montgomery, Miller and Tonigan (1995) theorized that coerced AA attendance violates the basic format and intent of AA's philosophy and traditions ("attraction rather than promotion") and contend that volitional attendance is a requirement for effectiveness. Large correlations have been reported between AA meeting attendance and the level of involvement or participation (Montgomery, Miller & Tonigan, 1995; Snow, Prochaska & Rossi 1994). However, researchers (e.g. Emrick et al., 1993; Tonigan, Connors & Miller, 1996) consistently have found higher associations with abstinence outcome measures between AA dosage measured in terms of involvement (e.g. leading meetings, use of a sponsor, working AA's 12 steps, etc.) than meeting attendance. Furthermore, some studies (Emrick et al. 1993; Montgomery, Miller & Tonigan 1995) have reported positive associations between abstinence and measures of involvement, when controlling for attendance.

A more recent experimental design involved 90 married alcoholic subjects assigned to three treatment conditions and followed them through 90 days of treatment (McCrady, Epstein & Hirsch, 1996). One of the groups included both treatment and AA attendance, while the other two groups received treatment only. AA attendance was elicited and controlled through goal setting and monitoring by the therapist. The results of this study found that AA attendance did not improve outcomes at 90 days, with the other treatment groups reporting similar outcomes compared to the AA plus treatment

group. These results are difficult to interpret given two major weaknesses including: (1) the limited sample size for three groups where statistical power was insufficient to detect small or medium effects, and (2) AA dosage was primarily measured in terms of attendance (inadequately measuring level of involvment).

The McCrady, Epstein and Hurst (1996) findings have been criticized in light of other studies that consistently have found that involvement predicts favorable outcomes when controlling for attendance (Emrick et al. 1993; Montgomery, Miller & Tonigan 1995). AA attendance therefore is characterized as a necessary but insufficient condition for favorable drinking outcomes. Conversely, AA involvement is the most effective predictor of favorable drinking outcome. Unfortunately all other random assignment studies had relied on coerced attendance (Brandsma, Maultsby & Welsh, 1980; Ditman, Crawford, Forgy, Moskowitz & MacAndrew, 1967; Walshet al. 1991, McCrady, Epstein, Hirsch, 1996) and have thus been criticized, reasoning that it is less likely that individuals forced to attend AA would significantly involve themselves.

Nature and Extent of Effectiveness Studies

There are over 100 studies of AA affiliation and effectiveness spanning three decades (Emrick et al. 1993). This body of literature has been summarized repeatedly using alternative methods of analysis. The conclusions of the first comprehensive assessment by Emrick (1987), and the updated Emrick (1989) analysis of the literature on affiliation and effectiveness of AA, were similar to the more comprehensive and sophisticated meta-analytic review by Emrick et al. (1993). In general, these studies found moderate and consistent favorable drinking outcomes associated with measures of

AA affiliation and involvement. Finally, working with the meta-analytic data compiled in the Emrick et al. (1993) analysis, Tonigan, Tocova and Miller (1996) found larger and more consistent outcomes associated with affiliation among outpatient samples and "better quality" studies. More recent studies (e.g. Project MATCH Research Group, 1997a, 1997b; Timko, Moos, Finney & Moos, 1994; Timko, Finney, Moos and Moos, 1995; Humphreys, Moos & Cohen, 1997) generally have corroborated the finding that AA affiliation (especially when defined in terms of involvement) is associated with improved drinking outcomes.

Early Literature Reviews

Emrick (1987, 1989) reviewed published studies from 1976 through 1987 and concluded that there was some evidence that AA worked for some, in terms of abstinence and improved psychosocial outcomes. Emrick (1989) characterized these relationships as tentative, small to moderate, and marked by complexity and intractable research problems. More specifically, Emrick (1989) reported the correlation between post-treatment AA affiliation and drinking outcomes among 35 studies: 6% of the studies found negative correlations, 31% found no significant relationship, and 63% found positive relationships (where $p < .10$). Emrick also found that an individual's belief in controlled drinking (vs. abstinence) is negatively associated with AA affiliation. Finally, AA involvement, including leading meetings, being a sponsor or having a sponsor, and working steps six through twelve is a greater predictor of favorable drinking outcomes than meeting attendance.

Meta-Analytic Literature Reviews

Emrick et al. (1993) concluded that a modest and consistently positive relationship existed between drinking outcome and AA involvement during or after treatment. Emrick et al. stated, "these findings can be interpreted as suggesting that professionally treated patients who attend AA during or after treatment are more likely to improve in drinking behavior than are patients who do not attend AA, although the chances of drinking improvement are not overall a great deal higher" (p. 57). Emrick (1994) later summarized the meta-analytic findings across all studies, suggesting that individuals participating in AA during or after treatment have on average a moderately greater chance of improving drinking behavior (weighted meta-analytic correlation or r_w = .20, $n_{subjects}$ = 10,000). Using a subset of these data, Tonigan, Toscova and Miller (1996) found a considerably higher and consistent relationships between AA affiliation and drinking outcome measures within outpatient samples summarized in Table 1. (Note: For a more critical analysis of the nature, quality and extent of studies and methods contained in the meta-analyses, see "Meta-Analysis Study Quality" in the AA affiliation literature section of this document. Similarly, for study design and methods used to calculate weighted correlations in the meta-analysis, see "Meta Analytic Methods" also in the AA affiliation literature review of this document.)

According to the meta-analysis Emrick et al. (1993; Table 1) found that while frequency of meeting attendance might be considered the most obvious and straight forward measure of AA as an intervention, and while a moderate and positive correlation between attendance and favorable drinking outcomes was found, it is nonetheless an inconsistent finding. It would appear that level of involvement variables are more

Table 1: Relationship Between Affiliation Measures and Drinking Behavior Outcomes

Activity	r_w[a] *(weighted)*	*SD*	*N of Studies*	*N of Subjects*
Emrick et al. (1993):				
Frequency of attendance	.19	.10	13	1,939
Having a sponsor	.26	.02	4	539
Engaging in 12-step work	.20	.00	3	1,140
Leading (chairing) meetings	.23	.02	2	1,093
Increased participation	.29	.09	2	1,086
Sponsoring other members	.17	.04	2	1,091
Working step 6 through 12	.11	.00	2	1,096
Tonigan et al. (1996):				
Affiliation (outpatient samples only)	.31	.00	5	1,200

Notes: [a] Weighted average correlation from meta-analysis (see the "meta-analytic methods" for a discussion of computational methods). Adapted with written permission from: Emrick, C. D., Tonigan, J. S., Montgomery, H. & Little, L. (1993). Alcoholics Anonymous: What is currently known? In B.S. McCrady and W.R. Miller (Eds.). *Research on Alcoholics Anonymous: Opportunities and Alternatives*, p. 55, New Brunswick, NJ: Rutgers Center of Alcohol Studies, and Tonigan, J. S., Toscova, R. & Miller, W. R. (1996). Meta-Analysis of the literature on Alcoholics Anonymous: Sample and study characteristics moderate findings. *Journal of Studies on Alcohol, 57*, p. 68.

predictive of favorable drinking outcomes, (e.g. having an AA sponsor, engaging in 12-step work, chairing meetings and increased participation, were moderately, positively and more consistently related to favorable drinking outcomes). Smaller and positive relationships existed between sponsoring other AA members and working AA steps six through twelve.

Integrating earlier theory with present findings, Emrick et al. (1993, p. 56-57) generally concluded that those who, "become more actively involved in the organization, adopt its beliefs more completely, and follow its behavioral guidelines more carefully" appear to have better drinking outcomes. Emrick et al. considered the variation in findings attributable to different operationalizations of AA affiliation (emphasizing attendance vs. some measure of involvement) and concluded that, in general, working the AA program of recovery (involvement) is more consistently and positively related to favorable drinking outcomes than attendance. Interestingly, the often cited advice of "attending 90 meetings in 90 days" did not hold up as consistently as did participation and involvement, suggesting that the better advice may be to "get a sponsor and work the steps" (Emrick et al 1993, p. 55).

Emrick et al. (1993) also reviewed psychosocial outcomes other than drinking (Table 2). Notable findings included small yet consistent positive correlations between attendance and (1) more religious practice, (2) improved physical health, and (3) improved legal situation. A moderate and positive, but less consistent finding, also was found between AA attendance and psychological adjustment. In addition, Tonigan, Toscova and Miller (1996) later reported a larger effect between attendance and general "psychosocial adjustment" within the better quality studies.

Table 2: Relationship Between AA Attendance and Criteria Other Than Drinking

Activity	r_w[a] *(weighted)*	*SD*	*N of Studies*	*N of Subjects*
Emrick et al. (1993):				
More active religious life	.12	.00	5	2,211
Physical symptoms (reduced)	-.13	.00	2	258
Legal situation	.10	.00	2	284
Psychological adjustment	.25	.10	13	1,322
Toniganet al. (1996)				
Psychosocial adjustment (better quality studies)	.33	.05	3	359

Note: [a] Weighted average correlation from meta-analysis (see the "meta-analytic methods" for a discussion of computational methods). Adapted with written permission from: Emrick, C. D., Tonigan, J. S., Montgomery, H. & Little, L. (1993). Alcoholics Anonymous: What is currently known? In B.S. McCrady and W.R. Miller (Eds.). *Research on Alcoholics Anonymous: Opportunities and Alternatives*, (p. 60) New Brunswick, NJ: Rutgers Center of Alcohol Studies and Tonigan, J. S., Toscova, R. & Miller, W. R. (1996). Meta-analysis of the literature on Alcoholics Anonymous: Sample and study characteristics moderate findings. *Journal of Studies on Alcohol, 57*, p. 66.

More Recent Studies

Other than the randomized and controlled trials discussed previously, all of the studies reviewed here corroborate consistent and positive correlations between measures of AA affiliation and favorable drinking outcomes. Most notable among more recent studies is the large (n = 1,725) and rigorous Project MATCH study (e.g. Project MATCH Research Group, 1993) and a prominent prospective longitudinal project reporting consistent findings at one (Timko, Moos, Finney & Moos, 1994), three (Timko, Finney, Moos & Moos, 1995) and eight years (Humphreys, Moos & Cohen, 1997).

The Project MATCH authors (Project MATCH Research Group, 1997a) reported that AA attendance was associated with improved outcomes across all treatment conditions, suggesting the effectiveness of AA as an adjunct treatment, regardless of the type of formal treatment. The 12-step facilitation intervention encouraged AA involvement as one of its primary goals while the other groups (motivational enhancement and skills training) supported attendance only if attendance was initiated by the client. The Project MATCH Research Group (1997a) acknowledged that a significant proportion of the other two treatment conditions attended AA, confounding results of the study.

A prospective longitudinal study analyzing the effects of self-selection of treatment provides further evidence of the effectiveness of AA. The study followed 515 previously untreated alcoholics, selected from detoxification centers and information and referral telephone services (Timko, Finney, Moos, Moos & Steinbaum, 1993) for eight years. Subjects were followed-up at one (Timko, Moos, Finney & Moos, 1994), three

(Timko, Finney, Moos & Moos, 1995) and eight years (Humphreys, Moos & Cohen, 1997). At the eight-year follow-up, Humphreys et al. (1997) concluded that AA attendance had the broadest impact on drinking and psychosocial outcomes of any intervention included in this study. In general, this longitudinal study was able to obtain a relatively high rate of follow-up at one, three and eight year follow-ups. Some caution is suggested, however, given that approximately 30% of those selected refused to participate. In addition, results may not generalize to community samples of alcohol dependent individuals given the sample population (detoxification centers and those telephoning alcohol information and referral telephone services).

At one year follow-up, subjects had self-selected no treatment (24%), AA only (18%), outpatient treatment (25%), and inpatient treatment (32%), with many of the formal treatment subjects also attending AA (Timko, Moos, Finney & Moos 1994). Comparable and positive outcomes were reported across all but the untreated self-selection condition, where poorer outcomes were observed. AA attendance was positively associated with improved drinking status in the AA only self-selection group and among formal treatment subjects who commonly attended AA (Timko, Moos, Finney & Moos, 1994).

Subjects (n = 439) were contacted again at three years: 16% had engaged in no treatment, 25% had been treated in the first year only, and 53% had received additional treatment in years two or three (Timko, Finney, Moos & Moos, 1995). AA attendance was considered a form of treatment. AA attendance along with formal treatment was associated with better drinking measures than formal treatment alone. The authors report that more impaired drinkers tended to naturally self-select greater treatment involvement,

and in this study the greater the treatment involvement, the better the drinking outcome. Attending more treatment was related to a greater severity of drinking problem, poorer psychosocial functioning, and more negative life events at baseline, yet surprisingly associated with superior drinking outcomes at both one and three year follow-up. Comparable and positive outcomes were reported across all self-selection conditions (AA only, formal treatment with AA, and formal treatment without AA), except in the untreated self-selection condition that reported poorer outcomes.

At eight years, 395 subjects (77% of the original sample) were located for follow-up (Humphreys, Moos & Cohen, 1997). More outpatient treatment received in the first three years of the study predicted eight-year remission. In addition, greater AA attendance in the first three years of the study predicted alcohol remission, greater symptoms of depression, and better quality relationships with friends and spouse or partner. The authors concluded that short-term interventions have a long-term impact on alcoholism, and that AA attendance has the broadest impact on drinking and psychosocial outcomes of any intervention included in this study. The authors suggest that findings are comparable to those found in other long-term studies including the classic Vaillant (1996) 20-30 year prospective-longitudinal study.

Other effectiveness studies reviewed that were not included in the meta-analytic studies consistently have concluded that AA is effective. Three such studies are briefly summarized in the text that follows.

Cross et al. (1990), provided one of few long-term longitudinal studies, a ten-year follow-up study involving 158 patients from an inpatient treatment center. The results of

this study suggested that AA affiliation and involvement in AA sponsorship predict both favorable long-term drinking and psychosocial outcomes.

In a large (n = 2,029) follow-up study of 33 outpatient treatment programs, Miller, Ninonuevo, Klamen, Hoffmann and Smith (1997) found that post-treatment factors including involvement in outpatient aftercare and AA are more significant in predicting outcomes than patient or pre-treatment factors including gender, ethnic status, employment, marital status, addiction severity and motivation. Furthermore, the authors reported that when all variables were considered at once, AA attendance was the best single predictor of outcome (R = .40).

Finally, Isenhart (1997) reported results of a one year follow-up study of previously treated patients (n = 125). These results suggested that those who affiliated with AA or had an AA sponsor consumed less alcohol (Isenhart, 1997).

As a final note, some researchers (discussed in the literature review) have suggested that motivational factors may explain both positive drinking outcomes and AA affiliation. According to this view, AA affiliation may not be a causative factor, rather a covariate of motivation. AA creates an organized meeting place for those who are most motivated in establishing and maintaining sobriety. Nonetheless, this theory does not diminish the role of AA as a significant factor in recovery.

Problem Statement

Miller and McCrady (1993), editors of the proceedings of a 1993 research conference calling for studies on AA, note several reasons why knowledge from studies of AA would represent a major contribution to effective treatment of alcohol problems.

These reasons included the following: (1) AA commonly is recommended by treatment professionals and represents the most commonly sought form of help for alcohol problems, yet relatively little is known about AA and those who do and do not persist in their affiliation; (2) AA represents a cost effective treatment alternative in a cost conscious treatment environment, and unremitted alcoholism is extremely costly to the victims, their families and to society; and (3) AA affiliates represent a population of individuals engaged in recovery, offering researchers an opportunity to learn more about processes of change. Lastly and most germane to this discussion, Miller and McCrady acknowledged the benefits of matching individuals to optimum treatment approaches, noting that "it is reasonable to expect that AA works better for some people than for others, and it would be beneficial to know how to determine, in advance, which approach offers the best initial hope for a given individual" (p. 6).

Other researchers (e.g. Tonigan & Hiller-Sturmhoefel, 1995; Emrick, 1994) have also described benefits accruing to treatment providers from successful prediction of AA affiliation using pretreatment patient characteristics. The ability to identify who is likely (or unlikely) to affiliate with AA is a benefit that would logically improve the quality and effectiveness of pretreatment assessment, thereby facilitating improved treatment planning. The improved assessment would enable treatment providers to customize both initial treatment, as well as longer-term aftercare.

As summarized previously, volitional involvement in AA works for many, and represents a potentially effective, economical and accessible form of self-help and adjunct to professional treatment. Treatment providers generally are focused on initial needs, yet the high rate of relapse and repeated treatment episodes common among those

treated for alcohol dependence suggest a protracted and complex recovery period from alcohol dependence lasting months and even years, prior to initiation of a stable and enduring state of abstinence (e.g. Walsh et al., 1991; Martlatt & Gordon, 1985; Vaillant 1995, 1996). The rate of relapse at one year post-treatment commonly is reported as approximately equal to or less than the rate of remission (e.g. Timko, Moos, Finney & Moos, 1994; Emrick et al., 1993). These high rates of relapse suggest the need for more effective treatment(s) and/or more protracted treatment interventions such as AA.

As previously stated, there is evidence of enormous AA attrition within the year after the first trial. Unfortunately, no research was located in this review that investigates outcomes, needs or reasons for attrition among dropouts. In the absence of research knowledge one can only speculate about possible reasons for dropout among subjects: (1) relapse; (2) unfavorable perception of AA; (3) no further need of AA; (4) intolerance of AA (e.g. social discomfort, aversion to the spiritual discussions involving God, angered by someone or something in the AA program, belief in the ability to control drinking, etc); and/or (5) harmful or iatrogenic effects of AA. Treatment effectiveness would seemingly be enhanced by an understanding of who will/will not affiliate with AA prior to referral.

Despite the high rates of AA attrition, and a lack of understanding of its possible causes and consequences, most providers rely heavily on AA meetings and philosophies for treatment content (e.g. Humphreys, 1997), and commonly make AA aftercare referrals. These practices may ignore the needs of the majority of individuals who do not affiliate with AA long-term. This reliance on AA is compatible with cost constraints imposed by the contemporary managed treatment environment, which is unlikely to

tolerate extended professional services. Given the above, providers potentially could improve treatment effectiveness and better customize treatment planning if it were possible to predict affiliation using assessment data.

Purpose and Objectives of Research

As previously stated, the primary purpose of this study is to predict or classify post-treatment AA affiliation among individuals treated for alcohol disorders using information available at treatment. The relative success or failure of this endeavor will be evaluated based upon the extent to which the model(s) correctly classify above chance. Related objectives of the proposed study are discussed below.

Advance knowledge on AA affiliation. Prior theory and empirical evidence will be reviewed, and an a priori hypotheses and a model of affiliation will be advanced to guide the research. Independent predictor variables will be tested. Results of tests of individual variables will be interpreted and integrated with theories of affiliation.

Advance knowledge on classification methods and evaluate implications for practice. While tests of individual variables will be carried out using traditional methods, a more recent classification method, artificial neural networks, will be used along with binary logistic regression. Classification methods and results will be compared, and advantages from using either or both classification methods will be discussed. This study generally will explore the use of computer decision support systems in practice.

CHAPTER II: REVIEW OF THE AFFILIATION LITERATURE

Membership Survey

AA World Services (1997) publishes a "random survey" of membership every three years: the latest survey conducted in 1996 included 7,200 members selected from the U.S. and Canada. This publication reported a total of 96,000 groups throughout the world. Other researchers have reported that AA is represented in 150 countries with 1.7 million members (Miller & McCrady, 1993). Unfortunately, and despite some form of random selection and an impressive survey size, there are no published reports of the methods to critique the quality of the latest AA survey (AA World Service, 1997). Of greatest concern is the survey response rate that may have biased reported findings. Therefore, caution is suggested in interpreting these findings. However, a wealth of contextual and introductory information was provided by this report.

Members report a high rate of professional treatment utilization and satisfaction both before and after their involvement with AA, with 60% of members receiving some form of counseling (medical, psychological, spiritual, etc.) before AA, and 77% of those members reporting that the counseling played an important role in their subsequent AA involvement. Subsequent to their AA involvement, 62% of members reported receiving some type of counseling, and 85% of these reported that it played an important role in maintaining sobriety.

The AA mean length of sobriety is reported as greater than six years. Only 27% of the members reported sobriety of less than one year, and 45% reporting sobriety in excess of five years. Mean sobriety would logically be inflated by the high rate of

attrition among those who relapse. Despite the high level of sobriety, members still report an average of two meetings per week. In addition, 86% of members have a "home group", and 76% have a sponsor.

Survey results suggested that the majority of those affiliating with AA are influenced by self or other AA member referrals (99%), with only 48% reporting treatment provider referrals, and 12% corrections related sources. In a related issue, 73% report that they had reported their problems with alcohol to their primary health care professional, with only 39% reporting that they were referred to AA by a health care professional. From highest to lowest, factors most responsible for AA referral included (more than one answer was allowed): 51% self-referred, 48% referred by another member, 40% referred by a treatment facility, 39% referred by family, 16% referred by a counseling agency, 13% court referred, 9% referred by an employer or fellow worker, 8% referred by a health care provider, 8% referred by a friend or neighbor, 8% other referred, 5% referred through AA literature, 3% referred through Alateen or Al-Anon, 3% referred by correctional facilities, newspaper, magazine, radio, TV and 3% referred by clergy.

Following is a summary of selected AA demographics (AA World Service, 1997):

(1) Gender: 67% are men and 33% women

(2) Age: 1% are less than age 21, 12% are between 21 and 30, 30% are between 31 and 40, 29% are between 41 and 50, 16% are between 51 and 60, 9% are between 61 and 70, 3% are over 70

(3) Marital status: 39% are married, 24% are divorced, 28% are single, 6% are widowed, and 3% are separated;

(4) Race: 86% are white, 5% are black, 4% are Hispanic, 4% are Native American, 1%

are other;

(5) Occupational demographics: 13% who are professional or technical, 11% were retired, 11% are other or self-employed, 10% are manager/administrators, 9% are labor, 7% are unemployed, 6% are health professionals, 5% are craft workers, 5% are disabled, 4% are service workers, 4% are sales workers, 4% are clerical, 3% are educators, 3% are homemakers, 3% are students, and 2% are transportation workers

This AA demographic survey (AAS) included a number of demographic categories that appear to be over or under-represent compared to problem drinkers within U.S. communities. In this regard, the U.S. Secretary of Health and Human Services (1997, p. 16) published selected demographic statistics from the National Alcohol Survey of 1990 (NAS), which are contrasted with some of the AA demographics presented above:

1. Women are somewhat over represented in AA compared to community samples, where men represent approximately 74% of problem drinkers in the NAS survey compared to 67% in the AA membership survey.
2. Problem drinkers under age 30 appear to be vastly underrepresented within AA, only representing 13% of the AA respondents compared to 30% in the NAS community survey. The AA community appears to be composed of older recovering individuals.
3. While married problem drinkers appear to be substantially underrepresented in AA (NAS = 64% vs. AAS = 39%), divorced individuals appear to be substantially over-represented (NAS = 8% vs. AAS = 24%). In addition, AA may attract single individuals (NAS = 21% vs. AAS = 28%). Separated individuals were comparable in both surveys (NAS = 4% vs. AAS = 3%).

4. Blacks (NAS = 12% vs. AA = 5%), Hispanics (NAS = 9% vs. AA = 4%) and other minorities (NAS = 4% vs. AA = 1%), appear to be somewhat underrepresented compared to Whites (NAS = 75% vs. AA = 86%).

Theories of AA Affiliation

Researchers (e.g. Emrick, 1989, 1994; Timko, Finney, Moos, Moos & Steinman 1993) acknowledge and lament that present theories of affiliation are not capable of predicting who will or will not affiliate with AA subsequent to treatment. As previously noted, despite the fact that only a fraction of alcoholics actually affiliate with AA, the majority of treatment providers continue to dedicate a significant amount of treatment content to AA beliefs and make indiscriminant referrals (Humphreys, 1997). Treatment professionals would benefit from differentiating who will or will not affiliate with AA. Given this information, providers could consider alternative services for those who will not benefit from AA (Emrick, 1989, 1994). Yet researchers reviewing AA studies (e.g. Emrick et al., 1993; Tonigan, Toscova & Miller, 1996) observe that AA research is largely atheoretical, failing to design studies from existing theory, and to integrate findings to advance theory. Emrick et al. observe that this neglect has contributed to poorly conceived studies and impeded understanding of both AA effectiveness and affiliation.

In a survey of all Veterans Affairs (VA) inpatient and outpatient substance abuse treatment centers in the U.S. (n = 389), Humphreys (1997) found that an overwhelming majority of treatment facilities surveyed emphasize AA as a part of treatment and routinely refer individuals to AA for aftercare (79%). The author discussed guidelines

established by the American Psychiatric Association for referrals to alternative self-help groups. For example, the guidelines suggested that therapists refer clients on psychotropic medication (where negative AA bias is believed to exist), or those who are uncomfortable discussing spiritual matters to alternative self-help organizations. Unfortunately, Humphreys notes that these recommendations are largely ignored by treatment professionals. The survey suggested that referral to AA is the standard practice among treatment professionals, despite self-help alternatives including Rational Recovery and the Secular Organization for Sobriety. Humphreys (1997) reasoned that the widespread availability of AA groups, and poor availability of other recovery groups, might account for this predominance of AA referrals. This survey involved VA treatment centers and may not generalize to other U.S. alcohol treatment providers, although there is no obvious or apparent difference between VA treatment centers and other treatment centers that would threaten external validity.

Organizational Climate and Culture

Organizational behaviors, including affiliative processes and outcomes, have been researched and explained in the organizational culture and climate literature. Although none of the AA literature reviewed in this study borrowed from these theories, they are empirically grounded and appropriate for analysis of AA as an organization. The following brief summary of the culture and climate theory is intended to introduce the most basic and salient concepts related to organizational affiliation that describe affiliative mechanisms and can be generalized to other organizations.

Organizational culture commonly is defined as the most prominent and enduring beliefs, values and norms that serve to differentiate and maintain organizational identity and consistency (e.g. Glisson, in press, Cooke & Rousseau, 1988; Peters & Waterman, 1982). Cooke and Rousseau (1988) described alternative domains of organizational culture that can be measured and observed, including "shared beliefs and values guiding the thinking and behavioral styles of members" (p. 245), "shared norms and expectations that guide the thinking and behavior of members" (p. 246), "the patterns of activities and interactions that members observe" (p. 247), "ways of thinking and believing that members have in common," and "shared expectations relevant to all members" (p. 255). Glisson (in press) summarizes culture into two dimensions, consisting of values and related normative behaviors. Peters and Waterman (1982) examine cultures of alternative organizations to demonstrate how culture shapes and maintains consistent and congruent organizational and employee behaviors, beliefs and values. These values and beliefs are self-sustaining, reinforced by normative behavior of acculturated members.

Some authors (e.g. Harris & Mossholder, 1996; Glisson, in press) describe the influence of organizational climate on acculturation (closely related to affiliation), noting that acculturation is contingent upon congruence between the organization, the culture, and the individual. Organizational climate has been described as the members' perception, assessment and reaction to the organization, in terms of how the organization may fit with the individual's needs and desires (Glisson, in press). Whereas culture is a shared phenomenon, climate may vary among individual members of the organization, and may or may not be shared (Glisson, in press).

In this regard, Harris and Mossholder (1996) support the view that individuals acculturate (affiliate) based upon each individual's preferences and cultural congruence. These and other authors (e.g. Tao, Takagi, Ishida & Masuda, 1998) support this fit between the individual and the organizational culture that influences the affiliative outcome. Tao, Takagi, Ishida and Masuda (1998) contend that aspects of organizational affiliation, including attachment, internalization, and continuance are explained by organizational climate.

Affiliative Need and Fear of Drinking

Greater affiliative need has been used to explain AA affiliation since the 1950's (Smith, 1993). Intuitively appealing and plausible, the theory explains AA affiliation in terms of greater "affiliative need" that contributes to greater "group dependence" or greater affiliation. However, affiliative need theories are not widely accepted among contemporary researchers due to inconsistent findings in quantitative studies (e.g. Montgomery, Miller & Tonigan 1995; Emrick et al. 1993). Nonetheless, using qualitative methods, Smith (1993) provides a good theoretical foundation for socialization processes into the AA "social world," in terms of both affiliative need and fear of drinking as causal mechanisms. Smith concludes that individuals high in affiliative need are more likely to affiliate. More significantly, she posits that some who lack affiliative need affiliate out of fear of the self-destructive effects of their own drinking.

According to Smith (1993), repeated stories in AA meetings tell of the destructive effects of drinking, which serve to increase and reinforce fear of drinking or relapse. In

turn, this fear motivates the individual to affiliate with AA, a potential source of recovery that purportedly has worked for many of the AA members. Therefore, Smith concludes that while affiliative need enhances the socialization processes involved in affiliation, it is not a necessary condition for successful affiliation. Fear of drinking is offered as an alternative causal mechanism for affiliation.

Stages of Change and Motivation

Some suggest that AA is simply an organization for motivated alcoholics with a common goal of abstinence (e.g. Emrick 1994; Morgenstern, Labouvie, McCrady, Kahler & Frey 1997; DiClemente, 1993), and that motivation is the defining characteristic of affiliation. Within the context of alcohol problems, a complex theory of motivation has been developed that involves many relationships among constructs and processes related to changing drinking behaviors (Miller & Rollnick, 1991). In this regard, Miller and Rollnick (1991) define motivation in terms of the probability that the alcoholic will pursue and persist in interventions and activities believed to promote recovery from addiction. A link between the effects of negative consequences and motivation is implicit in motivational theory (Miller & Rollnick, 1991). This link is similar to AA's "bottom theory of motivation" (AA World Services, 1976), which posits that left unaided, the cumulative negative effects of chronic intoxication (the bottom) serve to motivate the alcoholic into some form of recovery (Miller & Rollnick, 1991). AA communicates this irony in a personification, describing alcohol as the "great persuader," which "finally beat us into a state of reasonableness" (AA World Services, 1976, p. 48).

Consistent with this theory, those who are motivated are more likely to persist in a

variety of recovery strategies, including greater AA affiliation. A distinction is made by Caldwell and Cutter (1997) and others (e.g. Miller & Rollnick, 1991) who contend that it is the "self-perception of the problem or the bottom" versus the objective reality (e.g. diagnostic tests) that influences motivation. Similarly, the "stages of change" literature describes other significant factors and processes that influence motivation including severity, negative drinking consequences, ambivalence and determination (e.g. Miller & Rollnick, 1991; Prochaska & DiClemente, 1982, 1986, 1992; DiClemente,1993). In this regard, the following discussion applies the transtheortical stages of change model (Prochaska & DiClemente, 1982, 1986, 1992; Miller & Rollnick, 1991) to the processes of AA affiliation.

Precontemplative. This stage is marked by alcoholics who presently are not considering change. The authors (Prochaska & DiClemente, 1982, 1986, 1992; Miller & Rollnick, 1991) suggested reasons, including: (1) the drinker does not perceive their drinking as a problem (unaware); (2) the drinker is unwilling to consider change at this time, possibly possessing positive drinking expectations greater than perceived negative consequences; or (3) the drinker is aware and willing, but lacking self-efficacy to change drinking habits (discouraged).

DiClimente (1993) notes that unaware or unwilling precontemplative alcoholics are not ready to adopt a goal of abstinence, and, in addition, are conflicted with AA's first step, which requires that the drinker be convinced that they can no longer "control (powerlessness) or enjoy" (AA World Services, 1976, p. 30) their drinking. DiClemente (1993) contends that these drinkers generally do not possess the necessary "desire to stop drinking" to consider AA membership, and they are unlikely to find empathetic support

for this position within AA (DiClemente, 1993). It therefore is unlikely that drinkers will affiliate with AA at this stage (DiClemente, 1993).

Despite DiClemente's (1993) contention, it is conceivable that AA may attract and aid some in the precontemplative stage. According to AA (AA World Services, 1976) and Miller and Rollnick (1991), if heavy drinking continues, there is a greater chance that negative drinking consequences (or "bottom") will increase awareness of drinking as a problem among those "unaware", and also reduce favorable drinking expectancies among the "unwilling" precontemplative drinkers. Motivated and softened by alcohol's painful effects, many may try AA and be moved farther along the stages of change by the experience. Exposure to AA stories may raise awareness (discrepancy) through stories that (1) articulate common negative consequences associated with chronic drunkenness and the adverse effects on members' lives, goals and values; (2) acknowledge that drinking was once a very important and enjoyable part of life; (3) conclude that they can no longer control their drinking; and (4) suggest that alcohol has made their life "unmanageable". If "unaware" or "unwilling" precomtemplative stage drinkers become aware that they cannot control or enjoy their drinking (AA World Services, 1976, p.30), they may be encouraged by the hope and mutual support available in AA, and affiliation may be reinforced. As such, AA attendance may contribute to moving the precontemplative drinker into the next stage of change (contemplative).

In addition, those stuck in the precontemplative stage due to a lack of self-efficacy may be aided by affiliation: (1) taking hope from success stories and the magnitude of other sober members; and (2) receiving encouragement and support from members as well as the AA second step, which promises help from a higher power.

Contemplative. This stage is marked by ambivalence surrounding the decision to initiate change or maintain present drinking behaviors. Within the context of AA, this ambivalence is directed at decisions involving abstinence or continued attempts to control drink, and affiliation with AA. The ambivalence is related to unresolved awareness of both negative (e.g. drinking consequences) and positive aspects of drinking (e.g. enjoyment, stress relief). Another potential source of ambivalence related to affiliation is suggested by stress and coping theory (below). That is, the individual may assess coping needs and alternative coping resources, including AA, home, and work, in deciding whether to continue affiliation. This decision, along with the decision surrounding abstinence versus moderation, contributes to the contemplative drinkers decision to affiliate or not affiliate with AA. DiClemente (1993) contends that the AA meeting environment fails to provide sufficient understanding and tolerance needed to facilitate the resolution of drinking ambivalence, which may partially explain AA attrition.

When feeling ambivalence surrounding drinking, the alcoholic may acknowledge loss of control and enjoyment of drinking, but cannot fully perceive the negative effects of drinking, or be willing to make such a significant commitment to change. Miller and Rollnick (1991) contend that empathy and tolerance of the alcoholic's need to discuss the good aspects of drinking is necessary before the individual is ready to consider and acknowledge negative aspects. In this regard, DiClemente's (1993) contention that members of AA will not tolerate persistent discussions of the pros of drinking is unfortunate, and may contribute to dropout. However, successive failed attempts at controlled drinking may result in successive exposure to AA, with each episode reinforcing the perception of the advantages of recovery, while each failed attempt to

control or enjoy reinforces the awareness of the disadvantages. The effects of this cycle could, therefore, result in eventual affiliation.

Bean-Bayog (1993) expands on systemic processes of ambivalence that may delay affiliation, suggesting that a number of "cons" of recovery serve to keep people from affiliating: (1) shame and stigma associated with acknowledging a problem with alcohol and labeling, (2) goal of abstinence, (3) resistance or aversion to spirituality, (4) social angst, and (5) AA recovery as a permanent condition. In response, the individual often considers and pursues alternatives other than AA including religion, self-will, or formal treatment. In addition, control over alcohol often is intermittent or partial, creating new hope that the individual may someday control his/her drinking. Bean-Bayog notes that AA deals with the pain, ambivalence and shame of the newcomer in a variety of ways: (1) simplifying tasks (e.g. "just don't drink" and "one day at a time"); (2) hearing those with significant lengths of sobriety identify themselves as alcoholics; (3) receiving group support to deal with fear; and (4) receiving reassurance and clarification. This author maintains that instillation of hope is the most powerful intervention that AA offers and may serve to overcome initial ambivalence related to affiliation.

Determination/Preparation. DiClemente (1993) acknowledges that if ambivalence is resolved and the decision is made to abstain from drinking, the AA member may benefit from the support and assistance available from AA affiliation. Determination stage individuals have made a decision to engage in recovery and are committed to abstaining from alcohol. The individual is actively engaged in developing a plan of recovery. AA offers many alternatives to facilitate this process including meetings, sponsorship, steps, sober social activities, etc. AA members telling their stories of how

the AA recovery program has enabled them to maintain sobriety reinforces affiliation.

Steps two and three are closely related to the determination stage. Step two contends that a power greater than oneself-will assist with the change and overcome the compulsion to drink. Step three involves a deeper level of commitment to recovery calling for a "decision to turn our will and our life over to the care of God as we understand him" (AA World Services, 1976). This decision is consistent with the determination stage and would serve to reduce any residual ambivalence or indecision.

Action. This phase involves creating and engaging in a plan of behavior change to initiate and maintain abstinence. Here AA offers many alternative interventions, such as working steps four through nine (designed to clean-up mental anguish arising from resentment and remorse of past events), talking to a sponsor, attending meetings, helping others, and more. Fear of relapse continues to be reinforced in meetings, and this fear serves to maintain determination, as well as increase the level of affiliation or involvement.

Maintenance. In the maintenance phase, the goal of stable abstinence is achieved and maintained. Fear of relapse provides continued motivation to maintain affiliation and involvement. AA steps 10 (continued inventory), 11 (prayer and meditation) and 12 (service to others) are designed to maintain the spiritual condition in a lifelong practice (AA World Services, 1976). AA literature suggests that recovery is a daily contingency; describing sobriety as contingent upon the maintenance of the spiritual condition. Improved quality of life also reinforces affiliation and perpetuates the maintenance stage.

Relapse and Termination. Consistent with AA, Prochaska and DiClemente (1982, 1986, 1992) characterize relapse as a normal stage of change, marked by a return to an

earlier stage. Developed and tested in smoking cessation, Prochaska and DiClemente posit an eventual end to the cycle of change. This is a major departure from AA philosophy, which posits a lifetime of maintenance of recovery (AA World Services, 1976).

In this regard, stages of change in smoking cessation may not generalize to recovery from alcohol dependence. It is acknowledged that those who quit smoking may fully recover and cease all therapeutic maintenance. However, the curative spiritual condition necessary for AA recovery can be maintained only through continued spiritual practice (AA Worlds Services, 1976; 1981). According to AA theory, a failure to maintain and enlarge upon the spiritual condition results in the individual becoming increasingly self-absorbed and miserable, which ultimately places the recovering alcoholic at grave risk of relapse. While the AA literature makes clear that the individual does not need to continue AA meeting attendance, spiritual practice embodied in the steps is advanced as an assurance against relapse (AA World Services, 1976, 1981).

Stress and Coping Theory

Stress and coping theory generally posits that individuals possess varying degrees of abilities and resources to cope with varying levels of stress. AA is viewed as a coping resource, and those with unmet coping needs are more likely affiliate with AA. Humphreys, Moos and Finney (1996) expand this theory, explaining that greater involvement in primary domains of work and intimate relationships may lessen the effects of friend relationships, including AA, reasoning that coping needs have been met in relationships, at work and home (Humphreys, Moos & Finney, 1996). The authors

find that the greater the "incumbency" in primary roles (work and home), the greater the coping available to deal with stressors, and the less the need for involvement with AA.

According to this theory AA is viewed as both a source of coping and a catalyst initiating active coping processes. Humphreys, Finney and Moos (1994) suggest that those with avoidant coping styles were seemingly attracted to AA due to a need for greater coping resources. The authors posit that there are many cognitive, behavioral, social coping and stress reduction processes available from affiliation and active involvement in AA. AA thereby encourages members to abandon avoidant coping tendencies (Humphreys, Finney & Moos, 1994). Affiliation is influenced by individuals, need for and reaction to the cognitive, behavioral and social support coping methods provided by AA (Humphreys, Finney & Moos, 1994).

While AA is defined and treated as an alternative intervention in much of the research, Humphreys, Moos and Finney (1996) contend that involvement in AA aids stress relief through improved coping, and, therefore is better conceptualized as a social resource or a supportive social network, where lasting friendships abound. In this context, AA may be most closely related to a church or a supportive community. Similarly, Emrick (1989) (p. 45) suggests that "AA may not cause abstinence so much as it provides a meeting place for those who have already reached the point of determining to be abstinent." According to this theory, AA affiliation can be viewed as an adaptive coping response to environmental stress.

Affiliation Studies: Review of the Literature

Prior Reviews of the Literature

Over 100 studies spanning three decades evaluate the effectiveness of AA as an intervention and attempt to identify factors associated with AA affiliation (Emrick et al., 1993). It should be noted that few studies examine affiliation as the primary variable of interest. Rather, AA affiliation is most commonly studied as a secondary objective of effectiveness studies. As previously described, those studies published prior to 1991 have been analyzed and summarized in literature reviews that assess both the effectiveness of AA and the correlates of affiliation. Emrick (1987, 1989) provided two in-depth reviews of quantitative studies that were updated and subjected to meta-analytic summary by Emrick et al. (1993). This review searched for both published and unpublished studies on AA, ultimately reviewing 107 studies for inclusion, but limited the review based upon quality and content to 74 studies. The authors used meta-analytic procedures as the basis for evaluating the relative strength and corroboration of factors associated with affiliation. The authors calculated and reported weighted average correlations, standard deviations, number of studies and subjects (see tables in this chapter). Research assistants coded and compiled studies, and interrater reliability was tested. Tonigan, Toscova and Miller (1996) later used the same meta-analytic data to analyze the moderating effects of both treatment modality (inpatient, outpatient or community) and study quality (poor and fair) on selected variables including affiliation.

Since the literature reviews described above, a later prospective longitudinal study has contributed significantly to this literature. This project involved 631 never before

treated alcoholics (prior AA attendance was NOT defined as treatment) selected from detoxification units and an alcoholism information and referral center in the San Francisco metropolitan area (Timko, Moos, Moos & Steinman, 1993). Baseline information was gathered and subjects were followed-up at one year (n = 515 or 81%; Timko, Moos, Finney & Moos, 1994; Timko, Moos, Moos & Steinman, 1993), three years (n = 439 or 70%; Humphreys, Moos & Finney, 1996; Humphreys, Finney & Moos, 1994) and eight years (n = 466 or 74%, Humphreys, Moos & Cohen, 1997). These studies focused on differences among four self-selection treatment conditions including no-treatment (24% at one year), AA only (18% at one year), outpatient (25% at one year), and residential (32% at one year) (Timko, Finney, Moos, Moos & Steinbaum, 1993). Correlates and outcomes of the four groups resulted in a variety of findings and theory generation on AA affiliation, effectiveness, and the nature and effects of self-selection or treatment effectiveness (e.g. Humphreys, Finney & Moos, 1994).

Moderate attrition existed at follow up periods: 18% at 1 year and 30% at year three, suggesting possible biasing effects of mortality. In addition, and although it is difficult to discern from the report, it appears as though 25% of those selected for the original study failed to complete baseline data, creating a potential problem with self-selection. Nonetheless, these studies represent one of few prospective and long-term longitudinal studies on alcoholism.

Most knowledge about alcohol treatment has been derived from studies with one-year or shorter follow-up intervals. Long-term (beyond one year) prospective studies are therefore significant in alcohol studies, where a preponderance of evidence suggests that the recovery process is long-term in nature. In this regard, studies that have followed

outcomes beyond one year period consistently have suggested that remission from dependence is unstable for years after initial treatment (e.g. Vaillant, 1996; Humphreys, Moos & Cohen, 1997). Accordingly, the current research initiative spanning eight years is both valuable and rare.

In addition to the four literature reviews and the longitudinal project described above, other studies on affiliation were reviewed that were published after Emrick et al. (post 1991), and a few that were not included in their review. These studies are summarized in a table and critiqued under the Chapter 2 section headed "Study Quality."

Meta-Analyses Study Quality

Emrick et al. (1993) selected 74 studies from 107, and analyzed them using meta-analytic methods. These studies vastly over-represent formal treatment samples and under-represent AA only or community samples. In addition to the Emrick et al. summary of results, Tonigan, Toscova and Miller (1996) later summarized these same studies by outpatient (n = 22 or 30%), inpatient (n = 50 or 67%) and community settings (n = 2 or 3%). In addition these authors (Tonigan, Toscova & Miller, 1996) reported findings among the better quality studies.

Although many studies exist and were subjected to review by Emrick et al. (1993), the quality of the studies reviewed was not good. The quality problems included inadequate statistical power, inadequate study designs, little use or integration of theory, and other difficulties inherent in performing AA research (e.g. random selection and assignment) (Emrick et al., 1993; Tonigan, Toscova & Miller, 1996). Few studies used random assignment or probability sampling. As previously explained, random

assignment poses unique problems in AA research, where an interaction with self-selection may be desirable (Tonigan, Toscova & Miller, 1996). In general, AA research (1) has been pre-experimental in nature; (2) has failed to report reliability of measurement instruments or corroborate self-reports; (3) has poorly operationalized variables; (4) have failed to report demographic characteristics of the sample; and (5) have over-represented middle age male groups (Emrick et al., 1993; Tonigan, Toscova & Miller, 1996).

Tonigan, Toscova and Miller (1996) described the studies included in the meta-analyses, noting that few studies involved random selection (n = 9 or 12%), random assignment (n = 10 or 14%) or matching (n = 8 or 11%). Emrick et al. (1993) acknowledges that over 19% of samples involved volunteer subjects, and only two of the studies involved random assignment to an AA test group. Only 16% of studies involved some form of experimental manipulation, with most studies being correlational in nature (Emrick et al., 1993). Approximately two-thirds of the studies obtained data at one point-in-time, making it impossible to determine if findings were influenced by extraneous variables or a treatment experience (Emrick et al., 1993).

Other study limitations included instrument reliability, where only 12% of the studies reported instrument reliability (Tonigan, Toscova & Miller, 1996). In addition only 27% of the studies used collaterals to test the reliability of client responses (Tonigan, Toscova & Miller, 1996). Regarding operationalization of the subjects inclusion criteria: (1) approximately 85% of the studies defined subjects as either "alcoholic" or "alcohol dependent"; and (2) the remainder of the studies described subjects in terms of years of problem drinking, prior treatments for alcohol, possessing

"severe" problems with alcohol or as simply having problems with alcohol (Emrick et al., 1993).

Tonigan, Toscova and Miller (1996) apply a measure of global study quality based upon a specific rating scheme that evaluated: sample selection, method of assignment, and reliability of measurement (psychometrics of instrument reported, use of collateral or biomedical measures to corroborate self-report). According to this evaluation system, all studies were rated as either "poor" or "fair" quality, with no studies rated as "good." Unfortunately, the authors do not disclose the relative proportions of studies rated poor, fair or good. Other problems with studies included lack of theory integration and poor statistical power, where no study had adequate statistical power (i.e. .80 or above) (Tonigan, Toscova & Miller, 1996).

Meta Analytic Methods

Emrick et al. (1993) and Tonigan, Toscova and Miller (1996) contended that methods used to calculate meta-analytic weighted correlations and lack of statistical power combined to make weighted correlations more conservative. Emrick et al. (1993) described the method by which correlations were computed: (1) approximately 70% of the studies provided Pearson correlations; (2) roughly 10% were calculated from means and standard deviations; (3) approximately 12% disclosed the "*p*" value, here critical values were found matching implied test statistics and respective degrees of freedom; and (4) about 8% of the studies indicated no significant difference was found between variables, and in these cases the authors assigned a correlation of "0".

Prior Literature Reviews

Emrick (1987) provided the first systematic, methodical and comprehensive review of the AA affiliation literature, later updating and clarifying many of the original findings in a follow-up study (Emrick, 1989). In this first comprehensive review of empirical research that preceded subsequent meta-analyses (Emrick et al., 1993; Tonigan, Toscova & Miller, 1996), Emrick (1989) reported a variety of findings not replicated in the meta-analyses.

The results of the 1989 review provided little definitive evidence for correlates of AA affiliation, with few consistent relationships. Emrick (1989) concluded that it is impossible to predict future AA affiliation among treatment populations. Emrick (1989) observed that while AA works for some, it is obviously not for everyone and could possibly harm some. These results pointed to the need for an improved and objective measure of evaluation and analysis, which was provided by the Emrick et al. (1993) meta-analysis. Although many inconsistent relationships were discussed, the results of this review were superceded by the results of the subsequent meta-analysis.

Meta-Analytic Study Findings

The lack of studies specifically focused on affiliation and prospective studies of alcoholics in the general population, severely limit what is known about affiliation. Despite methodological weaknesses in the studies reviewed, the Emrick et al. (1993) meta-analysis provided much needed evidence on correlates of AA affiliation. Emrick et al. noted that while definitions of affiliation varied among studies (e.g. number of meetings, group membership, involvement over length of time, or self-defined

affiliation), all definitions shared the common domain of greater "exposure" to AA.

Weighted average correlations, standard deviations, number of studies and number of subjects are compiled in Table 3 for correlates of affiliation derived from multiple studies. These correlations represent replications of findings, and therefore, carry greater evidential weight than single study correlations. Correlates of affiliation from single studies are compiled in Table 4. The multiple study correlations reported in Table 3 represent replicated findings and are therefore of greater significance than the single study findings reported in Table 4.

The largest and most consistent correlation among the Emrick et al. findings was that the "use of more external support" for help with drinking (including AA, church and other treatment sources) was strongly correlated with affiliation. While circular, this characteristic explains a considerable amount of the variance in affiliation, perhaps differentiating between those who prefer to resolve drinking problems individually, and those who are more inclined to look outside themselves. While Emrick et al. report a larger correlation (than external help-seeking) between affiliation and cognitive functioning, the finding is a very inconsistent.

The authors also (Emrick et al., 1993, see Table 3) reported several modest and "consistently positive" correlates of affiliation, corroborated in more than a single study: (1) losing control over drinking and personal behavior, (2) consuming a higher quantity of alcohol, (3) possessing greater anxiety about drinking, (4) being more obsessive-compulsive about drinking, (5) reporting greater belief that drinking enhances mental functioning, (6) and involving themselves more in religious/spiritual activities.

Other moderate but less consistent weighted correlations of affiliation that were

Table3: Weighted Meta Analytic Correlates of AA Affiliation from Multiple Studies

Personal Characteristic	r_w *(weighted)*	*SD Correct*	*N Studies*	*N Subjects*
Use of external support (more)	.43	.06	4	343
Loss of control over drinking (more)	.26	.00	2	368
Daily quantity of alcohol (more)	.26	.00	3	318
Physical dependence (more)	.23	.16	5	983
Anxiety about drinking (more)	.20	.00	4	416
Severity of dependence (more)	.18	.25	10	1,219
Obsessive-compulsive (more)	.18	.00	2	233
Enhance mental functioning (more)	.14	.00	2	233
Type of treatment	.14	.12	11	1,256
Social contact (more)	.13	.08	4	1,830
Poly-substance abuse	.12	.04	3	1,269
Gender (female)	.12	.08	5	1,746
Spiritual activity (more)	.12	.00	2	1,396
Age (older)	.10	.11	9	2,231
Education (more)	.08	.06	9	1,964
Prior alcoholism treatment (more)	.08	.13	6	2,885
Legal status (fewer problems)	.07	.00	2	176
Intelligence (higher)	.07	.00	3	175
Marital status (married)	.06	.10	5	1,508
Drink to enhance socialization	.06	.00	2	233
Adult mental health (better)	.05	.15	7	1,185
Employment status (better)	.05	.00	3	283
SES (higher)	.04	.10	4	368
Age first drink (older)	.03	.00	3	402
Social stability (more)	.02	.00	3	535
Pretreatment drinking (binge)	.02	.00	5	1,494
Internal control w/drinking	.01	.23	2	134
Religion (affil. type)	.00	.00	2	1,155
Age of onset (older)	-.01	.19	2	133
Gregarious drinking	-.09	.00	2	233
Cognitive functioning	-.53	.33	2	146

Notes: Adapted with written permission from Emrick, C. D., Tonigan, J. S., Montgomery, H. & Little, L. (1993). Alcoholics Anonymous: What is currently known? In B.S. McCrady and W.R. Miller (Eds.). *Research on Alcoholics Anonymous: Opportunities and Alternatives,* p. 50, New Brunswick, NJ: Rutgers Center of Alcohol Studies.

Table 4: Single Study Correlations of AA Affiliation

Personal Characteristic	*r*	*N*
No. of drinking situations	.76	107
Authoritarian attitude	.52	50
Ethnic background (Irish)	.48	49
Impression that drinking causes social problems	.41	75
Active-person/active God	.40	77
Passive-person/active God	.40	76
Alcohol or drugs in childhood environment	.39	271
Intrinsic religion	.35	78
Duration of alcohol problem	-.32	107
God control	.32	76
Active-person/passive God	-.31	78
Personal religious experience	.30	79
Warm childhood environment	.28	49
Cognitive style (flexible)	-.24	47
Internal control	-.22	77
Psychosocial adjustment	-.20	100
Religious conflict	-.20	77
Self-labeling "alcoholic"	.18	223
Somatic complaints	-.10	107
Race	.00	39
Parental SES (higher)	.00	49
Adult social competence	.00	49
Abstinence before treatment	.00	1,105
Length of stay in treatment	.00	1,105
Amount of counseling interview	.00	1,105
Amount of clergy counseling	.00	1,105
Early predictors of adult adjustment	.00	49
Sociopathy (more)	.00	49
Primary alcoholism	.00	249
Introversion (more)	.00	49
Extrinsic religion	.00	77

Note: Adapted with written permission from Emrick, C. D., Tonigan, J. S., Montgomery, H. & Little, L. (1993). Alcoholics Anonymous: What is currently known? In B.S. McCrady and W.R. Miller (Eds.). *Research on Alcoholics Anonymous: Opportunities and Alternatives,* p. 51, New Brunswick, NJ: Rutgers Center of Alcohol Studies.

difficult to interpret due to greater variability, included a variety of severity measures such as greater severity, more history of treatment, and greater physical dependence. Similarly, a high negative, but highly inconsistent finding was found between cognitive functioning and affiliation from two studies.

In addition, a number of moderate effect sizes, or correlates of affiliation, were reported from single studies including (Emrick et al. 1993, see Table 4): (1) having a flexible thinking style; (2) possessing greater psychosocial adjustment; (3) accepting the "alcoholic" diagnostic label; (4) possessing a more authoritarian attitude; (5) having a longer history of alcohol problems; (6) possessing greater religiosity (several factors); (7) having a more external locus of control (e.g. several factors including God); (8)

Moderating Effects of Study Quality and Sample Origin

experiencing a warmer childhood environment; (9) growing up in a childhood environment that included drugs and alcohol use; (10) engaging in better treatment compliance; (11) reaching out for help; (12) and engaging heavier in AA's first three steps.

Using the Emrick et al. (1993) meta-analytic data, Tonigan, Toscova and Miller (1996) further analyzed the moderating effects of treatment modality or sample origin (inpatient, outpatient or community), and study quality (fair or poor) on selected results from the Emrick et al. analysis. Results were summarized by outpatient (n = 22, 30%), inpatient (n = 50, 67%) and community settings (n = 2, 3%). Results also were summarized based upon the global study quality rating previously described. The same meta-analytic methods were used as previously described in the Emrick et al. review.

Tonigan, Toscova and Miller (1996) reported a moderate and consistent correlation between drinking severity measures and affiliation, including: (1) outpatient samples (r_w = .29, SD < .01, n_{study} = 4, $n_{subjects}$ = 291); (2) community samples (r_w = -.20, SD < .01, n_{study} = 2, $n_{subjects}$ = 253), and (3) the better quality studies (r_w = .20, SD <= .01, n_{study} = 5, $n_{subjects}$ = 617). Given the strength and size of the outpatient correlation, it was surprising to find that the correlation between inpatient samples and severity was both low and inconsistent (r_w = .08, SD = .07, n_{study} = 9, $n_{subjects}$ = 2,057).

More Recent Studies and Synthesis

As previously noted, 20 additional studies of affiliation were located and reviewed that were not included in the Emrick et al. (1993) analysis. Study quality is evaluated prior to the review of this literature. Following this review is a general discussion and synthesis of contextual issues, major findings, theory, hypotheses and a proposed model of affiliation derived from this literature review.

Study Quality

In addition to the meta-analytic studies, a total of 20 additional studies were found and included in the review that follows. A critique of study quality is aided by Table 5, which summarizes the population studied, study design, sample size, and the major strengths and weaknesses. In general, and with few exceptions, the quality of these additional studies is poor and consistent with the meta-analytic studies (Emrick et al. (1993); Tonigan, Toscova & Miller, 1996). Given constraints of study quality, caution is advised in interpreting the results that follow.

Despite limitations of study quality, there is an abundance of correlational

Table 5: Summary of the Affiliation Literature

Citation	*Population Studied (PS)/ Summary Design (SD)*	*Relationship(s) of Interest*	*Sel*	*BL*	*used*	*Major Strengths (S)/ Weaknesses (W)*
AA World Services, 1997	PS: AA members/SD: Cross-sectional random sample survey	AA membership characteristics	?	n/a	7200	S: Random selection; large N/W: Lack of documentation; effects of self-selection and response rate
Caldwell & Cutter, 1997	PS: Alcohol abuse or dependent patients/SD: Survey at 3 months post tx of voluntary participants from 3 I/P and O/P tx programs	Effects of employment factors on AA affiliation	100	n/a	55	S: Understudied substantive area/W: Convenience sample; small N; effects of response rate and self-selection
Caldwell & Cutter, 1998	PS: Alcohol abuse or dependent patients / SD: Longitudinal study of voluntary participants from 3 tx programs at 3 months post-tx	Personal characteristics of AA affiliates	100	100	55	W: Convenience sample; small N; effects of mortality and self-selection
Connors & Dermen, 1996	PS: Secular Organization for Sobriety (SOS) members / SD: Selected SOS meeting leaders (n=180) were sent mail surveys for distribution to voluntary member subjects	AA attitude among SOS members	?	n/a	158	S: Adequate N / W: No control over selection criteria. Effects of self-selection and response rate.
Connors, Tonigan & Miller, 1996	PS: Problem drinkers--mostly alcohol dependent / SD: Survey comparing a measure of religiosity to AA affiliation measures (Project MATCH)	AA affiliation and measures of religiosity	1726	n/a	1637	S: Large N; use of psychometrically tested instruments / W: Chance findings.
Cross, Morgan, Mooney, Martin & Rafter., 1990	PS: Alcoholic patients from an inpatient tx center / SD: Random longitudinal survey of patients admitted to the hospital during a one year period, followed up at 10 years post tx	Physician discharge notes predicting AA affiliation	200	n/a	161	S: Random selection; 10 year follow-up; adequate N / W: Effects of response rate.
Dean & Edwards, 1990	PS: Alcoholic patients / SD: Survey of 47 volunteer subjects from 2 inpatient tx programs	Locus of control and AA affiliation	47	n/a	47	S: Good use of theory; psychometrically tested measures used for IV / W: Small sample low statistical power.
Hasin & Glick, 1992	PS: U.S. adults meeting 12 month alcohol dependence criteria / SD: Secondary data analysis using the National Health Interview Survey of 1988, a multistage random sample	Severity of dependence and AA attendance	4339	n/a	4339	S: Random sample; large N / W: Severity measure is not psychometrically derived; chance findings; weaknesses of national survey are not described.

Table 5: Continued

Citation	*Population Studied (PS) / Summary Design (SD)*	*Relationship(s) of Interest*	*Sel*	*BL*	*used*	*Major Strengths (S) / Weaknesses (W)*
Humphreys, Finney & Moos, 1994	PS: Previously untreated problem drinkers / SD: Longitudinal study of volunteers from 3 detoxification and 4 information and referral sources followed up at three years	Effects of stress and coping factors on AA affiliation	>852	631	439	S: Good use of theory; large sample; psychometric measures used / W: Effects of tx mortality and self-selection
Humphreys, Kaskutas & Weisner, 1998	PS: Problem drinkers seeking tx / SD: Cross-sectional survey of consecutive admissions at 10 alcohol inpatient and outpatient tx programs meeting inclusion criteria. Selection was purposefully distributed across HMO, public and for profit programs.	Personal characteristics, drinking severity, social resources, tx history and AA affiliation	?	n/a	927	S: Good use of theory; used psychometrically tested measures; large and diverse sample. W: Original sample is not disclosed; effects of response rate cannot be assessed.
Humphreys, Moos & Finney, 1996	PS: Previously untreated problem drinkers / SD: Longitudinal study of volunteer subjects from 3 detoxification and 4 information and referral sources followed up at three years	Life stressors, social resources and AA affiliation	>852	631	439	S: Good use of theory; large sample; psychometric measures used / W: Effects of tx mortality and self-selection bias
Isenhart (1997)	PS: Alcohol dependent males / SD: Longitudinal study of consecutive admissions to a veterans inpatient tx program followed up at one year post tx	Stages of change, drinking severity and pre-tx AA affiliation compared to post-tx affiliation	208	125	125	S: Use of psychometrically tested measures; satisfactory N / W: Limitations of reporting on sampling methods; effects of self-selection and mortality.
Kurtz et al., 1995	PS: Alcoholics with a diagnosis of a serious mental illness / SD: Voluntary members of a specialized AA group for dual diagnosed alcoholics, who met selection criteria were recruited for surveys	Personal characteristics including social comfort and AA involvement	42	n/a	40	S: Understudied area; little mortality / W: Small sample (power); effects of self-selection.
Montgomery, Miller & Tonigan, 1995	PS: Alcohol abuse and dependent patients / SD: Longitudinal study of a sample from a single inpatient treatment facility meeting inclusion criteria and followed-up at 31 weeks post tx	Personal characteristics and AA affiliation	?	66	54	S: Replication of prior research findings; use of psychometrically tested instruments / W: Effects of self-selection are not explained; small sample (power). Response rate cannot be determined.

Table 5: Continued

Citation	*Population Studied (PS) / Summary Design (SD)*	*Relationship(s) of Interest*	*Sel*	*BL*	*used*	*Major Strengths (S) / Weaknesses (W)*
Morgenstern, Labouvie, McCrady, Kahler & Frey, 1997	PS: Alcohol abuse or dependent patients SD: Longitudinal study of patients from an I/P and an O/P tx and followed up at 1 and 6 months from discharge	Measures of motivation and AA affiliation	144	119	93	S: Use of psychometrically tested measures; satisfactory N; good use of theory / W: Effects of self-selection and mortality
Reigle, 1996	PS: Male alcohol abusers SD: Longitudinal study of males in a VA tx center followed up at 1 year post tx	Personality factors and coping processes and AA affiliation	?	125	37	S: Use of established instruments at baseline / W: Effects of mortality; limitations of documentation of sampling methods; small N (power); cannot determine mortality.
Sandoz, 1991	PS: Recovering alcoholics in AA / SD: Compared test results of an AA group (n=52) to a community sample (n=51).	Locus of control and AA affiliation	120	n/a	103	S: Adequate sample size; use of established instruments / W: Lack of random sampling; self-selection bias; AA drops outs are not represented in the sample.
Smith, 1993	PS: AA members / SD: Qualitative interviews from doctoral dissertation with volunteer AA members with at least 2 years sobriety	Effects of affiliative need and fear of drinking on AA affiliation and group dependence	?	n/a	50	S: Good use and advancement of theory; adequate qualitative sample / W: Lack of deductive hypothesis and empirical support for findings.
Timko, Finney, Moos, Moos & Steinbaum, 1993	PS: Previously untreated problem drinkers / SD: Longitudinal study of previously untreated volunteers from 3 detoxification and 4 information and referral sources followed up at one year	Personal characteristics influencing selection to tx group (including AA)	>852	631	515	S: Utilization of theory; large sample; reasonably high follow-up proportion / W: Lacks random assignment; effects of tx mortality and self-selection
Tucker & Gladsjo, 1993	PS: People who had overcome a problem with alcohol in the community / SD: Volunteers recruited from a newspaper advertisement were surveyed	Measures of motivation and AA affiliation	161	n/a	126	S: Community sample; under studied area / W: Effects of response rate and self-selection.

Notes: Sel = Selected for sample. BL = Baseline data collected. Used = Final N used in analysis. Tx (or tx) = Treatment. ? = Could not be reasonably derived from the article. n/a = Not applicable.

evidence available to support theory and hypotheses. A set of hypotheses and a model of affiliation are compiled and reported at the conclusion of this chapter. Development of the model is based primarily on plausible theoretical foundations and supported by sometimes limited and inconsistent empirical findings. While plausible theory is a requirement for hypothesis generation and model development, good quality studies are not essential. However, empirical evidence narrows and sharpens the accuracy of the model, and the lack of quality empirical evidence on affiliation contributes to over-specification of hypothesized constructs predicting future AA affiliation.

As with the meta-analytic studies, these samples were drawn primarily from treatment populations (65%). As noted previously, this may enhance the relevance and generalizability of the studies given the context of the problem, i.e. predicting future AA affiliation from treatment populations. In addition, this proportion is comparable to estimates of professionally treated alcoholics within community samples (e.g. Tucker & Gladsjo, 1993; AA World Services, 1976; Timko et al., 1993). It should be noted however, that over-reliance on treatment populations may have resulted in findings that are biased by the effects of greater severity, compared to community samples. While the effects of less severity upon affiliation are not presently known (in part because of this bias), it is suggested that those who are at an earlier stage of dependence (less severe) would be much less inclined to affiliate with AA, and may attempt or succeed at controlled drinking initiatives.

The absence of experimental designs is not surprising given the nature of the construct of interest (AA affiliation) and practical limitations of AA research, although a recent study may have demonstrated how experimental research may be initiated in future

trials (McCrady, Epstein & Hirsch, 1995). AA researchers have been reluctant to preclude or compensate individuals to not attend AA, due to ethical considerations (i.e. researchers generally have believed AA is effective). In addition, findings previously presented suggested the efficacy of volitional affiliation with self-selection as a necessary condition of volitional affiliation. These issues (ethics and volitional affiliation) combine to make experimental designs and use of control groups difficult and rare, though not impossible. As previously described, McCrady, Epstein and Hirsch (1996) were successful at controlling for AA attendance through the use of collaborative patient-counselor goal setting, routine monitoring, and spouse involvement.

Other improvements to these studies involve statistical control. In AA affiliation research, the compelling research question is finding defining characteristics of those who do or do not self-select AA. Accordingly, longitudinal studies of treatment populations that measure some predictor of interest at baseline, compared to a follow-up measure of AA affiliation, were the most prevalent study designs. A superior design would measure several theoretical predictor variables at both baseline, and statistically control for (1) the changes in measures between pre and post-treatment scores, as well as (2) the effects of competing predictors. Unfortunately, point-in-time surveys and pre-experimental designs prevalent in this literature failed to control for and rule out alternative explanations of affiliation, a major limitation within the affiliation literature.

Among the studies critiqued in this section 40% (8 of 20) used longitudinal designs. Only one study used a comparison group, where a point-in-time survey was used to compare an AA group to a community group of non-problem drinkers (Sandoz, 1991). Point-in-time survey designs evaluating multiple constructs of interest were used

in the majority of studies (60%). One of the surveys used a qualitative design (Smith, 1993).

Beyond study design, sampling methods and size are of greatest interest. Although sample size in 65% of the studies appeared adequate ($range_n$ = 93 to 7,200), limited sample size may have reduced power and limited results in 35% of the studies ($range_n$ = 35 to 55). In addition to the self-selection bias inherent in AA research, 85% of the studies suffered from the potentially biasing effects of convenience samples using volunteer participants. Only three of the studies used random selection. In addition, as depicted in Table 5, internal validity of most studies commonly was threatened by the effects of mortality, with attrition commonly equaling or exceeding 20% in retrospective designs (see Table 5).

Many of the studies used established instruments and provided references describing the instruments. However, consistent with the observations of Tonigan, Toscova and Miller (1996), few studies reported psychometric properties of the instruments within their study. In addition, only two of the studies reported use of collateral sources to verify AA affiliation or complete missing follow-up information. Lastly, although Tonigan, Toscova and Miller point out that few of the studies in the meta-analytic review integrated theory within the literature review or discussion of results, many of these studies used theory to inform study design and integrated findings with theory.

In all, study designs were pre-experimental failing to rely upon random selection and studies suffered from the biasing effects of both self-selection and mortality. In

addition, statistical power may have attenuated the findings of many of the studies. Accordingly, caution should be used in interpreting the following findings.

Personality Factors

Some dimensions of personality have been repeatedly theorized and studied as markers of an "AA personality," including greater affiliative need, extroversion and authoritarianism (e.g. Reigle, 1996; Emrick et al. 1993; Emrick, 1987, 1989; Montgomery, Miller & Tonigan, 1995). Despite considerable theory and research attention directed at identifying personality features that may distinguish AA affiliates, research findings are too inconsistent to support a relationship (Emrick et al., 1993; Emrick, 1987).

Consistent with the above, a recent dissertation (Reigle, 1996) advanced AA personality theory and found a relationship between affiliation and "lower agreeableness" in a small Veterans' treatment center sample ($n = 37$) of alcoholic men. The authors suggest that these personality characteristics are similar to "authoritarian" personality factors suggested by earlier studies. This result is consistent with an "authoritarian" personality finding from a small ($n = 50$) study in the Emrick et al. (1993) meta-analysis (see Table 4). Reigle suggests that AA affiliates were more assertive, tough-minded, skeptical and critical. Due to the unique sample characteristics (male veteran population), the small sample size, enormous study mortality (70%), and inconsistent results to replicate findings on authoritarian personality (Emrick et al. 1993; Montgomery, Miller & Tonigan, 1995), these findings may not generalize to more universal AA populations.

Another recent study failed to corroborate commonly theorized AA personality constructs found in the Emrick et al. (1993) review. This study involved the selection of a sample from an inpatient treatment center, which was then followed-up at approximately 31 weeks post-treatment (Montgomery, Miller & Tonigan, 1995). The authors failed to find significant associations between commonly hypothesized personality predictors and AA affiliation, including inflexible cognitive style, authoritarian personality style, affiliative need, or extroversion. Montgomery et al. (1995) concluded that there is little evidence to support the "AA personality." However, caution should be used in interpreting these results, given the enormous rate of refusal to participate in the study by eligible subjects, which is not explained by the authors.

Severity Measures and Treatment Modality

Considerable evidence exists supporting a positive relationship between addiction severity and affiliation (Emrick et al., 1993; Tonigan, Toscova & Miller, 1996). A more recent study by Hasin and Glick (1992), analyzed the data from a large (n = 4,339) household survey for those meeting the DSM-III-R criteria for alcohol dependence, where 74% were rated as mildly dependent, 17% moderate and 9% severe. The authors concluded that greater alcohol severity was a significant predictor of dichotomous AA attendance in the previous 12 months, with 1.73% of mildly dependent individuals, 7.80% of moderately dependent individuals and 39.54% of severely dependent individuals reporting 12 month AA attendance.

Corroborating evidence is provided by Emrick et al. (1993) and Tonigan, Toscova and Miller (1996). In the Emrick et al. (1993) meta-analysis, positive and consistent

correlations were reported between measures of severity and affiliation across studies (see Table 3). Measures of severity included loss control of control over drinking, daily quantity of alcohol, physical dependence, severity of dependence, prior treatment and duration of problem. Tonigan, Toscova and Miller (1996) consolidated measures of severity and found moderate and consistent relationships between drinking severity and overall affiliation in the outpatient samples (r_w = .29, SD < .01, n_{study} = 4, $n_{subjects}$ = 291) and a negative relationship in the community samples (r_w = -.20, SD < .01, n_{study} = 2, $n_{subjects}$ = 253). However, this finding was not corroborated in inpatient samples, where a small but inconsistent relationship was found when applying the same procedures to inpatient samples. Of greatest import, a consistent and positive correlation between severity and affiliation is reported across all treatment groups in the better quality studies (r_w = .20, SD = .00, n_{study} = 5, $n_{subjects}$ = 617). The negative relationship within community samples is difficult to explain. Furthermore, consistent findings among outpatient samples (suggesting less severity) and inconsistent results in inpatient samples (suggesting greater severity) could suggest the presence of interactions or curvilinear relationships between measures of severity and affiliation.

Findings suggesting a curvilinear relationship or interactions between severity and other variables also were found within a community sample by Tucker and Gladsjo (1993). In this study, AA affiliation was associated most with intermediate levels of drinking consequences (a measure of severity). In a related finding, this study found more generally that external help-seeking, including greater AA affiliation, was related to greater perception of a drinking problem. External help-seeking was also the strongest and most consistent correlate from the Emrick et al. (1993) study. While circular, this

characteristic explains a considerable amount of the variance in affiliation, perhaps differentiating between those who prefer to resolve drinking problems individually and with little external help, compared to those who are more inclined to look outside themselves.

Timko, Finney, Moos, Moos and Steinbaum (1993), note that while AA only participants were similar in income resource variables (including insurance), they differed from those self-selecting inpatient treatment in terms of severity measures (less symptoms of dependence, less depression and greater self-esteem). In addition, and consistent with Emrick et al.'s findings (1993), Timko et al. (1993) found that AA members with more severe drinking problems, and greater psychological dysfunction, attended more AA meetings (Timko et al.). Severity measures and resources also predicted self-selection of inpatient versus outpatient treatment, with less severity and more resources predicting outpatient treatment.

The above findings generally corroborate a relationship between severity measures and AA affiliation, where the greater the level of severity, the greater the level of affiliation. However, some of these findings are inconsistent, possibly due to interactions or covariates. Severity may moderate or mediate the effects of other variables on affiliation, including perception of drinking as a problem, external help-seeking, or self-selection of formal treatment or AA (Timko et al., 1993). Other evidence may suggest a curvilinear quadratic relationship where intermediate levels of severity predicted greater affiliation than extremes of severity. Still other theory and empirical evidence presented in later sections of this chapter suggest that severity measures may interact and attenuate the effect of factors that are negatively associated with AA (e.g.

poor social skills, interpersonal support outside of AA and aversion to religiosity). Severity also plays a role in motivation, where greater severity influences other variables (e.g. negative drinking consequences) that tend to increase motivation for change (bottom and stages of change theories).

Motivation and Stages of Change

Based upon qualitative research findings, Smith (1993) posits that greater fear of drinking or relapse is associated with greater affiliation, even among individuals with little affiliative need. This relationship is moderately and consistently corroborated by four studies reviewed by Emrick et al. (1993; Table 3). It is conceivable and logical that this finding may generalize to other negative emotional states surrounding drinking or relapse (e.g. shame, guilt, remorse), although studies were not found that tested the relationship of other negative emotions and affiliation.

Motivation and negative emotions are posited to play major role in affiliative outcome. However, identifying the linkage between negative emotional states, affiliative outcome and related motivational constructs is impossible given these limited and loosely connected study results. It is logical to assert that awareness that drinking is causing one to fall short of core values and goals creates negative emotions related to continued drinking, which naturally would influence motivation to change and play a significant role in affiliative behavior. Interestingly, the linkage between negative emotional states, stages of change, and motivation is not emphasized in prominent theories (e.g. Miller & Rollnick, 1991; Prochaska & DiClemente, 1982, 1986, 1992) that rely more on cognitive states.

Much has been written (summarized above) about the effects of motivation on changes in drinking behavior. Motivation is a complex phenomenon involving a variety of related constructs and processes (e.g. severity and bottom; awareness, feelings and beliefs about drinking, ambivalence, determination, commitment, etc.), where greater motivation is positively related to later stages of change (e.g. determination and action stages) (Miller & Rollnick, 1991). In addition, some authors (e.g. Emrick 1994; Morgenstern, Labouvie, McCrady, Kahler & Frey 1997; DiClemente, 1993) have posited that greater motivation (e.g. determination and action stage of change) predicts AA affiliation. The limited empirical evidence (summarized below) suggests a positive correlation between motivation, higher stage of change, and AA affiliation.

As suggested above, a few recent studies have found that more advanced stages of change were associated with greater affiliation. Isenhart (1997) found that higher determination stage scores at pre-treatment predicted AA affiliation at one year from treatment. In addition, Morgenstern, Labouvie, McCrady, Kahler and Frey (1997) found clients who possessed certain dimensions of motivation, including greater appraisal of the harmful effects of drinking (precontemplative task) and greater commitment to abstinence (determination and action stages) at admission to treatment, predicted affiliation and involvement at six months.

Alternatively, some studies have found that lower stages of change (e.g. precontemplative and contemplative) are associated with less affiliation. In a longitudinal sample from three treatment programs, Caldwell and Cutter (1998) reported that lesser affiliated individuals possessed greater ambivalence (contemplative stage task) surrounding their drinking problem at 90 days post-treatment. Another long-term study

(Cross, Morgan, Mooney, Martin & Rafter, 1990) following a cohort of alcoholics for ten years post treatment, concluded that AA involvement was predicted by the physician's judgment of the patient's acceptance of the diagnostic label at discharge. Acceptance of labels is consistent with determination and action stages tasks. Alternatively, "unawareness" is a defining characteristic of the precontemplative stage. In addition, the association between affiliation and acceptance of the diagnostic label is corroborated in the Emrick et al. (1993) meta-analytic (Table 4). Finally, in a related finding, Tucker and Gladsjo (1993) concluded that awareness of drinking as a problem was the primary predictor of external help-seeking, which is strongly associated with greater AA affiliation (Emrick et al., 1993).

Theory and empirical evidence support motivational and stage of change constructs related to affiliation. Unfortunately, these constructs are complex. Several viable motivational relationships are possible predictors of affiliation and a motivational system is suggested. This system starts with increasing severity, which may increase drinking consequences, which may increase perception of drinking as a problem, which may increase negative emotions surrounding drinking, which may reduce ambivalence and increase determination to engage in some form of recovery, which may increase the chance of taking action, which may include AA affiliation. In addition, other theories and research findings discussed in this chapter suggest that greater motivation appears to interact with other factors and barriers to affiliation.

Stress and Coping Theory

AA members who have fewer work/partner resources or higher stressors may be more inclined to get social coping needs met through greater AA affiliation (Humphreys, Finney & Moos, 1994; Humphreys, Moos & Finney, 1996). Humphreys, Moos and Finney (1996) suggest that greater involvement in work and intimate relationships may lessen the effects of friend relationships available in AA. Thus, coping needs may be satisfied in relationships at work and home. Indeed, Timko, Finney, Moos, Moos and Steinbaum (1993) found that unmarried participants attended more AA meetings.

AA involvement also was related negatively to the level of work support resources at baseline (Humphreys, Finney & Moos, 1994). Consistent with this theory, a study that followed an inpatient sample three months after treatment found that subjects with greater job stability, and those who described work as being related positively to their recovery were less likely to affiliate with AA (Caldwell & Cutter, 1997).

Interestingly, Humphreys, Finney and Moos (1994) found that avoidant coping style at baseline predicted greater AA attendance at three years, and greater AA involvement predicted more adaptive and less avoidant coping styles at the three year follow-up. These authors suggested that AA both attracted individuals deficient in coping skills, as well as enhanced coping styles and resources. In general, the studies described above supported the stress and coping model developed by the authors and hypotheses that less effective (more avoidant) coping styles, greater coping needs, and less interpersonal support outside AA predict greater affiliation.

Social Competency and Comfort

While it theoretically is plausible that the level of social functioning and/or social comfort may influence AA affiliation, studies (Emrick et al., 1993; Tables 3 and 4) generally have found small and inconsistent correlational support for these relations, including more social contact (4 studies) and gregarious drinking (2 studies). Other studies found no relationship between affiliation and adult social competence or introversion. In a later study, Montgomery, Miller and Tonigan (1995) failed to find extraversion and affiliative need related to affiliation.

Conversely, Kurtz et al (1995) reported a moderate and positive relationship between measures of AA involvment and group comfort among dual diagnosis patients ($r = .32, n = 40, p < .05$). Similarly, in a study of participation three months post-treatment ($n = 55$), Caldwell and Cutter (1998) reported that those who rejected AA were less inclined to self-disclose in meetings. Caldwell and Cutter (1998) suggested minimum skills or requirements that may be required for successful AA involvement: (1) comfort with self-disclosure; (2) willingness to engage in emotional intimacy; (3) willingness to remain vulnerable; (4) basic social skills; and (5) basic communication skills. Given the social aspects of AA attendance, others have posited (e.g. Smith, 1993) relationships between affiliation and social dimensions, for example, extraversion and affiliative need. Smith (1993) reports in her qualitative study of AA that affiliative need and other measures of social comfort were predictors of affiliation.

As discussed above, this line of research is marked with inconsistent findings. Subjects in the Kurtz et al. study possessed a second psychiatric diagnosis of a severe mental illness, and may not represent the AA population as a whole. In addition, the

Caldwell and Cutter study was flawed by a high rate of mortality (45%).

Despite poor empirical results, logical and theoretical considerations are compelling. That is, given the social nature of AA, it seems apparent that social skills and fears could represent barriers to affiliation. It may be that other variables may have attenuated correlations in prior studies. Other variables that might have moderated (or mediated) the effects of social resistance to AA include motivational covariates (e.g. severity, perception of drinking as a problem and fear of drinking) and levels of support from primary relations outside AA (stress and coping theory). Alternatively, the poor quality of the AA research may have contributed to misleading results.

Religion, Spirituality, and Purpose in Life

Although much theory and many studies have hypothesized relationships between affiliation and various dimensions of religion, spirituality and meaning/purpose in life, these constructs remain poor and inconsistent predictors of AA affiliation (Emrick et al. 1993; see Tables 3 and 4). However, a related relationship is plausible and supported by a single finding, i.e. greater religious aversion may predict AA attrition (Connors & Dermen, 1996). Connors and Dermen (1996) chronicle the growth of alternative secular organizations such as Rational Recovery and Secular Organizations for Sobriety, and summarize the results of a survey suggesting that aversion to AA's religious/spiritual aspects contributes to attrition.

A related study of alcohol dependent individuals from a single inpatient treatment center (Montgomery, Miller & Tonigan, 1995) failed to replicate a number of commonly theorized predictors of AA affiliation, among these, the authors failed to find a significant

relationship between a measure of a spiritual "bottom" and affiliation. The measure was based upon two instruments: the first measuring desire for meaning in life and the second measuring current level of meaning, with the difference representing a measure of conflict or spiritual bottom. These results are inconsistent with theories suggesting the role of existential angst or a search for greater meaning in life predicting AA affiliation. However, statistical power ($n = 54$) may have been inadequate to have detected moderate or small effects, and these results should be interpreted with caution.

In another study, Connors, Tonigan and Miller (1996) reported a weak positive relationship between the number of AA meetings attended in the past year and religiosity, where religiosity was operationalized in terms of prayer and meditation, scripture reading, attendance at religious services, and "experiences of God." Some of these activities are part of the AA program (prayer and meditation), whereas others are strictly religious (e.g. scripture reading, religious services). This finding may corroborate a related finding from Emrick et al. (1993), where a small, positive and consistent correlation was obtained in two studies.

Miller, Tonigan and Miller noted that, despite the AA emphasis on prayer, meditation, moral inventory and the "spiritual awakening" required for recovery, religiosity as measured by this instrument, may be a better predictor of religious involvement than AA involvement. Accordingly, this instrument may prove useful in differentiating between those who are more inclined to affiliate with AA and those who alternatively may be more inclined to affiliate with church. In any event, religiosity explains only a small proportion of the variance in affiliation.

It should be noted that while the Connors and Dermen (1996) study supports

aversion to religiosity as a potential cause for dropout, this study was flawed by both design and sampling problems. Nonetheless, this survey provides evidence for plausible theory. In addition, the development of alternative secular organizations (e.g. Rational Recovery, Secular Organization for Sobriety) does appear to support the contention that those averse to AA's religiosity may be inclined to drop out. Conversely, and consistent with stress and coping theory, that more religious individuals may be inclined to get their coping needs met within churches, rather than in AA.

These findings generally suggest that (1) those with intermediate levels of religiosity are the most likely to affiliate; (2) those with lower levels may be averse to AA's religiosity and drop out; and (3) those with greater religiosity may be more inclined to affiliate with church, rather than AA. This suggests a curvilinear relationship between affiliation and religiosity, and possibly explains the limited empirical support found in the literature. In addition, weak correlations found in these studies may be attributable to the presence of interactions between religiosity and other constructs, such as motivation and coping needs. These findings should be interpreted with caution given study quality and small sample sizes, discussed previously.

Locus of Control/Self-Efficacy/External Help-Seeking

Locus of control, self-efficacy, and external help-seeking are prevalent concepts in the literature that are related and difficult to disentangle. Accordingly, they are reviewed together. Research interest in locus of control and affiliation is evident in the volume of studies reported by Emrick et al. (1993; see Tables 3 and 4), including use of external support, loss of control, internal control, and God control versus internal control.

This interest is related to AA's controversial first step admission of powerlessness over alcohol (Sandoz, 1991) and the historical controversy involving behavioral arguments that emphasize internal control over drinking behaviors. In addition, and as discussed previously, lack of self-efficacy is a factor theoretically related to the precontemplative stage of change (Prochaska & DiClemente, 1982, 1986, 1992). Similarly, low self-efficacy is related to avoidant coping styles found associated with affiliation and discussed under "Stress and Coping Theory."

Dean and Edwards (1990) defined locus of control as including (1) internal or self-controlled, (2) external based upon "powerful others", and (3) external based upon chance, fate or luck. The study consisted of 47 inpatient subjects tested at baseline for locus of control orientation. The authors noted that while some posit that an internal locus of control improves drinking outcomes, the literature has found conflicting locus of control relationships related to positive drinking outcomes. Consistent with Emrick et al. (1993), Dean and Edwards found that individuals with powerful other locus of control will seek external treatments more readily than those with an internal or chance orientation. The authors find that a powerful other external orientation, predicted longer affiliation with AA. Surprisingly, the authors also find that individuals with a "powerful other" locus have superior drinking outcomes, perhaps explained by the greater affiliation with AA.

Further evidence to support the relationship between locus of control and AA affiliation is documented by Emrick et al. (1993; see Table 3), where moderate to large and consistent correlations are reported between affiliation and greater use of external support (4 studies) and loss of control over drinking (2 studies). Other single study

findings reported by Emrick et al. (see Table 3) support a moderate positive relationship between external locus and affiliation. Conversely, in a more recent study of dually diagnosed alcoholics, Kurtz et al. (1995) failed to find a significant relationship between locus of control and AA affiliation. The findings of the latter study may have been limited by a lack of statistical power, or may pertain only to dually diagnosed AA affiliates included in the study.

Another study (Sandoz, 1991) supported the relationship between greater external locus of control and affiliation, moderated by length of sobriety. This study compared AA members with varying length of affiliation (n = 52) with a control group of non-addicted individuals (n = 51). Sandoz found that while AA members possess greater external locus of control, the relationship decreased with greater duration of both affiliation and sobriety. Both measures of personal authority and internal locus increased with length of sobriety. In addition, people who had received formal treatment had higher personal authority scores than those who did not. The authors suggested that external locus of control in early recovery may be related to the emphasis on powerlessness and unmanageability required by AA's first step.

Based upon the theory and studies discussed above, greater external locus of control, lower self-efficacy and greater external help-seeking predict affiliation.

History of Affiliation

Lastly, limited empirical support and theory support a greater history of AA affiliation predicting future affiliation. Humphreys, Kaskutas and Weisner (1998) reported results of a sample (n = 927) of substance abusers presenting at a cross-section

of treatment sources, including public treatment, HMOs and private for-profit medical programs. The findings suggested that a large portion of individuals presenting for addiction treatment have a significant history of prior AA attendance (83%), which may predict future affiliation. The authors theorized that availability of meetings, prominence and economies of AA may have resulted in AA becoming the "first stop," prior to more formal treatment. Furthermore, Humphreys, Kaskutas and Weisner (1998) suggested that a history of affiliation may predict future affiliation, where factors contributing to pretreatment affiliation may endure beyond initial formal treatment.

Discussion

The review of effectiveness literature suggested that volitional involvement in AA is consistently and moderately associated with improved drinking outcomes. While this is significant, the majority of individuals who try AA drop out within a year, and AA appears to be under-utilized by alcohol dependent individuals in the U.S. Therefore, and despite tremendous influence (e.g. Miller & McCrady, 1993) and prominence (e.g. Room, 1993), it appears that AA is utilized by a minority of alcohol dependent individuals (Bean-Bayog, 1993). Despite this, AA referrals and treatment content continue as a predominant practice among alcohol treatment professionals (e.g. Humphreys, 1997). Given the above, knowledge concerning affiliation is significant.

This review did not locate any study that predicted AA affiliation from information available at pretreatment. In addition, no study followed those who dropped out of AA to provide an understanding of disaffiliation. It is conceivable that the standard practice of AA referrals among treatment providers (Humphreys, 1997) may be

inappropriate, or at a minimum, ignore the needs of those who disaffiliate. In this regard, Emrick (1994), contends that, "it is inadvisable to tell every such patient that AA or another 12-step group will be necessary or even helpful in dealing with his or her chemical dependency problem" (p. 351).

The affiliation literature generally defined affiliation as a measure of AA exposure or dosage, more often defined in terms of meeting attendance. However, this literature also found affiliation to be more predictive of improved drinking outcomes when defined in terms of the level of involvement or participation (e.g. Emrick et al., 1993). The Emrick et al. (1993) meta-analysis summarized empirical evidence of correlates of affiliative outcome. In this regard, Emrick, (1994) subsequently summarized findings as follows:

> ...alcohol troubled individuals with certain characteristics have been found consistently across samples to be more likely to become involved with AA. More likely to affiliate were those who had a history of using external sources of support to stop drinking, experienced loss of control of drinking behavior itself, as well as of behavior when under the influence of alcohol, consumed large quantities of alcohol on days when drinking occurred, suffered anxiety about drinking behavior, been obsessively, compulsively involved with drinking, believed that drinking had enhanced their mental functioning, and engaged in religious/spiritual activity...with the exception of one variable, using external sources of support to deal with drinking, all the personal characteristics that were found in the meta-analysis related only modestly at best with AA affiliation. (p. 351)

Emrick (1994) also concluded that demographic characteristics are poor predictors of AA affiliation. Emrick interprets these findings for clinicians making AA referrals, suggesting that a thorough AA referral assessment is needed. This assessment should include drinking, treatment and psychological factors found moderately predictive

of affiliation in the meta-analysis (see Tables 3 and 4). Emrick provides further guidance stating,

> ...if this patient has had a history of seeking out help from others to stop drinking and has been active in spiritual/religious domain of life, his or her candidacy for the go to AA advice is even greater. Further markers for possible successful affiliation include...having a readiness to accept formal authority, and being less likely to believe that what occurs in life is under the patients control. (p. 353)

Theoretical and empirical support for a variety of relationships was established in the preceding review of more recent literature and synthesis of findings. This review of more recent literature generally is consistent with the contentions of Emrick (1994), with notable exceptions; for example, authoritarian personality and thinking style were not found related to affiliation in later literature.

Hypotheses of AA affiliation

Based upon the forgoing literature review, a series of hypotheses are advanced to predict AA affiliation from information available at treatment assessment, followed by a model advanced in the concluding section. This review has suggested several predictor variables that contribute to a complex model involving moderating, mediating and curvilinear relationships among variables.

Both theory and empirical evidence are considered in arriving at relationships predicting affiliation, as described in the preceding synthesis. Based upon this review, hypotheses are presented in Table 6. When these measures of these hypothesized constructs are obtained at pretreatment, they are posited to predict post-treatment AA affiliation. Note that items designated with an asterick and the column labeled "Model Domain" are discussed and developed in the model of AA affiliation that follows this

Table 6: Relationships Hypothesized to Predict Greater AA Affiliation

Relationships Predicting Greater Affiliation:	***Model Domain**
1. More external help-seeking, external locus of control, less self-efficacy and belief in loss of control	Cultural
2. Greater severity (i.e. generally greater alcohol dependence diagnostic symptoms)	Motivational
3. More accepting of the diagnostic label	Cultural
4. Greater perception of drinking as a problem	Motivational
5. Greater negative feelings (e.g. fear or anxiety, guilt) surrounding drinking	Motivational
6. Less ambivalent concerning the goal of abstinence (including less belief in control drinking)	Motivational
7. Higher determination to change; greater motivation/readiness to change (stages of change)	Motivational
8. Less interpersonal coping resources outside of AA, (e.g. partner and work)	Coping
9. Greater avoidance in coping style	Coping
10. More accepting of religiosity	Cultural
11. Greater pre-treatment AA attendance and involvement	Cultural
12. Greater social competency and comfort	Cultural
13. Greater stress*	Coping
14. Greater perception of coping resources in AA*	Coping
15. The drinker's perception that s/he can derive utility (enjoy) drinking*	Motivational
16. Greater perception of AA benefits*	Cultural
Selected Interactions Predicting Greater Affiliation:	
1. Greater social competency and comfort AND greater motivational measures*	
2. Greater social competency and comfort AND less interpersonal coping resources outside AA*	
3. Less interpersonal coping resources outside AA AND greater motivational measures*	
4. More religiosity AND greater perception of drinking as a problem*	
5. More religiosity AND greater negative feelings surrounding drinking*	
6. More religiosity AND less interpersonal coping resources outside AA*	
Hypothesized Curvilinear Relationships:	
1. Religiosity**	
2. Severity**	

Note: *Developed and derived from theory advanced in the "model of AA affiliation" section, which follows. **Although these curvilinear relations were hypothesized, they are not tested for curvilinearity.

section.

The findings in the literature review were complex and difficult to interpret. Some plausible theoretical relationships were found to be inconsistent predictors of affiliation including social competency and comfort, religiosity and severity measures. It was suggested that inconsistencies in both severity and religiosity might be the result of curvilinear relations. Other inconsistencies were believed to result from combinations of interactions between factors. A model is advanced in the next section to aid in conceptualizing processes that influence and ultimately determine the affiliative outcome.

A Model of AA Affiliation

Given the level of complexity found in this literature review, a model is proposed to conceptually simplify and explain affiliative processes based upon theory and predictors identified in the AA literature review, and borrowing from the organizational culture and climate literature (discussed previously). According to the model, the hypothesized predictors of affiliation are categorized into three major domains (depicted in Table 6) that influence the affiliative outcome: motivation, coping ability, and cultural congruence. This model further posits that affiliative behavior is a function of interactions between explanatory variables within the three domains (motivation, coping and culture) at a point-in-time (dynamic).

In general, the model suggests a non-affiliative initial state where affiliation is unlikely. Affiliation might be contraindicated (drinking is not a problem) or caused by resistance to change. Obviously, without sufficient cause, few individuals will affiliate with AA. This state of homeostasis describes the initial nonaffiliated individual, who

needs a compelling reason or crisis to initiate drinking behavior change or affiliation. The needed crisis is provided by increased severity of dependence and the associated negative consequences (bottom and motivational theories), both posited as necessary prerequisites for affiliation. These and other motivational factors (e.g. perception of drinking as a problem, overcoming ambivalence) "drive" the affiliation model.

Motivational variables appear to play a dominant role in affiliation. Some studies would reduce AA to an organized forum of motivated individuals engaging in sobriety. In fact, it is logical that both affiliation and positive drinking outcomes could be largely explained by greater motivation to change. Motivation is a complex construct affected by many variables and composed of multiple domains. Key variables believed to influence motivation covary with affiliation, i.e. greater severity is believed to increase drinking consequences, which increase the perception of drinking as a problem, which increases negative emotions surrounding drinking, which reduce ambivalence and increase determination to engage in abstinence, which in turn increases the chance of AA affiliation. In addition, motivational constructs are posited to interact with resistance factors (e.g. religious aversion, greater interpersonal coping resources from partner and work relations, greater social competence and discomfort, etc).

Stress and coping theory also provides a unique and compelling perspective on affiliative processes. This theory holds that the level of stress at a point-in-time and the individual's current level of coping resources determine the individuals ability to cope, which can influence both propensity to use alcohol and/or to engage in affiliative behavior. Theory and empirical findings suggest that AA represents a viable interpersonal coping resource. Conversely, individuals with greater alternative coping

resources (e.g. partner and work) or less stress are less likely to affiliate with AA because their coping needs are satisfied in other life domains. Individuals deficit in coping resources at a point-in-time are therefore more likely to affiliate with AA.

Lastly, theory borrowed from organizational culture and climate provides a plausible and powerful theoretical framework to conceptualize and explain AA affiliation. Some of the hypothesized constructs (in Table 6) are cultural (e.g. religiosity, need for greater social competence, acceptance of diagnostic label, etc.), related to normative values and beliefs of the AA organization. The organizational culture and climate literature commonly explains the level of organizational affiliation in terms of acculturation, involvement, attachment and commitment to an organization (Tao, Takagi, Ishida & Masuda, 1998; Glisson, in press).

The theory of organizational culture and climate therefore is integrated into this AA affiliation model, which posits dominant and enduring AA cultural values, beliefs and related norms that create an organizational climate conducive to some, while dispelling others. Examples of enduring and prominent aspects of AA culture apparent in the AA literature (AA World Services, 1976, 1981) and in the affiliation research literature include (1) valuing sobriety, serenity and peace of mind; (2) believing in initiation and maintenance of a spiritual condition as the primary curative factor; (3) using the twelve steps to create the necessary spiritual condition, (4) admitting and accepting the label of "alcoholic", (5) believing in a lifetime recovery process requiring abstinence, and (6) valuing involvement with other AA members ("fellowship") as a multidimensional resource enabling sobriety, sense of belonging, identity, entertainment, and coping. Consistent with the organizational culture and climate literature, individuals

who cannot perceive value and personal congruence within these prevailing, normative values are less to affiliate.

Each model domain (motivational, coping, and cultural) is composed of factors that influence and define the composite or overall strength of the domain (Table 6). Major influences or factors effecting the three domains are depicted in Table 7. Table 7 further categorizes these factors based upon the correlational direction on affiliative behavior, i.e. primarily positively or negatively influencing AA affiliation. Negative factors represent resistance or inhibitory factors, reducing the chance of affiliation, whereas positive or facilitating factors increase the likelihood of affiliation. These individual factors contribute to the composite state of each domain that ultimately determines the affiliation outcome.

Figure 1 illustrates interactions among the three composite domains that ultimately combine to determine the affiliative outcome. In reality, these interactions may occur among specific factors (selected examples are hypothesized in Table 6), which create the possibility of a very large number of interactions among combinations and permutations of specific factors. Therefore, Figure 1 artificially simplifies the possible interactions to aid in conceptualization. Interactions among motivation for sobriety, perceived coping needs and acceptance of the AA culture are posited to determine the affiliation outcome. That is, (1) those high in coping abilities may affiliate if they are high in motivation or very congruent with AA cultural values; (2) those low in motivation may affiliate if they are deficient in coping abilities and/or congruent with AA culture; and (3) those conflicted with the AA culture may affiliate if high in motivation or deficient in coping abilities.

Table 7: Affiliative Domains and Major Factors

RESISTANT INITIAL STATE [a] *Negative or Inhibitory Factors*	*FACILLITATING INTERACTIONS* [b] *Positive or Facilitating Factors*
Inhibitory Motivational Factors: • The drinker's perception that s/he is able to control or manage drinking • Greater ambivalence and perception that s/he can derive utility (enjoy) drinking	Facilitating Motivational Factors: • Greater severity and drinking consequences • Greater perception of drinking as a problem • Greater fear (anxiety), remorse or guilt related to drinking
Inhibitory Coping Factors: • Greater coping abilities and interpersonal resources outside AA	Facilitating Coping Factors: • Low self-efficacy • Greater stress levels • Coping resources perceived in AA
Inhibitory AA Cultural Factors: • Belief in controlled drinking • Either extreme of religiosity: Disdain (aversion) or extreme appreciation (religious zealot) • Impaired social skills and/or social discomfort	Facilitating AA Cultural Factors: • Goal of abstinence • Accepting of the diagnostic label • External help-seeking (fellowship) • Tolerant of spirituality and religiosity • Greater perception of AA benefits

Notes: [a] *Initial State*: The presence of negative or resistance factors creates an initial state of no affiliation and potential resistance surrounding affiliation. [b] *Facilitating Interactions*: The drinker remains in the unaffiliated initial state in the absence of interactions with facilitating influences. Greater severity increases negative consequences creating interactions between factors that determine affiliative behavior at a point-in-time.

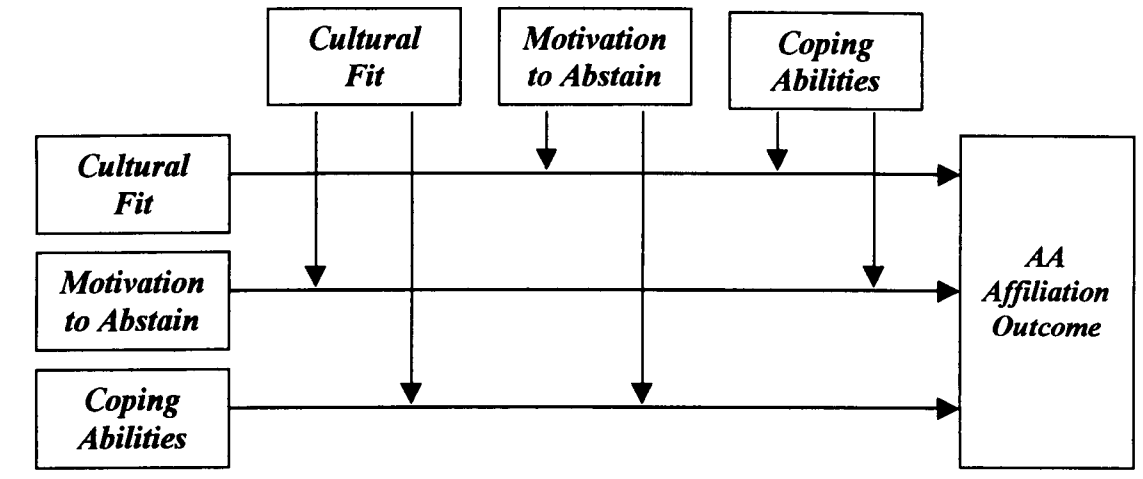


Figure 1: AA Affiliation Model

In summary, the affiliation model is derived from a combination of the most salient explanatory variables summarized in Table 6 and compiled into the three interacting domains in Table 7. In addition, the model relies on alternative theories, organized into the three explanatory domains of affiliation including motivation, coping abilities and organizational culture and climate. The model suggests severity and negative drinking consequences are the "driving force" (bottom theory), and the affiliative outcome is ultimately determined based upon interactions between various domain constructs. Consistent with motivational and stages of change theory, affiliation is viewed as a dynamic state where the overall inclination to affiliate varies depending on the level of interacting influences at a point-in-time.

CHAPTER III: METHODOLOGY

This section describes the methodology used to meet the purpose and goals previously described in the introductory chapter, under "problem statement." As stated, the primary purpose of this study is to accurately predict post-treatment AA affiliation among individuals treated for alcohol disorders using data available at pretreatment. Secondary objectives include (1) developing alternative classification models using a suitable traditional classification method and an artificial neural network (ANN), a more recently advanced classification method; (2) comparing predictive accuracy of the two methods and methodological advantages, if any, derived from using both methods; (3) summarizing, presenting and interpreting significant findings from tests of individual variables that may aid in advancing theory of affiliative processes; and (4) describing implications for practice.

Before proceeding, a key convention and definitions are necessary. The word "prediction" is used interchangeably throughout this study to describe what technically is referred to as "classification." Authors (e.g. Michie, Spiegelhater & Taylor, 1994; SPSS, 1997a, Johnson, 1998) define classification as a procedure that will place each new case into a single category among a discreet number of predefined categories, based upon other information about the case. Some authors (e.g. SPSS, 1997a) reserve the term "prediction" for similar problems where the solution involves estimating a numeric response variable or the probability of an event. In either case the output is numeric, compared to the categorical output inherent in classification problems. For this dissertation *classification* is defined as a type of prediction, where the response variable

is a categorical response variable. Therefore, the term *prediction* often is used in these results and in the discussion that follows to describe what is technically "classification."

This section begins by describing the secondary data set used in achieving the purpose and objectives of the study. This section summarizes and describes the methodological and design issues in the original study that affect the nature and quality of the data and the measures used to represent hypothesized constructs. This section is followed by a description of the secondary data analysis proposed to meet the purpose and objectives of this proposal.

Subjects: Project MATCH

This project is a secondary data analysis, using procedures to classify individuals into predefined categories of affiliation defined more fully in subsequent sections of this chapter. Considering the purpose and objectives of this project, data were needed from a large sample of alcohol disordered individuals, while a broad range of personal characteristics were measured at pretreatment and a suitable measure of affiliation was collected at a reasonable follow-up interval. In addition, a variety of explanatory variables were needed to fully represent the hypothesized variables, preferably from psychometrically sound measures. It also was important that the sample consisted of a sufficiently large number of cases to accommodate both model development (training) and testing requirements of the specific methods. In addition to the above, if the classification methods were to be successful, the data would have to be obtained in a well-designed and controlled research initiative.

All of the conditions were met by data from the Project MATCH study (PM), a large (N = 1,726) and rigorous national multisite study funded by the National Institute of Alcohol Abuse and Alcoholism (NIAAA). PM was an extraordinary study in both quality and scope, collecting a large volume of baseline and follow-up variables related to problem drinking. The following discussion summarizes the PM study, including: subjects (sampling and assignment), design, matching hypotheses, and data collected. These are followed by a brief discussion of results. In all, the PM data represents an exceptional data set for this research.

Context: Treatment Matching Hypothesis and Project MATCH

Decades of treatment research had culminated in the widely accepted belief that treatment outcomes could be improved by matching attributes of the individual to specific treatment approaches (Project MATCH Research Group, 1997a, 1997b). This matching hypothesis had shown promise in more than 30 previous matching studies (Project Match Research Group, 1997b). Review of the alcoholism treatment effectiveness studies conducted by the Institute of Medicine (1990) concluded that while alcoholism treatment research has generally demonstrated the effectiveness of alcohol treatment, the more salient question was "which kinds of individuals, with what kinds of alcohol problems, are likely to respond to what kinds of treatments by achieving which kinds of goals when delivered by which kinds of practitioners (Institute of Medicine, 1990)?"

Studies further suggested that there was not a single best treatment for alcohol dependence, but that a number of treatments seem to work equally well (Donovan &

Mattson, 1994). Following this observation, a decade of research matching clients to treatment had contributed to the belief that individuals were heterogeneous, and that treatments for alcoholism can be matched to the individual's unique needs and characteristics (e.g. Donovan & Mattson, 1994). PM would depart from a tradition of main effects studies of treatment towards one that acknowledged interactions between the intervention and the client (Donovan & Mattson, 1994). The matching hypothesis posits that individual characteristics will predict that some individuals will do better than others in a given treatment.

The NIAAA funded PM to replicate prior studies and to test two matching hypotheses (Project Match Research Group, 1993, 1997b). The Project MATCH Research Group (1993) described prior patient-treatment matching studies as promising, suggesting several patient characteristics for testing that were readily measured. Nine clinical research units or sites were selected to carry out the trial with an elaborate centralized organizational system to provide coordination and control of the project (e.g. project management, training of clinicians and data collectors, and supervision of study quality assurance). In addition, Yale University provided training manuals, training of clinical staff and certification of therapists for alternative treatment conditions (Project Match Research Group, 1993).

Treatment Groups

Several alternative matching treatment conditions were delivered over a twelve week, twelve-session treatment period. Ultimately, three alternative treatment conditions were selected. The Project Match Research Group (1993) described selection of

alternative treatment conditions. Candidate treatments were evaluated based on (1) clinical effectiveness demonstrated in prior research, (2) evidence of distinctive matching effects based on prior studies and/or strong theoretical foundations, (3) presence of "distinctiveness" or contrast from other candidate treatments, and (4) other feasibility issues. While Cognitive-Behavioral Coping Skills Therapy (CBT) and Motivational Enhancement Therapy (MET) met all of these conditions, the Twelve-Step Facilitation (TSF) treatment condition was selected due to its prevalence in practice, the wide scale belief in its effectiveness, and a desire to generalize findings to practice (Project Match Research Group, 1993).

Treatment guides were developed for all three treatment conditions, and PM clinicians were trained and certified to deliver a specific treatment. Treatment sessions were videotaped and rated to assure quality and consistency of treatment dosage (Project Match Research Group, 1997b). While the TSF and CBT treatment conditions were provided in twelve weekly sessions, the MET treatment condition consisted of four "adequate dose" sessions spaced across the twelve-week trial. The MET condition is a brief treatment protocol for problem drinkers where one to three sessions are typical (Project Match Research Group, 1997b). Significant others were included in all three treatment conditions with a maximum of two sessions.

The Project Match Research Group (1993) describes the primary goal of the TSF condition as promoting active participation in AA, whereas other treatment conditions supported but did not recommend AA attendance. MET is designed to enhance motivation and personal resources and to engage the client in the change process using motivational and behavioral psychology. The CBT treatment approach endeavors to

teach subjects the selected interpersonal and intrapersonal skills to improve coping abilities and thereby reduce the risk of relapse and the propensity to depend on alcohol for coping.

Primary and Secondary Matching Hypotheses

Primary and secondary matching attributes were identified and proposed based upon empirical support or strong theoretical considerations (Project MATCH Research Group, 1997a). These a priori hypotheses were to posit better outcomes between the three alternative treatment conditions at one year post-treatment, i.e. hypothesized matching characteristics were expected to predict significantly better outcomes in a given treatment condition compared to the other two treatment conditions. Primary and secondary variables were established in committee (described below), based upon relative evidence from the research literature and theoretical considerations. Primary variables were consensus selections for those most likely to differentiate among alternative treatments. Secondary matching variables were either slightly different constructs than primary matching variables or were measured using an alternative instrument.

The Project MATCH Research Group (1997a) describes the rationale for variable and hypotheses selection, including: (1) prior empirical evidence suggesting differential outcomes, (2) a solid theoretical foundation and (3) valid measures for the matching variable. Several variables were suggested to meet these criteria. The research group narrowed the selection to 10 primary matching variables with the strongest empirical support or most compelling theoretical justification (Project MATCH Research Group,

1997a, p. 1672).

Thus, PM was designed as an elaborate experiment to test the effects of matching hypotheses, using random assignment to three treatment conditions and a variety of matching variables and hypotheses. The process of study design (including hypothesis generation, variable selection, measurement and data collection) was focused on maximizing study quality and was highly structured to achieve this end. The methods by which the primary and secondary matching hypotheses were derived is representative of the thorough study design processes inherent in all of PM. The following description of this process is used as a sample of the process and the level of care inherent in the PM study design (Project MATCH Research Group, 1997a,):

> The effort that went into the development of the matching hypotheses in Project MATCH was considerable. Teams of collaborating investigators were formed on the basis of interest and expertise to develop each of the hypotheses. Each variable was chosen because it was judged to have particular potential for matching (client to treatment) and many had been shown to be previously involved in reported matching effects. Each hypothesis team conducted a review of the literature developed a rationale for the matching hypothesis proposal, as well as the specific predictions made, and operationally defined the matching variable. The team was also required to postulate the likely mediational process through which the matching effect would occur. A document describing all this was reviewed by matching hypotheses review committee which gave feedback to each hypothesis team, and one or more iterations followed. Finally, the revised document was reviewed by the entire steering committee which either accepted the hypothesis or sent it back to the hypothesis team...In summary, the a priori hypotheses finally selected and tested were theoretically driven and empirically supported. (pp. 1686-1687)

Secondary matching hypothesis variables held promise, but were excluded from the primary hypothesis. Most of these variables either were alternative operationalizations or used different measures than primary hypothesis constructs (e.g. DSM diagnosis vs. psychiatric severity, antisocial personality disorder vs. sociopathy,

readiness to change vs. motivation).

The final list of a priori variables included in the primary matching hypothesis, consisted of alcohol involvement, cognitive impairment, conceptual level, meaning seeking, motivation, psychiatric severity, sociopathy, and support for drinking (Project Match Research Group, 1998). Secondary hypotheses matching variables included antisocial personality disorder, DSM-III-R Axis I psychopathology, alcohol dependence, anger, assertion of autonomy, prior engagement in AA, religiosity, self-efficacy, readiness to change and level of social functioning (Project Match Research Group, 1998).

Pretreatment Data Collection

The goal of the PM pre-treatment baseline data set was to accumulate comprehensive assessment data and to measure the primary and secondary matching variables (Connors et al., 1994). Guidelines for selection of instruments included the ability to measure all matching variables and acceptable psychometric properties (Connors et al.).

A comprehensive set of assessment procedures were established to adequately measure the full range of client characteristics of theoretical significance (Project Match Research Group, 1993). Assessment instruments and data were collected to measure the following domains: demographic, clinical, personality and predisposing factors, treatment history, alcohol diagnostic and consequences, drinking behavior and other substance use, level of psychosocial functioning, other psychiatric disorder(s), neuropsychological

functioning, attitude/motivation/existential factors, and social support (Project Match Research Group, 1993).

Other baseline data collection considerations included reducing order effects and eliminating effects of recent alcohol consumption (Connors et al., 1994). The authors suggest that the PM assessment was probably one of the most comprehensive alcohol pre-treatment assessment batteries ever administered (Connors et al.), and because of this, client fatigue was taken into account in the planning and administration of the assessment battery. Blood-alcohol levels were screened using breath tests and clients exceeding .10 were rescheduled.

Sampling and Group Assignment

PM was carried out at the nine clinical research units or sites (CRUs) dispersed throughout the U.S.. A roughly equal number of subjects were selected from outpatient clinical research centers (outpatients) and from inpatient aftercare programs (inpatients or aftercare) over a two-year period (see Table 8). Representation of both inpatient and outpatient populations in roughly equal proportions, was necessary to establish a representative sample of formal treatment populations. This is significant given anticipated individual differences among the two populations. The outpatient subjects were selected from either the community (presenting for treatment) or from outpatient centers where subjects were currently engaged in outpatient treatment. The inpatient arm consisted of both intensive inpatient aftercare or day hospital treatment clients. Subjects were randomly assigned to one of the three PM protocol therapies, described in the text that follows.

Table 8: Personal and Demographic Characteristics by Treatment Arm

Variable	*Outpatient (N = 952)*	*Inpatient (N = 774)*
Treatment assignment:		
CBT (*N* = 567)	301	266
MET (*N* = 577)	316	261
TSF (*N* = 582)	335	247
Gender:		
Gender - Male (*N* = 1,307/76%)	688	619
Gender - Female (*N* = 419/24%)	264	155
Age - mean	38.9	41.9
SD	10.7	11.1
Ethnicity		
White	80%	80%
Black	6%	15%
Hispanic	12%	3%
Other	2%	1%
Years of formal education - mean	13.4	13.1
SD	2.2	2.1
Relationship status: Couple	36%	34%
Employment status: Employed	51%	48%
Percent with prior treatment for alcohol problems	45%	62%
No. of alcohol dependence symptoms - mean	5.8	6.8
SD	1.9	1.9

Note: Total *N* = 1,726. Adapted with written permission from Project MATCH Research Group (1997b). Matching alcoholism treatments to client heterogeneity: Project MATCH post-treatment drinking outcomes. *Journal on Studies of Alcohol*, 58, p. 10.

As stated, subjects were recruited over a two-year period approximately equal across the nine CRUs. The Project MATCH Research Group (1993) reports inclusion and exclusion criteria. Subjects considered for inclusion in the trial had a current DSM-III-R diagnosis of alcohol abuse or dependence; used alcohol as the primary drug of choice; were actively involved in drinking during the three months prior to the study; were over 18 years of age; had a minimum sixth grade reading level; and had no current probation or parole requirements. Subjects were excluded for current dependence on illicit drugs; danger to themselves or others; lack of "residential stability"; inability to provide a collateral person; psychological impairment or acute psychosis; or involvement in alternative formal treatment (other than AA). In addition, the individual had to consent to randomization of treatment conditions; have transportation to treatment sessions; and have been previously detoxified.

A sufficient volume of subjects were selected across treatment sites to insure an adequate sample size and control for type I and II error rates (Project Match Research Group, 1993). In addition, sample size was established to insure adequate power and other statistical requirements, given the large volume of a priori matching factors, small effect sizes, and anticipated distribution of variables (Project Match Research Group, 1993).

Subjects were randomly assigned to each treatment condition using "urn randomization". This process matched subjects on eight key client characteristics, to avoid chance imbalance and to insure a representative assignment to the three conditions. Examples of matching variables included: current drinking severity, prior treatment for

drinking and other psychiatric disorders, sociopathy, mental states, employment status, gender and education (Project Match Research Group, 1993).

Follow-up and Outcome Measures

Follow-up assessments were conducted at 3, 6, 9 and 12 months from post-treatment. Follow-up data included considerable detail on both drinking outcomes and AA attendance and involvement. More extensive validation measures were used at 6 and 12-month assessments, which included collateral interviews and blood and urine tests. Telephone interviews were conducted when clients could not be assessed in person (Project Match Research Group, 1997b). Interestingly, subjects reported greater use of drugs and alcohol than collateral informants or laboratory tests depicted (Project Match Research Group, 1997b). The Project Match Research Group (1997b) ultimately concluded that reliability and validity checks from collateral and laboratory procedures created a high confidence level of accuracy in verbal reports.

Project MATCH Summary Findings

Surprisingly, at the 12 month post-treatment follow-up, the Project MATCH Research Group (1997a) reported that no strong conclusions can be made regarding treatment matching hypotheses and treatment outcomes.

> Despite the detection of several matching effects, the number of hypotheses tested leaves open the possibility that these were attributable to chance. What can be concluded with some confidence is that matching clients on the basis of any single attribute hypothesized and tested in project match is unlikely to markedly enhance the effectiveness of any of these three treatments. Despite the promise of earlier matching studies, the intuitively appealing notion that matching can appreciably enhance treatment effectiveness has been severely challenged. (p. 1686)...Alternative explanations need to be assessed. While the null hypothesis can never be proven, in retrospect it appears plausible to argue that matching

> clients to treatments on the basis of single attributes may not substantially affect their drinking outcomes...Project match differed from most of the prior studies (matching studies that found matching effects) in several respects, which may be especially pertinent: (1) this was a multisite study, as opposed to having been conducted at a single site; (2) Project MATCH tested a priori hypotheses, whereas many prior matching results appear to have been identified in a posteriori analysis. Matching results from single site studies may not be generalizable across treatment settings and client populations. The presence of strong site by treatment main effects...suggest that results from single site studies may be interpreted with caution. The fact that prior matching results have rarely been replicated also raises the possibility that they may have been the result of type I errors. (p. 1689)

Study Design and Data Collection

Consistent with the primary objectives of the study, the PM data were used in tests of individual variables and to develop classification models predicting AA affiliation at one year post-treatment. As such, this study is a secondary data analysis, and the PM data provides an excellent source of data for this purpose.

Previously hypothesized predictor constructs were well represented by psychometrically sound instruments (summarized below). In addition, several treatment variables (aftercare or outpatient selection condition, treatment condition and treatment site), demographic variables (age, education, marital status, employment status, gender), and results of two structured interviews (diagnostic evaluation and interpersonal support) served as measures of hypothesized constructs. Sample size was sufficient to allocate some of the cases to model training or development (75%), with a portion of the cases "held out" (Johnson, 1998) for validation of model accuracy (25%). Lastly, PM provided demographic variables to describe and contrast varying levels of AA affiliation.

Operationalization of the AA Affiliation Response Variable

Most studies reviewed in the literature have historically operationalized AA affiliation in terms of some measure of attendance. However, as discussed previously, AA involvement (or participation) has been found to be a superior predictor of favorable drinking outcome compared to meeting attendance. As such, involvement is an important and logical domain of AA dose, exposure or "affiliation". In this regard, Tonigan, Connors and Miller (1996) reviewed the affiliation literature and considered alternative measures of AA affiliation for purposes of creating an affiliation scale for Project MATCH. These researchers concluded that both attendance and involvement are highly correlated and represent primary domains of AA exposure or "affiliation". Accordingly, these two domains were emphasized in developing the Alcoholics Anonymous Involvement scale (AAI) (Tonigan, Connors & Miller, 1996).

The AAI was selected as the affiliation response variable in this study. The AAI consists of 11 items with a possible score ranging from 0 to 11. Items consist of eight dichotomous questions scored as 0 ("no") or 1 ("yes"), plus three numeric questions (items 8, 9 and 10 in Table 9) that are converted to proportion (percentile) scores and vary between 0 and 1. The three proportional items are calculated by dividing the respondents numeric response by the mean item response for all subjects. Tonigan, Connors and Miller (1996) reported acceptable internal consistency (*Alpha* = .85, *N* = 1,625) and test-retest reliability (r = .76; N = 76). The authors analyzed the domain content of the test using factor analysis. A two-factor solution (attendance and involvement) was presented, using exploratory factor analysis with alpha extraction and

Table 9: List of Questions and Exploratory Factor Analysis of the AAI (N = 1,625)

Item	*Attendance Factor*	*Involvement Factor*
1. Ever attended an AA meeting? (A)	.67	.17
2. Attended AA last year? (A)	.85	.28
3. Ever considered self an AA member? (I)	.39	.51
4. Ever attended "90 meetings in 90 days"? (I)	.17	.53
5. Celebrated an AA birthday? (I)	.19	.64
6. Ever had an AA sponsor? (I)	.32	.60
7. Ever been an AA sponsor? (I)	.02	.47
8. Number of AA steps worked? (A/I)	.52	.52
9. Number of meetings attended in last year? (A)	.80	.28
10. Number of AA meetings (lifetime)? (A)	.72	.56
11. Ever had spiritual awakening? (I)	.27	.37

Note: A: Items loading heaviest on factor 1, designated as "attendance". I: Items loading heaviest on factor 2, designated as "involvement". Adapted with written permission from Tonigan, J. S., Connors, G. J. & Miller, W. R. (1996). Alcoholics Anonymous Involvement (AAI) Scale: Reliability and norms. *Psychology of Addictive Behaviors, 10,* p. 78. Copyright © 1996 by the Educational Publishing Foundation.

varimax rotation (see Table 9).

PM researchers administered the AAI at baseline and at both nine and twelve month follow-up intervals. The twelve month follow-up interval was analyzed in the present study for several reasons: (1) one year is the post-treatment follow-up standard in substance abuse research and provides a more consistent follow-up interval for analysis; (2) the PM twelve month assessment period methodology was more rigorous, involving both collateral interviews and blood and urine testing that could translate into greater reliability; and (3) researchers (discussed previously) have estimated that attrition grows from approximately 50% at 90 days to 75% to 90% at one year. In addition the AAI was administered to a substantial proportion of the original sample at the 12 month follow-up (N = 1,506 or 88%), a reasonable response rate.

At both nine and twelve month follow-up intervals, AAI questions were modified to refer to the 90 day period preceding the administration of the test. As such, all of the questions described in Table 9 were asked within the context of "in the last 90 days," with the exception of question 11, which was worded as, "have you ever had a spiritual awakening or conversion since AA involvement?"

Once the twelve-month AAI follow-up was selected as the affiliation response variable, analyses were performed to consider whether the variable was suitable for numeric prediction, or alternatively should be recoded into a categorical response variable. An analysis of the distribution and characteristics of the data was performed, and it was decided that due to the heavy skew of the distribution, a categorical variable would be more appropriate for classification. A secondary consideration supporting the use of a categorical variable included perceived clinical utility of a numeric versus categorical prediction, where a category might be more easily interpreted by clinicians than a numeric scale.

Ultimately, a dichotomous AAI response variable was used based upon the distribution of the AAI composite score and the following analysis (see Figure 2 and Table 10). The data are a highly skewed ("L" shaped) with a relatively low median point (1.5) relative to the range of scores (0.5 to 7.0). A prominent modal peak (at or below .8) representing 43% of the subjects exists at an extremely low affiliative score. This large cluster of subjects failed to score at least one equivalent item response out of the eleven possible on the AAI scale. This category therefore is labeled as *"disaffiliates"*.

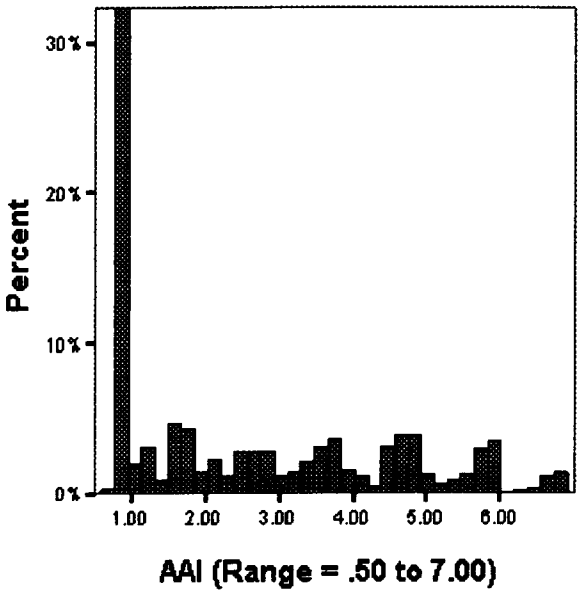


Figure 2: AAI Histogram

Table 10: Descriptive Statistics for 12 Month AAI Scores

Description	Amount
Valid N	1,506
Missing N	220
Mean	2.35
Standard Deviation	1.89
Mode	.80
Lower Quartile Range	.50 to .80
Median	1.50
Upper Quartile Range	3.80 to 7.00

Furthermore, only 8.5% of the subjects fell between this lower quartile/modal and the median (1.5). The median score (1.5) is also a relatively low composite score and would reasonably fit the category description of disaffiliates.

Alternatively, data above the lower quartile (.8) is irregular and relatively flat (see Figure 2), with no discernable natural cluster or grouping. The median (1.5) therefore represented a logical cut-point for this study's categorical outcome variable. The lower category of scores (less than 1.5) is a very low AAI, relative to the upper quartile score of 3.8 and the maximum score of 7.0 (disaffiliates). The distribution therefore suggests a dichotomous split at the median with subjects scoring above the median representing *"moderate to high affiliates."*

The disaffiliate group represented a much more consistent and potentially homogeneous AAI score group ($range_{disaffiliate} = 1.5$), compared to the moderate to high affiliate group ($range_{moderate\text{-}high} = 5.5$). Those above the proposed median cut-point are composed of approximately half *"moderate affiliates,"* (between the median and the upper quartile) with the other half representing *"high affiliates"* (above the upper quartile). However, it was decided that a dichotomous split at the median would provide the best overall categorization for a number of reasons: (1) there are treatment planning

advantages related to identifying those most at risk of dropping out of AA; (2) there were no recognized benefits attributable to separately predicting moderate and high affiliates; and (3) there is an SPSS (1997a) recommendation that for best classification accuracy categories should be represented in roughly equal proportions.

Operationalization of Explanatory Variables

The PM data provide an abundance of suitable measures for most hypothesized constructs in many cases, redundant or highly related measures or domains of the hypothesized constructs. Hypothesized constructs primarily were measured by instruments with suitable psychometric properties. Table 11 lists hypothesized constructs along with alternative PM measures, their definitions, and citations that report instrument development and psychometric properties, where applicable. Based upon this review, hypothesized constructs are represented by an abundance of good quality measures in PM data.

Finally, the hypotheses and model advanced at the conclusion of the literature review proposed the potential for interactions among domains of motivation, coping ability and AA culture. Consistent with the model, product terms were developed to represent hypothesized interactions. Following is a list of these interactions and the product terms selected to represent the interactions in the test of individual variables.

1. Greater social competency and comfort AND greater motivational measures
    - Social Functioning X Motivation

Note: This list is continued after Table 11.

Table 11: PM Baseline Measures for Hypothesized Constructs

Measure/Citation/Reliability/Direction*	Description
Construct: *Alcohol self-efficacy*	**Domain:** *Cultural*
Alcohol Abstinence Self-efficacy Scale: Temptation Minus Confidence (SELFEF2); DiClemente, Carbonari, Montgomery & Hughes, 1994; Alpha = .92; N = 226; +	Efficacy is described as the "individuals' personal evaluation about their capability to exercise control over events or to perform particular behaviors" (p. 141). A composite measure of "abstinence self-efficacy" created by the subtracting a "confidence in abstinence" subscale from a "temptation to drink subscale". Temptation to drink under varying conditions is contra-related to abstinence self-efficacy.
Alcohol Use Inventory: Loss of Control over Drinking (LCONTROL); Horn, Wanberg & Foster, 1987; Horn, Wanberg & Foster, 1986; Wanberg, Horn & Foster, 1977; Alpha = .79, N = 2,261; +	"Loss of control over behavior when drinking. Become belligerent, harm others, stagger, stumble, attempt suicide, have blackouts, pass out." (Horn, Wanberg & Foster, 1986, p. 7)
Alcohol Use Inventory: Prior Attempts to Deal with Drinking (HELPBEFR); Horn, Wanberg, & Foster, 1987; Horn, Wanberg & Foster, 1986; Wanberg, Horn & Foster, 1977; Alpha = .68; N = 2,261; +	"Prior attempts to deal with drinking. Have used antabuse, tranquilizers, medicines; have been detoxified; have attended AA, tried religion, sought other help to stop." (Horn, Wanberg and Foster, 1986, p. 7)
Alcohol Use Inventory: Uncontrolled Life Disruption (DISRUPT2); Horn, Wanberg & Foster, 1987; Horn, Wanberg & Foster, 1986; Wanberg, Horn & Foster, 1977; Alpha = .74; N = 2,261; +	"Uncontrolled life disruption, indirectly stated. This is indicated by responses of acknowledgement that one eats and sleeps little when seriously drinking, does not eat after an evening of drinking, ...knows the experience of a "dry drunk" (feeling of being drunk, but without drinking), drinks more than one kind of alcohol, is unable to stop after one or two drinks, takes many drinks at a party or bar before stopping, has broken out in small sores from drinking, drinks to relieve hangover, and had used alcohol substitutes such as shaving lotion. The items are not of a kind that one would ascribe to if she or he were not a heavy drinker, but several of the items are not typically listed in descriptions of alcoholism. Individuals motivated to hide serious drinking problems often score higher..." (Horn, Wanberg & Foster, 1986, pp. 8-9)
Interpersonal Dependency Inventory: Assertion of Autonomy (AUTON); Hirschfield et al. 1977; Split Half Reliability = .72; N = 180; -	"Interpersonal dependency refers to a complex of thoughts, beliefs, feelings, and behaviors which revolve around the need to associate closely with, interact with, and rely upon valued other people." (p. 610). The present measure represents a 14 item subscale measuring assertion of autonomy. Items assess the need for others or independence, e.g. "I don't need anyone; I rely on myself; I don't need much from people". A higher score represents greater independence or autonomy.

Table 11: Continued

Measure/Citation/Reliability/Direction[a]	Description
Construct: *Dependence severity*	**Domain:** *Motivation*
Addiction Severity Index: Psychiatric Severity (ASIPSY); McLellan, Luborsky, Woody & O'Brien, 1980; Interrater r > .71; N = 325; +	A structured interview that assesses severity, where severity is defined as "need for additional treatment" (p. 27). A broad assessment of six drinking related problem areas including: chemical abuse, medical, psychological, legal, family/social, and employment/support.
Alcohol Use Inventory: Role Maladapatation (ROLEMALA); Horn, Wanberg & Foster, 1987; Horn, Wanberg & Foster, 1986; Wanberg, Horn & Foster, 1977; Alpha = .66; N = 2,261; +	"Social role maladaptation. Drinking has resulted in loss of job, driving offenses, living alone, missing work, unemployment, much moving, the detention by authorities." (Horn, Wanberg & Foster, 1986, p. 7)
Alcohol Use Inventory: Uncontrolled Life Disruption (DISRUPT2); Horn, Wanberg & Foster, 1987; Horn, Wanberg & Foster, 1986; Wanberg, Horn & Foster, 1977; Alpha = .74; N = 2,261; +	"Uncontrolled life disruption, indirectly stated. This is indicated by responses of acknowledgement that one eats and sleeps little when seriously drinking, does not eat after an evening of drinking, ...knows the experience of a "dry drunk" (feeling of being drunk, but without drinking), drinks more than one kind of alcohol, is unable to stop after one or two drinks, takes many drinks at a party or bar before stopping, has broken out in small sores from drinking, drinks to relieve hangover, and had used alcohol substitutes such as shaving lotion. The items are not of a kind that one would ascribe to if she or he were not a heavy drinker, but several of the items are not typically listed in descriptions of alcoholism. Individuals motivated to hide serious drinking problems often score higher..." (Horn, Wanberg & Foster, 1986, pp. 8-9)
Ethanol Dependence Scale: Alcohol Dependence Severity (ALDEPEND); Babor, 1996; Alpha = .90; N = 1,726; +	A self-report measure of severity of alcohol dependence, organized into major content, or alcohol dependence syndrome areas including importance (salience), impaired control, tolerance, withdrawal, and relief drinking. This instrument was designed to measure severity of the elements contained in the DSM-III-R and the International Classification of Diseases.
Structured Clinical Interview of the DSM-III-R: Alcohol Dependence Symptoms (SCACTC and SCACTW); Project MATCH structured interview.; N/A; +	This is a structured diagnostic interview derived from the DSM-III-R, and scored as the total number of positive diagnostic criteria or symptoms. Two versions exist: the lifetime number of positive symptoms, or worst, (SCACTW) and the current number of positive symptoms (SCACTC).

Table 11: Continued

Measure/Citation/Reliability/Direction[a]	Description
Treatment Site (SITE #); Project MATCH designation; N/A; inpatient sites = +	Represents the 11 treatment "sites". The site designation represents both physical treatment location (from cities disbursed throughout the USA; N = 9) and the sampling source or "arm", i.e. from either inpatient aftercare or outpatient treatment populations. All sites assigned subjects to one of the three treatment conditions. One physical location selected subjects from both arms and another included two therapy teams in two separate physical locations. Two separate "sites" were added to define these anomalies.
Construct: ***Diagnostic label acceptance***	**Domain:** *Cultural*
Alcohol Use Inventory: Awareness of Drinking Problem (AWARENES); Horn, Wanberg & Foster, 1987; Horn, Wanberg & Foster, 1986; Wanberg, Horn & Foster, 1977; Not Reported; +	"Awareness of drinking problems. Believe drinking interferes with meeting responsibilities; unable to regulate times of drinking or amount drunk." (Horn, Wanberg & Foster, 1986, p. 7)
Alcohol Use Inventory: Loss of Control over Drinking (LCONTROL); Horn, Wanberg & Foster, 1987; Horn, Wanberg & Foster, 1986; Wanberg, Horn & Foster, 1977; Alpha = .79, N = 2,261; +	"Loss of control over behavior when drinking. Become belligerent, harm others, stagger, stumble, attempt suicide, have blackouts, pass out." (Horn, Wanberg & Foster, 1986, p. 7)
Alcohol Use Inventory: Readiness for Help (RECEPTIV); Horn, Wanberg & Foster, 1987; Horn, Wanberg & Foster, 1986; Wanberg, Horn & Foster, 1977; Not Reported; +	A measure constructed from selected questions of the AUI. Psychometrics not reported. "Readiness for help. Matters have come to crisis; need help; will do what counselor suggests; feel can stop." (Horn, Wanberg & Foster, 1986, p. 7)
Stages of Change Readiness and Treatment Eagerness Scale : Self-report to, "I am an alcoholic" (single question-SOCQ18); Miller & Tonigan, 1996; N/A; +	Question number 18: "I am an alcoholic." A 5 point Liekert scale question varying from strongly agree (5) to strongly disagree (1).
Construct: ***Drinking problem perception***	**Domain:** *Motivation*
Alcohol Use Inventory: Awareness of Drinking Problem (AWARENES); Horn, Wanberg & Foster, 1987; Horn, Wanberg & Foster, 1986; Wanberg, Horn & Foster, 1977; Not Reported; +	"Awareness of drinking problems. Believe drinking interferes with meeting responsibilities; unable to regulate times of drinking or amount drunk." (Horn, Wanberg & Foster, 1986, p. 7)
Alcohol Use Inventory: Guilt or Worry About Drinking (GUITLWOR); Horn, Wanberg & Foster, 1987; Horn, Wanberg & Foster, 1986; Wanberg, Horn & Foster, 1977; Alpha = .78; N = 2,261; +	"Guilt or worry associated with drinking. Concern that drinking is getting worse, occurring at unaccustomed times, provoking fear, creating depression; anxious about drinking bouts; avoid talking about drinking." (Horn, Wanberg, & Foster, 1986, p. 7)

Table 11: Continued

Measure/Citation/Reliability/Direction[a]	Description
Alcohol Use Inventory: Readiness for Help (RECEPTIV); Horn, Wanberg & Foster, 1987; Horn, Wanberg & Foster, 1986; Wanberg, Horn & Foster, 1977; Not Reported; +	A measure constructed from selected questions of the AUI. Psychometrics not reported. "Readiness for help. Matters have come to crisis; need help; will do what counselor suggests; feel can stop." (Horn, Wanberg & Foster, 1986, p. 7)
Stages of Change Readiness and Treatment Eagerness Scale : Self report to, "I am an alcoholic" (single question-SOCQ18); Miller & Tonigan, 1996; N/A; +	Question number 18: "I am an alcoholic." A 5 point Liekert scale question varying from strongly agree (5) to strongly disagree (1).
Construct: ***Drinking negative feelings***	**Domain:** *Motivation*
Alcohol Use Inventory: Guilt or Worry About Drinking (GUITLWOR); Horn, Wanberg & Foster, 1987; Horn, Wanberg & Foster, 1986; Wanberg, Horn & Foster, 1977; Alpha = .78; N = 2,261; +	"Guilt or worry associated with drinking. Concern that drinking is getting worse, occurring at unaccustomed times, provoking fear, creating depression; anxious about drinking bouts; avoid talking about drinking." (Horn, Wanberg & Foster, 1986, p. 7)
Alcohol Use Inventory: Awareness of Drinking Problem (AWARENES); Horn, Wanberg & Foster, 1987; Horn, Wanberg & Foster, 1986; Wanberg, Horn & Foster, 1977; Not Reported; +	"Awareness of drinking problems. Believe drinking interferes with meeting responsibilities; unable to regulate times of drinking or amount drunk." (Horn, Wanberg & Foster, 1986, p. 7)
Alcohol Use Inventory: Readiness for Help (RECEPTIV); Horn, Wanberg & Foster, 1987; Horn, Wanberg & Foster, 1986; Wanberg, Horn & Foster, 1977; Not Reported; +	A measure constructed from selected questions of the AUI. Psychometrics not reported. "Readiness for help. Matters have come to crisis; need help; will do what counselor suggests; feel can stop." (Horn, Wanberg & Foster, 1986, p. 7)
Construct: ***Abstinance ambivalence***	**Domain:** *Motivation*
Stages of Change Readiness and Treatment Eagerness Scale: Ambivalence Surrounding Change (AMBIV); Miller & Tonigan, 1996; Alpha = .60; N = 1,672; +	Ambivalence surrounding changing drinking behaviors is a subscale of the Stages of Change Readiness and Treatment Eagerness Scale. Ambivalence depicts a conflicted state where the individuals perceives both positive and negative aspects for changing as well as not changing drinking behaviors. As such it is an important domain of motivation to change.
Alcohol Use Inventory: Readiness for Help (RECEPTIV); Horn, Wanberg & Foster, 1987; Horn, Wanberg & Foster, 1986; Wanberg, Horn & Foster, 1977; Not Reported; -	A measure constructed from selected questions of the AUI. Psychometrics not reported. "Readiness for help. Matters have come to crisis; need help; will do what counselor suggests; feel can stop." (Horn, Wanberg & Foster, 1986, p. 7)

Table 11: Continued

Measure/Citation/Reliability/Direction[a]	Description
Construct: ***Determination/motivation/readiness to change***	**Domain:** *Motivation*
University of Rhode Island Change Assessment: Motivation (MOTIVATN); DiClemente & Hughes, 1990; Alpha = .69 to .82; N = 224; +	A composite measure related to motivation to engage in changes in drinking behaviors. Contains subscales designed to measure the degree to which an individual identifies with a stage of change, including, precontemplation, contemplation, action and maintenance.
Stages of Change Readiness and Treatment Eagerness Scale: Readiness for Change (SOCRDY); Miller & Tonigan, 1996; Alpha = .89; N = 1,672; +	A measure of motivation or readiness for change. A composite score from an instrument that measures constructs related to the stages of change including recognition of the need for change, ambivalence about change and taking steps designed to initiate change.
Alcohol Use Inventory: Awareness of Drinking Problem (AWARENES); Horn, Wanberg & Foster, 1987; Horn, Wanberg & Foster, 1986; Wanberg, Horn & Foster, 1977; Not Reported; +	"Awareness of drinking problems. Believe drinking interferes with meeting responsibilities; unable to regulate times of drinking or amount drunk." (Horn, Wanberg & Foster, 1986, p. 7)
Alcohol Use Inventory: Readiness for Help (RECEPTIV); Horn, Wanberg & Foster, 1987; Horn, Wanberg & Foster, 1986; Wanberg, Horn & Foster, 1977; Not Reported; +	A measure constructed from selected questions of the AUI. Psychometrics not reported. "Readiness for help. Matters have come to crisis; need help; will do what counselor suggests; feel can stop." (Horn, Wanberg & Foster, 1986, p. 7)
Construct: ***Non-AA interpersonal coping resources***	**Domain:** *Coping*
Alcohol Use Inventory: Role Maladaptation (ROLEMALA); Horn, Wanberg & Foster, 1987; Horn, Wanberg & Foster, 1986; Wanberg, Horn & Foster, 1977; Alpha = .66; N = 2,261; -	"Social role maladaptation. Drinking has resulted in loss of job, driving offenses, living alone, missing work, unemployment, much moving, the detention by authorities." (Horn, Wanberg & Foster, 1986, p. 7)
Drinker Inventory of Consequences: Recent Interpersonal Drinking Consequences (INTERCR).; Miller, Tonigan & Longabaugh, 1995; Alpha > .77; N = 1,389; -	"Interpersonal consequences focuses on the impact of drinking on the respondent's relationships. Adverse consequences here include damage to or the loss of a friendship or love relationship, impairment of parenting and harm to family, concern about drinking from family or friends, damage to reputation, and cruel or embarrassing actions while drinking." (Horn, Wanberg, & Foster, 1986, p. 10)
Important People and Activities: Social Support for Drinking (SOCSUPP); Clifford & Longabaugh, 1991; Not Reported; +	Structured and graded interview concerning nature and extent of social support available from important people and activities. A higher score represents greater social support.

Table 11: Continued

Measure/Citation/Reliability/Direction[a]	Description
Marital Status (MARITALS); Project MATCH demographics; N/A; married status = + and single categories = -	A categorical measure of marital status and significant other relations including: never married, married, separated, divorced, widowed and cohabitating.
Social Support Questionnaire: Family (SSFAM); Rice & Longabuagh, 1996; Alpha = .85; N = 1,726; +	This is a 7 item measure of perceived social support available from family.
Social Support Questionnaire:- Friends (SSFRND); Rice & Longabuagh, 1996; Alpha = .81; N = 1,726; +	This is a 7 dichotomous item measure of perceived social support available from friends.
Work or Job Status (Unemployed); Project MATCH demographics; N/A; employed status = + and unemployed statuses = -	A dichotomous dummy coded measure of work status where 1 = unemployed and 0 = part-time, temporary or permanent employment. This variable was recoded from the PM WORK variable, a categorical measure of work or job status including: full-time permanent, full-time temporary or irregular, part-time.,
Your Work Place: Support for Abstinence at Work (YWFAC3); Beattie, Longabaugh & Fava, 1992; Alpha = .61; N = 204; +	This is a 5 item subscale measuring support or encouragement for abstinence in the work place, where a greater score represents more support for abstinence.
Your Work Place: Support for Consumption at Work (YWFAC2); Beattie, Longabaugh & Fava, 1992; Alpha = .64; N = 204; -	This is a 5 item subscale measuring support or encouragement for alcohol consumption in the workplace, where a greater score represents more workplace support for consumption.
Construct: ***Avoidant coping style***	**Domain:** *Coping*
Alcohol Abstinence Self-efficacy Scale: Temptation Minus Confidence (SELFEF2); DiClemente, Carbonari, Montgomery & Hughes, 1994; Alpha = .92; N = 226; -	Efficacy is described as the "individuals' personal evaluation about their capability to exercise control over events or to perform particular behaviors" (p. 141). A composite measure of "abstinence self-efficacy" created by the subtracting a "confidence in abstinence" subscale from a "temptation to drink subscale". Temptation to drink under varying conditions is contra-related to abstinence self-efficacy.
Alcohol Use Inventory: Drink to Manage Mood (MANGMOOD); Horn, Wanberg & Foster, 1987; Horn, Wanberg & Foster, 1986; Wanberg, Horn & Foster, 1977; Alpha = .76; N = 2,261, +	"Drink to manage moods. Drink when down, feeling depressed, to change moods, to forget, to relieve tension." (Horn, Wanberg & Foster, 1986, p. 6)

Table 11: Continued

Measure/Citation/Reliability/Direction[a]	Description
Interpersonal Dependency Inventory: Assertion of Autonomy (AUTON); Hirschfield et al. 1977; Split Half Reliability = .72; N = 180; -	"Interpersonal dependency refers to a complex of thoughts, beliefs, feelings, and behaviors which revolve around the need to associate closely with, interact with, and rely upon valued other people." (p. 610). The present measure represents a 14 item subscale measuring assertion of autonomy. Items assess the need for others or independence, e.g. "I don't need anyone; I rely on myself; I don't need much from people". A higher score represents greater independence or autonomy.
Construct: ***Religiosity***	**Domain:** *Cultural*
Age (AGE); Project MATCH demographics; N/A; greater age = +	An ordinal system of age in years including the following categories: 18 thru 24, 25 thru 29, 30 thru 34, 35 thru 39, 40 thru 44, 45 thru 49, 50 thru 54, 55 thru 59, 60 years and older.
Religious Background and Beliefs Scale (RBBTOT); Connors, Tonigan & Miller, 1996; Alpha = .86; N = 1,637; +	A multidimensional religiosity measure including behavioral, cognitive, existential, spiritual, ritualistic and social components. The focus of this measure is on religious behavior. Behaviors include dimensions of prayer, meditation, scripture reading, formal worship, and experiences of God. Factor analysis suggested factors of God consciousness, formal religious practices, experiences of God and meditation.
Construct: ***Pretreatment AA attendance/involvement***	**Domain:** *Cultural*
AA Involvement Scale: Baseline (AAINVAS); Tonigan, Connors & Miller, 1996; Alpha = .85; N = 1,625; +	Affiliation defined and measured as a combination of meeting attendance and involvement factors. See discussion under methodology.
Construct: ***Social competency and comfort***	**Domain:** *Coping*
Alcohol Use Inventory: Role Maladaptation (ROLEMALA); Horn, Wanberg & Foster, 1987; Horn, Wanberg & Foster, 1986; Wanberg, Horn & Foster, 1977; Alpha = .66; N = 2,261; -	"Social role maladaptation. Drinking has resulted in loss of job, driving offenses, living alone, missing work, unemployment, much moving, the detention by authorities." (Horn, Wanberg & Foster, 1986, p. 7)
Drinker Inventory of Consequences: Recent Interpersonal Drinking Consequences (INTERCR).; Miller, Tonigan & Longabaugh, 1995; Alpha > .77; N = 1,389; -	"Interpersonal consequences focuses on the impact of drinking on the respondent's relationships. Adverse consequences here include damage to or the loss of a friendship or love relationship, impairment of parenting and harm to family, concern about drinking from family or friends, damage to reputation, and cruel or embarrassing actions while drinking." (Horn, Wanberg, & Foster, 1986, p. 10)

Table 11: Continued

Measure/Citation/Reliability/Direction[a]	Description
Psychosocial Functioning Inventory: Social Functioning (SOCFUNCS); Feragne, Longabaugh & Stevenson, 1983; Alpha > .70; N = 420; +	A composite social functioning measure, within roles of spouse or housemate, parent, and as a friend.
Construct: ***Stress level***	**Domain:** *Coping*
Alcohol Use Inventory: Guilt or Worry About Drinking (GUITLWOR); Horn, Wanberg & Foster, 1987; Horn, Wanberg & Foster, 1986; Wanberg, Horn & Foster, 1977; Alpha = .78; N = 2,261; +	"Guilt or worry associated with drinking. Concern that drinking is getting worse, occurring at unaccustomed times, provoking fear, creating depression; anxious about drinking bouts; avoid talking about drinking." (Horn, Wanberg & Foster, 1986, p. 7)
Drinker Inventory of Consequences: Lifetime Drinking Consequences Composite Score (DRCTOTL); Miller, Tonigan & Longabaugh, 1995; Alpha > .91; N = 1,389; +	Represents a composite measure of negative consequences attributable to drinking. Categories of negative consequences include physical, intrapersonal, interpersonal and accidents or impulsive actions.
Work or Job Status (Unemployed); Project MATCH demographics; N/A; employed categories status = - and unemployed status = +	A dichotomous dummy coded measure of work status where 1 = unemployed and 0 = part-time, temporary or permanent employment. This variable was recoded from the PM WORK variable, a categorical measure of work or job status including: full-time permanent, full-time temporary or irregular, part-time.,
Construct: ***AA coping resources perceived***	**Domain:** *Coping*
Marital Status (MARITALS); Project MATCH demographics; N/A; single statuses = + and married statuses = -	A categorical measure of marital status and significant other relations including: never married, married, separated, divorced, widowed and cohabitating.
Treatment Assignment (TSF, MET or CBT); Project MATCH treatment assignment.; N/A, TSF = +, CBT = -	Three dummy coded variables representing the PM treatment assignment to TSF, MET or CBT.
Work or Job Status (Unemployed); Project MATCH demographics; N/A; employed statuses = -, unemployed status = +	A dichotomous dummy coded measure of work status where 1 = unemployed and 0 = part-time, temporary or permanent employment. This variable was recoded from the PM WORK variable, a categorical measure of work or job status including: full-time permanent, full-time temporary or irregular, part-time.,

Table 11: Continued

Measure/Citation/Reliability/Direction[a]	Description
Treatment Site (SITE #); Project MATCH designation; N/A; inpatient sites = +, outpatient sites = -	Represents the 11 treatment "sites". The site designation represents both physical treatment location (from cities disbursed throughout the USA; N = 9) and the sampling source or "arm", i.e. from either inpatient aftercare or outpatient treatment populations. All sites assigned subjects to one of the three treatment conditions. One physical location selected subjects from both arms and another included two therapy teams in two separate physical locations. Two separate "sites" were added to define these anomalies.
Construct: ***AA benefits perceived***	**Domain:** *Cultural*
Age (AGE); Project MATCH demographics; N/A; older = +	An ordinal system of age in years including the following categories: 18 thru 24, 25 thru 29, 30 thru 34, 35 thru 39, 40 thru 44, 45 thru 49, 50 thru 54, 55 thru 59, 60 years and older.
Education in Years (EDYRS); Project MATCH demographics; N/A; more educated = +	An ordinal measure of education in years including: 8 or less years (grammar school); 9 to 11 years (some high school); 12 (high school); 13 to 15 (some college); 16 (college graduate); 17 or more (post graduate).
Gender (GENDER); Project MATCH demographics; N/A; male = +, female = 1	Gender dummy coded where male = 1.
Race (RACE); Project MATCH demographics; N/A; Caucasian = +, Minorities = -	A categorical measure of race including: White, African American, Hispanic and Other.
Treatment Assignment (TSF, MET or CBT); Project MATCH treatment assignment.; N/A; TSF = +	Three dummy coded variables representing the PM treatment assignment to TSF, MET or CBT.
Construct: ***Favorable drinking perception***	**Domain:** *Cultural*
Age (AGE); Project MATCH demographics; N/A; younger = +	An ordinal system of age in years including the following categories: 18 thru 24, 25 thru 29, 30 thru 34, 35 thru 39, 40 thru 44, 45 thru 49, 50 thru 54, 55 thru 59, 60 years and older.
Alcohol Use Inventory: Awareness of Drinking Problem (AWARENES); Horn, Wanberg & Foster, 1987; Horn, Wanberg & Foster, 1986; Wanberg, Horn & Foster, 1977; Not Reported; -	"Awareness of drinking problems. Believe drinking interferes with meeting responsibilities; unable to regulate times of drinking or amount drunk." (Horn, Wanberg & Foster, 1986, p. 7)

Table 11: Continued

Measure/Citation/Reliability/Direction[a]	Description
Alcohol Use Inventory: Guilt or Worry About Drinking (GUITLWOR); Horn, Wanberg & Foster, 1987; Horn, Wanberg & Foster, 1986; Wanberg, Horn & Foster, 1977; Alpha = .78; N = 2,261; -	"Guilt or worry associated with drinking. Concern that drinking is getting worse, occurring at unaccustomed times, provoking fear, creating depression; anxious about drinking bouts; avoid talking about drinking." (Horn, Wanberg & Foster, 1986, p. 7)
Alcohol Use Inventory: Readiness for Help (RECEPTIV); Horn, Wanberg & Foster, 1987; Horn, Wanberg & Foster, 1986; Wanberg, Horn & Foster, 1977; Not Reported; -	A measure constructed from selected questions of the AUI. Psychometrics not reported. "Readiness for help. Matters have come to crisis; need help; will do what counselor suggests; feel can stop." (Horn, Wanberg & Foster, 1986, p. 7)
Drinker Inventory of Consequences: Lifetime Drinking Consequences Composite Score (DRCTOTL); Miller, Tonigan & Longabaugh, 1995; Alpha > .91; N = 1,389; -	Represents a composite measure of negative consequences attributable to drinking. Categories of negative consequences include physical, intrapersonal, interpersonal and accidents or impulsive actions.

Note: [a]The direction of the relationship between a construct and the related variable is designated with a "+" indicating a positive relationship and a "-" designating a negative correlation.

2. Greater social competency and comfort AND less interpersonal coping resources outside AA

- Unemployed X Social Functioning
- Social Support of Friends X Social Functioning
- Social Support of Family X Social Functioning

3. Less interpersonal coping resources outside AA AND greater motivational measures

- Unemployed X Motivation
- Social Support of Family X Motivation
- Support of Friends X Motivation

4. More religiosity AND greater perception of drinking as a problem

- Religious Beliefs X Awareness of Problem

5. More religiosity AND greater negative feelings surrounding drinking

- Religious Beliefs X Guilt Worry

6. More religiosity AND less interpersonal coping resources outside AA

- Social Support Family X Religious Beliefs
- Social Support of Friends X Religious Beliefs
- Unemployed X Religious Beliefs

Data Analysis:

The primary objective of the research project was to develop an accurate classification model of the dichotomous measure of affiliation at 12 months post-treatment using PM pre-treatment data. Accuracy was quantified using kappa, sensitivity, and specificity. *Kappa* provides a chance-corrected measure of actual versus

predicted membership of subjects and is therefore a superior measure of classification accuracy compared to a simple proportion of correct classifications. Kappa is interpreted as a proportion above or below chance prediction, with "1" representing perfect agreement, "-1" representing perfect disagreement, and "0" representing observed agreement equal to chance agreement (Orme, 1986; Cohen & Cohen, 1983). The null hypothesis is $kappa \leq 0$, and the experimental hypothesis is $kappa > 0$.

In addition, given benefits previously described from correctly predicting disaffiliate class membership, sensitivity was used as a measure of classification accuracy. *Sensitivity* is the percentage of true positive classifications of disaffiliate class members (coded as "0") relative to the total number of disaffiliate class members. *Specificity* is the percentage of true negatives correctly classified. Specificity is calculated by dividing the total number of true moderate to high affiliates (coded as "1") classified correctly by the total number from this category.

This study also examines the independent effects of the constructs (Table 6) on affiliation. Since a significant relationship in either direction would be important, a two-tailed test were used. Measures defined in Table 11 represented hypothesized constructs, and the Chi-Square Wald statistic was used to test variables for significance. Hypotheses testing is not possible with ANNs, which are used for classification only. Given the dichotomous response variable and the prevalence of categorical explanatory variables, binary logistic regression (BLR) was suitable for examining the independent effects of variables and for creating predictive models. BLR is a method of predicting dichotomous response variables (Long, 1997; Johnson, 1998; Mitchell, 1994). Key assumptions

include a dichotomous dependent variable and independence of observations (Long, 1997). The BLR odds ratios provided a basis for interpretation of those variables that were found significant.

Finally, an additional method was selected to evaluate the ability to correctly classify affiliation above chance. The use of the second method provided a redundant test and comparison of classification accuracy. It was believed that more recent advances in computer classification methods, which automatically handle multiple interactions, would provide comparable or superior predictive accuracy within this study (Michie, Spielgelhalter & Taylor, 1994). These methods are described in greater detail in the text that follows.

Alternative Classification Algorithms

A controlled and extensive comparison of alternative classification methods was provided by the StatLog project (e.g. Michie, Spiegelhalter & Taylor; 1994; Gama & Brazdil, 1995; Brazdil, Gama & Henery, 1994). Using more than 20 large and diverse data sets, this project ran numerous and rigorous comparisons among 22 viable classification algorithms, including traditional statistical (e.g. discriminant analysis and logistic regression), artificial neural networks and other machine learning methods (e.g. decision trees classifiers) (Michie, Spiegelhalter & Taylor, 1994; Gama & Brazdil, 1995; Brazdil, Gama & Henery, 1994).

The StatLog researchers (e.g. Brazdil & Henery, 1994; StatLog Partners, 1994; Brazdil, Gama & Henery, 1994) analyzed the results of classification accuracy (defined as classification error) and endeavored to establish decision rules depicting the most

appropriate classification method for use, given conditions inherent in the data. In this regard, Brazdil, Gama and Henery (1994) concluded that (1) all methods worked well, (2) there was no best prediction or classification method, however, and (3) predictive accuracy of the different methods did vary between data sets. These authors were unable to define simple rules suggesting what methods to use under particular circumstances. Consequently, the authors advised using more than one classification method to verify classification results.

Michie, Spiegelhalter and Taylor, (1994) concluded from the StatLog research that as a class of algorithms, "neural networks perform very well...(and) seem to provide either the best or near to best predictive performance in nearly all cases" (p. 221). Other authors reviewed the same results (Brazdil & Henery, 1994) and noted that logistic regression performed in the top five methods in terms of accuracy. Among StatLog test results using data similar to the PM data (i.e. in terms of the number of response variable classification categories [2 or 3], the number of explanatory variables and the existence of multiple categorical variables), logistic regression and ANNs performed comparably (within 1% accuracy), and were among the best in terms of accuracy (StatLog Partners, 1994). Accordingly, both ANNs and BLR were viewed as good candidates for providing optimal classification accuracy within the proposed project and will provide a redundant measure of accuracy (Brazdil, Gama & Henery, 1994).

Artificial Neural Networks

ANNs are pattern recognition algorithms (e.g. Vicino, 1998; Collins & Clark, 1993; Bejou, Wray & Ingram, 1996) and have demonstrated comparable, and in some

cases superior predictive abilities, as compared to more traditional statistical methods, including logistic regression. ANNs generally are described (e.g. Vicino, 1998; Collins & Clark, 1993) as robust, nonparametric and flexible classification methods, relatively free of many constraints and assumptions associated with traditional regression methods. Vicino (1998) describes the greater flexibility of ANN models where use of product terms for interactions are optional and multicollinearity does not pose substantial problems in classification (tested by Bejou, Wray & Ingram, 1996). In addition, Bejou, Wray and Ingram (1996), and Collins and Clark (1993) suggest that preprocessing of nonlinear relations between explanatory and response variables (i.e. squaring variables for quadratic relations or cubing variables for cubic relations) is also optional with ANNs.

Authors (e.g. Rohwer, Wynne-Jones & Wysotzki, 1994; Collins & Clark, 1993) commonly describe analogous processes involved in brain functioning and ANNs, where both use heuristics derived and applied through processing inputs in parallel that suggest a nonlinear solution based upon weighting and summing of inputs. For sure, ANNs owe their development to some extent to studies of brain functioning, but a detailed discussion of parallels to brain functioning is considered unnecessary and beyond the scope of this introduction. For purposes of this review, ANNs are depicted as the unique parallel architecture that relies on interconnected and weighted nonlinear functions or "nodes," and can accommodate a variety of classification algorithms, which are described in greater detail in the discussion that follows (Galletly, Clark, McFarlane & Psychother, 1996). Among other applications, the ANN architecture has been successfully adapted to classification problems in a process culminating in "pattern recognition."

The task of the specific ANN algorithm is to optimize classification accuracy in "*pattern recognition*," which generally is defined as a process of discovery directed at defining meaningful relations between input (explanatory variables) and output (response variable) (Collins & Clark, 1993). The algorithms transform weights of nonlinear functions to fit patterns or features in the data, while at the same time minimize the tendency to "*over-train*" or learn too many patterns in the training data, thereby attenuating the ability to generalize to the other data (Galletly, Clark, McFarlane & Psychother, 1996).

In addition to over-training tendencies, other disadvantages exist. Perhaps the greatest drawback is the difficulty involved in interpreting results of ANN models (Vicino, 1998; SPSS, 1997a). There are no statistics describing significance or the relative strength or direction of the relationships, as in regression analysis. While ANN weights are provided to fully define the neural model, they are not readily interpretable (SPSS, 1997a). Accordingly, use of a more traditional regression method is appropriate where interpretation and integration of statistical results with theory is important (as in the present study).

Other caveats and assumptions also exist. Some (e.g. SPSS, 1997a; Faraggi & Simon, 1995) prescribe the creation of multiple models using multiple random starting points to improve the chance of finding the optimal solution, noting that ANN stopping algorithms may terminate model development with a sub-optimal solution. Despite discussions that suggest that ANNs are robust and free of traditional assumptions and constraints, authors (Collins & Clark, 1993; SPSS, 1997a) note that model performance may suffer in the face of non-normal explanatory variables and suggest (1) special coding

of categorical variables, (2) transformation of highly skewed variables, and (3) elimination or trimming of distributions containing clusters of outliers.

One of the oldest and most frequently used ANN methods, the forward back-propagation multi-layer perceptron model, is slow to develop (train), compared to some more recent ANN algorithms (e.g. radial basis function or Bayesian) that provide comparable classification accuracy (Rohwer, Wynne-Jones & Wysotzki, 1994). In addition, among the StatlLog findings, the radial basis function, which uses the same neural structure as the multi-layered perceptron (Rohwer, Wynne-Jones & Wysotzki, 1994), performed comparably to other ANN methods tested (StatLog Partners, 1994). While Rohwer, Wynne-Jones and Wysotzki (1994) note that a Bayesian ANN was not tested in the StatLog project, it is worthy of mention as it uses an error term that prevents over-training and creates superior model development speeds.

Neural Network Functioning

Neural networks considered for use in this study included the traditional multi-layer perceptron (MLP), the Bayesian neural network and the Radial Basis Function (RBF) neural network, all included in SPSS Neural Connections Version 2.0. Since Bayesian and RBF networks are variants of the MLP, the following describes functioning of the MLP. This discussion is followed by a description of differences in the RBF network, which was selected for use in the data analysis. The decision to use the RBF network was based upon the review of the StatLog literature, and results in two comparison tests briefly described in the results chapter.

Functions of the MLP neural network development can be summarized into (1) model training, learning or pattern detection using training data (minimization of training classification error through the "back-propagation" process); (2) model correction for over training using a "validation" algorithm; and (3) cross validation or "testing" using hold-out data (SPSS, 1997a, Rohwer, Wynne-Jones & Wysotzki, 1994). As implied, data are initially randomly assigned between training, validation (correct for over-training) and test (cross validation) data sets (SPSS, 1997a, 1997b).

The neural network architecture commonly is represented with "neural nodes," which represent simple processing elements that can consist of input signals, weights, a weight summation function, a non-linear function and an output signal or classification estimate (SPSS, 1997a; Rohwer, Wynne-Jones & Wysotzki, 1994). Figure 3 illustrates a simple neural network model consisting of three input nodes (representing three predictor variables and weights assigned), two nodes in the middle or "hidden layer" (representing non-linear functions and weights assigned), and one target or response variable node. Processing proceeds in parallel with predictor input data, which are read and processed concurrently, flowing from left to right in a process that is aptly referred to as "feed-forward" (Rohwer, Wynne-Jones & Wysotzki, 1994).

The present research project was concerned with developing a supervised classification model, i.e. one that learns patterns within training data from inputs (or predictor or explanatory variables) by comparison to a predefined categorical target variable, in this case disaffiliates versus moderate to high affiliate class membership. The MLP architecture uses a learning rule called the "Generalized Delta Rule," which allows "learning" or pattern detection through a programmed process described as "back-

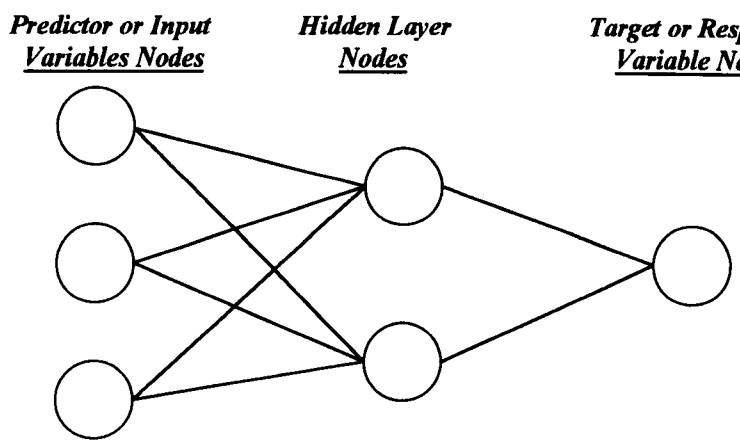


Figure 3: Typical Representation of an MLP Artificial Neural Network Model.

propagation" (SPSS, 1997a, Rohwer, Wynne-Jones & Wysotzki, 1994). Forward and back-propagation processes are characteristics of the MLP architecture created by this learning rule (SPSS, 1997a, Rohwer, Wynne-Jones & Wysotzki, 1994). The training process is described in the following excerpt from Patterson and Cloud (1998):

> To begin the training of the neural network, the linkages between nodes in the network initially are assigned random weights (Sarle, 1997; SPSS, 1997; Weiss & Kulikowshi, 1991). Networks are typically composed of input nodes, one for each independent or predictor variable, a hidden layer of nodes, and one or more output nodes. With each successive case presented to the model, the weights linking the nodes are recalculated and summed. Each node in the hidden layer uses a nonlinear function to convert the weighted sum of its inputs into an output signal. The output signals from the nodes in the hidden layer are again summed and nonlinearly transformed into the model's predicted output, which is then compared to the actual output. If the predicted output is within a pre-selected tolerance (or error) range, it is considered by the network as correct, and the pattern therefore learned. If the predicted output is outside of the tolerance range, it is then "back propagated." Back-propagation means that the linkage weights in the network are then re-calculated based on the error between the network's predicted output and the actual output (Sarle, 1997; SPSS, 1997a). In this process of self--modification, repeated training cycles are run until the error is reduced to a predetermined acceptable level. At this point the network is considered trained, in that it has learned the optimal pattern of association between the input data and output data (Collins & Clark, 1993). (p. 3)

Over-training (sometimes called over-specification or over-fitting) occurs when the ANN learns too many patterns and defines too much variation within training cases, rendering the model inept at generalizing to new data (SPSS, 1997a; Rohwer, Wynne-Jones & Wysotzki, 1994). To adjust for over-training, a small portion of the data is subjected to the validation procedure that adjusts and corrects model weights for over-fitting, with the goal of improving the models ability to generalize to the validation data set (Cross, Harrison & Kennedy, 1995). The validation method runs automatically during Neural Connection normal training.

Stopping conditions are included within each of the SPSS models. With MLP and RBF models the algorithms are programmed to stop when the change in error is less than -0.01% over 5 epochs (SPSS, 1997b). A number of adjustments can influence model performance within the MLP network, including (1) the number of hidden layers (either 1 or 2) and (2) the number of nodes in a hidden layer SPSS, 1997b). Finally, model performance can be enhanced through the addition or removal of predictor variables (Vicino, 1998). Unfortunately, there are no variable elimination methods included with the SPSS Neural Connection, and finding the best possible model involves iterative and ad hoc trials of alternative predictor variable sets.

The Radial Basis Function (RBF) ANN

The RBF was selected as the ANN for use in the data analysis, based upon relative performance within the StatLog project and results of two comparison tests (between the RBF, the MLP and a Bayesian network) described in the results section. This following section briefly describes the functioning of the RBF network.

The RBF is a supervised, feed-forward network with a single hidden layer, similar to the MLP, however, it creates a solution by defining radial clusters in the data (SPSS, 1997b). Unlike the MLP that uses an iterative training process, the RBF network trains in a single stage, which results in much faster training times (SPSS, 1997b; Rohwer, Wynne-Jones & Wysotzki, 1994). Rohwer, Wynne-Jones and Wysotzki, (1994, p. 93) describe the RBF network as "structured" much like the MLP, but relying on "defining the non-linear function of the distance of an input point from that center, using a variety of (basis) functions" (e.g. thin plate splines, Gaussians). These authors further describe the MLP and RBF models as "computationally equivalent". Similarly, SPSS (1997a) describes functioning of the RBF network:

> The RBF network is responsive to local regions in the input feature space. It operates by measuring the distance between the input vector and the center of each of its basis functions...Rather than constructing a decision surface in the input feature space as the MLP, individual clusters of data are encircled by a number of basis functions. If a data point falls within a region of activation, then the node corresponding to that basis function responds most strongly. (pp. 28-29).

SPSS (1997a) suggests that optimizing the RBF network involves adjusting the number of centers, varying the positioning of these centers and selecting the best radial function (spline, Gaussian, multi-quadratic or inverse quadratic) to correctly model the data. A hidden layer node exists for every center defined by the model. Similar to the MLP, having too many nodes (or centers) results in over-training and poor generalizability, whereas the presence of too few centers will result in poor classification accuracy (SPSS, 1997a, 1997b). An automatic validation algorithm is used to adjust for over-fitting (SPSS, 1997a, 1997b).

The positioning of centers is randomly assigned within SPSS using a random seed; this random seed starting point was varied and tested in five trials in the present study, consistent with the recommendation of SPSS (1997a, 1997b). Finding the optimum number of centers is automatic within Neural Connection, which by default increases the number of centers by five, from five and fifty. However, SPSS (1997a, 1997b) recommends experimenting with both the radial function used (spline, Gaussian, multi-quadratic or inverse quadratic) and the initial random starting point defining initial center position. Accordingly, these corrections and adjustments were tested by varying settings and observing results. The results of tests varying the random starting point, and the radial function are summarized in the results chapter.

Data Preparation, Testing and Analysis

As stated, redundant classification methods were used to satisfy the primary objective of this study, i.e. predicting affiliation with pretreatment data where predictive accuracy is quantified using kappa, sensitivity and specificity. It was believed that a model would be derived that would predict significantly above chance. Tests of classification accuracy will be based upon a random selection of 25% of the data records, representing a cross validation "*hold-out*" data set (Johnson, 1998; Henery, 1994). The same hold-out sample will be used to test both BLR and ANNs to allow comparison.

In addition to serving as a redundant method of prediction, ANNs were used to provide a distinct advantage over BLR. ANNs are capable of detecting and integrating the effects of interactions into the model without identifying or transforming the relevant explanatory variables into interaction product terms (Vicino, 1998). This was an

important advantage in the present study, given the interaction model previously posited, and the likelihood for unspecified interaction terms. Although ANNs have other benefits over more traditional regression methods, most notably, less need for data preprocessing (described below), they also have some disadvantages, including difficulty interpreting model results (atheoretical) and the lack of automated methods for variable selection or reduction (SPSS 1997a, 1997b).

In addition to the obvious advantage of comparing ANN performance to an established method such as BLR, several other advantages exist. Perhaps most notable, BLR and ANNs compliment many of the other's shortcomings including: (1) BLR provides a significance test of the independent effects of individual variables, whereas ANNs do not; (2) odds ratios included with BLR output facilitate interpretation of results and advancing theory, a major shortcoming of ANNs; (3) BLR includes variable selection methods (forward/backward) that are relatively well established in the literature, and appropriate in prediction studies (e.g. Cohen & Cohen, 1983; Johnson, 1998), yet a limitation in ANN research; (4) ANN accuracy could suggest the possibility of unspecified interactions within the BLR model, and (5) comparable accuracy between ANNs and BLR logically suggests attainment of optimal model specification.

Several tests and preprocessing procedures are proposed for the optimal performance of BLR (Norusis, 1994; Johnson, 1998; Long, 1997). While some of these tests and related data preparations are not required for ANNs (e.g. interaction product terms and multiple collinear conflicts), these and other transformations will not impede and should enhance ANN model development (SPSS, 1997a; StatLog Partners, 1994). These BLR tests and related data conversions involve (1) creating interaction terms, (2)

replacing missing data, (3) coding of categorical variables, (4) testing and investigating influential outliers using Cookes Distance and/or plots, and (5) testing for and eliminating multiple collinear variables (Norusis, 1994; Long, 1997; Johnson, 1998).

Variable Selection

Regression authors (e.g. Johnson, 1998; Cohen & Cohen, 1983; Darlington, 1990; Pedhazer, 1997; Fox, 1997) commonly describe the advantages and suitability of variable selection (also referred to as variable reduction or elimination) methods in prediction problems. These methods reduce the number of predictor variables while providing comparable accuracy. Use of fewer variables provides a practical advantage, improving model utility, and thereby increasing the likelihood of future model utilization. More specifically, the less data that must be accumulated and entered into a prediction model, the less costly to maintain and use such a model. Given the large number of predictor variables included in the present study ($n = 57$), parsimony is a relevant and practical issue that can contribute to greater utilization of affiliation models in both clinical settings and future research.

A review of statistical literature on prediction model specification found that all authors discussed variable selection methods and acknowledged suitability of their use in prediction research (e.g. Johnson, 1998; Cohen & Cohen, 1983; Darlington, 1990; Pedhazer, 1997; Fox, 1997). Variable selection methods commonly discussed included step-wise, forward elimination, backward elimination and all possible subsets methods. Not all authors recommended a specific variable elimination method, and among those who did (e.g. Darlington, 1990; Johnson, 1998; Fox 1997), there was complete

disagreement on the best method. However, all authors did agree that all variable selection methods result in different solutions, and that none of the methods guarantee an optimum solution. Norusis (1994) recommended that alternative variable selection models be used to arrive at the best solution. This suggestion included use of both backward and forward selection methods included in SPSS version 9.0. This is the approach adopted for use in this project.

Consistent with the Norusis (1994) suggestion, all forward and backward selection methods included in SPSS Version 9.0 were used in this study, including conditional, likelihood ratio (LR), and Wald methods. All three of the forward methods resulted in the exact same set of variables, as did all three of the backward methods in the current study. Results of these two variable sets are reported in the results chapter.

Unfortunately, no variable elimination methods are included in SPSS Neural Connection 2.0, and there is no mention of automated variable selection methods in the ANN literature reviewed. This is an apparent limitation of ANNs, compared to traditional statistical methods. However, ANNs should provide comparable accuracy on the predictor variable sets suggested by BLR forward and backward selection methods. It was reasoned that the same relationships found by BLR variable selection models should be detectable by pattern recognition abilities inherent in the ANN. It was conceded, however, that since the BLR method is used in variable selection, ANNs could be at somewhat of a disadvantage in competing with BLR using these variable sets, and a somewhat less accurate ANN model might be expected.

A random sample was drawn ($N = 377$, 25%) from the total PM data set ($N =$ 1,506) and used for a "hold-out cross validation" test data set. The remaining cases ($N =$

1,129, 75%) were used to train or develop all BLR and ANN models for testing. The same training and testing data sample or data allocation was used in all BLR and ANN trials. Keeping training data separate from the hold-out testing data improves test validity. In addition, the use of the same training and testing data in all models allowed a valid comparison between BLR and ANN on classification accuracy.

CHAPTER IV: RESULTS

The results are organized as follows: (1) general demographic data on all samples used in the data analyses, (2) data testing and preparation, (3) results of tests of individual variables using BLR, and (4) prediction trials using both BLR and ANNs. Each section concludes with a brief summary of results.

Samples

Table 12 includes a compilation of demographic characteristics of all of the Project MATCH data plus samples used in this analyses. While the Project MATCH sample totaled 1,726, a subset consisting of all subjects completing the 12 month follow-up AAI (N = 1,506) was used in this analysis. As previously described, the AAI response variable was cut at the median to create a dichotomous affiliation measure, where "disaffiliated subjects" (N = 761) total 50.5% of the subjects, compared to the "moderate to high affiliates" consisting of 49.5% (N = 745). In addition to the analysis of the complete set of those completing the 12 month AAI follow-up instrument, Table 12 describes the 25% cross validation hold-out data sample (N = 377) that was used to develop and test prediction accuracy as reported in the final section of these results.

Data Preparation and Testing

Constructs hypothesized to predict affiliation were derived from the literature review, along with a model that suggested interactions among the domains of motivation, coping and culture. Then Project MATCH variables were compiled and matched to hypothesized constructs as described in the methodology section (see Table 11).

Table 12: Sample Demographics

	PM Total (N = 1,726)	*AAI "Completers" (N = 1,506)*	*Hold-Out Sample (N = 377)*
AAI Affiliation Categories[a]:			
Disafilliates	44%	51%	50%
Moderate to High Affiliates	43%	49%	50%
Male	76%	76%	76%
Treatment Arm:			
Outpatient	55%	55%	55%
Aftercare	45%	45%	45%
Treatment Condition:			
CBT	33%	33%	37%
MET	33%	33%	28%
TSF	34%	34%	35%
Median Age Category	35-39	35-39	35-39
Median Education Category in Years	13	13	13
Race:			
White	80%	80%	77%
Black	10%	10%	11%
Hispanic	8%	8%	11%
Other	2%	2%	2%
Employed	78%	79%	78%
Relationship Status: Couple	41%	41%	38%
Current no. of alcohol dependence symptoms - mean	6.2	6.2	6.4
SD	2.0	2.0	1.8

Note: All percentages represent the quantity observed divided by the column total "*N*". [a]The "total" column does not add to 100% due to AAI missing data (*N* = 220, 13%).

Constructs advanced in the hypotheses are represented by a total of 38 measures and 57 total variables, when dummy or effects coded categorical variables are counted separately. Data testing and preparation of data are described in the following discussion.

A review was performed for missing data. Two workplace instruments (YWFAC2 and YWFAC3) were administered only to individuals who were employed, which created conditionally missing values in both variables exceeding 300. This was remedied by (1) including a dichotomous variable in the BLR analysis where "1" was dummy coded to represent unemployed and "0" represented employed, and (2) substituting means for missing workplace values (Cohen & Cohen, 1983; Orme & Reis, 1991). Other missing values included 12 variables missing less than 1%; 18 variables missing between 1% to 5%; and 4 variables missing greater than 5% but less than 10% of total. Since these missing values were all less than 10% of total, they were replaced using mean substitution (Cohen & Cohen, 1983). Categorical variables were first dummy or effects coded and the missing values within the resulting recoded variables were replaced with means.

Following is a compilation of other tests and preprocessing of data:

1. Variable Distributions: Each variable was reviewed for unusual or problematic distributions with descriptive statistics, frequency distributions and plots. The results of this review did not suggest any major problematic distributions.

2. Categorical variables: Gender (male = 1, female = 0) and employment status (unemployed = 1, employed = 0) were dummy coded. All other categorical variables including marital status, race, treatment assignment and treatment site were effects coded.

3. Multicollinearity: Tolerance was calculated and reviewed on all variables prior to running BLR. Tolerance exceeded .20 in all cases.

4. Outliers: Cooke's Distance was calculated and all values were less than .6, suggesting that there were no influential outliers.

5. Interaction product terms were created to represent the selected interactions.

Tests of Individual Variables Using BLR

Table 13 includes the result of BLR. Results of BLR tests of individual variables are evaluated based upon the two-tailed, .05 significance level, since significant findings in either direction would be important. For purposes of testing the hypotheses, the entire data set of 12 month follow-up AAI "completers" were used ($N = 1{,}506$). Variables were entered into the model in "blocks" with demographic variables entered first, followed by the treatment related variables, the treatment and site interactions, the remaining hypothesized measures, and finally, the interaction product terms.

Three of the five blocks of variables were significant at $p < .05$ including demographic variables, treatment variables and the main effect variables. Treatment by site interactions (block #3) and other hypothesized interactions (block #5) were not significant. In total, the model was able to predict correctly 72.4% (*kappa* = .44, *95% CI* = .40 to .49, $t = 17.21$, $p < .001$) of the 1,506 cases using the "leave-one-out" cross validation method included as the default with SPSS Version 9.0 (SPSS, 1999).

Surprisingly few of the measures of interest were significant at .05. Many of those that were significant represented treatment, site or sampling arm (aftercare or

Table 13: Results of Tests of Individual Variables Using BLR

Measure	*B*	*S.E.*	*Wald*	*Df*	*Sig*	*R*	*Odds Ratio*
Age	0.091	0.028	10.388	1	0.001	0.063	1.095
Education in Years	-0.025	0.029	0.736	1	0.391	0.000	0.976
Gender - Male	0.060	0.123	0.234	1	0.629	0.000	1.061
Marital Status (Effects Coded) - Never Married	-0.187	0.126	2.203	1	0.138	-0.010	0.829
Marital Status (Effects Coded) - Married	-0.100	0.108	0.853	1	0.356	0.000	0.905
Marital Status (Effects Coded) - Separated	0.630	0.176	12.767	1	0.000	0.072	1.877
Marital Status (Effects Coded) - Divorced	0.230	0.116	3.904	1	0.048	0.030	1.258
Marital Status (Effects Coded) - Cohabiting	-0.267	0.178	2.266	1	0.132	-0.011	0.766
Marital Status (Effects Coded) - Widowed	-0.304	0.294	1.072	1	0.301	0.000	0.738
Race (Effects Coded) - White	0.000	0.131	0.000	1	0.999	0.000	1.000
Race (Effects Coded) - African American	-0.199	0.172	1.340	1	0.247	0.000	0.820
Race (Effects Coded) - Hispanic	-0.285	0.181	2.496	1	0.114	-0.015	0.752
Race (Effects Coded) - Other	0.480	0.322	2.218	1	0.136	0.010	1.162
DEMOGRAPHIC BLOCK: Chi-Square = 45.57, df = 11, p < .001							
Treatment Assignment (Effects Coded) - MET	-0.111	0.078	2.028	1	0.155	-0.004	0.895
Treatment Assignment (Effects Coded) - CBT	-0.354	0.078	20.536	1	0.000	-0.095	0.702
Treatment Assignment (Effects Coded) - TSF	0.4621	0.078	35.435	1	0.000	0.128	1.587
Site 0 (Effects Coded): Outpatient ARM	-0.284	0.182	2.436	1	0.119	-0.015	0.753
Site 1 (Effects Coded): Outpatient ARM	-0.720	0.163	19.439	1	0.000	-0.092	0.487
Site 2 (Effects Coded): Outpatient ARM	-0.514	0.161	10.226	1	0.001	-0.064	0.598
Site 4 (Effects Coded): Outpatient ARM	-0.119	0.176	0.458	1	0.499	0.000	0.888
Site 5 (Effects Coded): Outpatient ARM	-0.516	0.165	9.728	1	0.002	-0.062	0.597
Site 3 (Effects Coded): Aftercare ARM	0.132	0.225	0.343	1	0.558	0.000	1.141
Site 6 (Effects Coded): Aftercare ARM	1.075	0.223	23.240	1	0.000	0.102	2.930
Site 7 (Effects Coded): Aftercare ARM	0.435	0.163	7.129	1	0.008	0.050	1.545
Site 8 (Effects Coded): Aftercare ARM	0.646	0.181	12.778	1	0.000	0.073	1.907
Site 9 (Effects Coded): Aftercare ARM	-0.349	0.267	1.705	1	0.192	0.000	0.706
Site 10 (Effects Coded): Aftercare ARM	0.211	0.168	1.579	1	0.209	0.000	1.235
TREATMENT BLOCK: Chi-Square = 119.32, df = 12, p < .001							

Table 13: Continued

Measure	*B*	*S.E.*	*Wald*	*Df*	*Sig*	*R*	*Odds Ratio*
MET X Site 0	0.058	0.211	0.075	1	0.784	0.000	1.060
MET X Site 1	0.100	0.228	0.194	1	0.660	0.000	1.105
MET X Site 2	-0.049	0.236	0.044	1	0.835	0.000	0.952
MET X Site 3	-0.314	0.331	0.898	1	0.343	0.000	0.731
MET X Site 4	-0.021	0.255	0.007	1	0.935	0.000	0.980
MET X Site 5	-0.082	0.236	0.120	1	0.729	0.000	0.922
MET X Site 6	-0.202	0.303	0.447	1	0.504	0.000	0.817
MET X Site 7	-0.340	0.225	2.300	1	0.129	-0.013	0.712
MET X Site 8	0.036	0.247	0.021	1	0.885	0.000	1.036
MET X Site 9	1.014	0.403	6.320	1	0.012	0.047	2.757
MET X Site 10	-0.198	0.231	0.730	1	0.393	0.000	0.821
TSF X Site 1	-0.082	0.226	0.132	1	0.716	0.000	0.921
TSF X Site 2	0.149	0.216	0.476	1	0.490	0.000	1.161
TSF X Site 3	0.550	0.333	2.732	1	0.098	0.020	1.734
TSF X Site 4	0.031	0.245	0.016	1	0.899	0.000	1.032
TSF X Site 5	-0.168	0.219	0.589	1	0.443	0.000	0.846
TSF X Site 6	0.004	0.349	0.000	1	0.992	0.000	1.004
TSF X Site 7	0.128	0.238	0.291	1	0.589	0.000	1.137
TSF X Site 8	-0.243	0.248	0.965	1	0.326	0.000	0.784
TSF X Site 9	-0.577	0.376	2.357	1	0.125	-0.014	0.562
TSF X Site 10	-0.109	0.256	0.181	1	0.671	0.000	0.897
CBT X Site 0	-0.372	0.229	2.643	1	0.104	-0.018	0.689
CBT X Site 1	-0.015	0.237	0.004	1	0.948	0.000	0.985
CBT X Site 2	-0.098	0.244	0.160	1	0.689	0.000	0.907
CBT X Site 3	-0.235	0.331	0.503	1	0.478	0.000	0.791
CBT X Site 4	-0.030	0.245	0.015	1	0.902	0.000	0.970
CBT X Site 5	0.252	0.234	1.155	1	0.283	0.000	1.286
CBT X Site 6	0.201	0.314	0.411	1	0.522	0.000	1.223
CBT X Site 7	0.214	0.224	0.911	1	0.340	0.000	1.238
CBT X Site 8	0.209	0.244	0.731	1	0.392	0.000	1.232
CBT X Site 9	-0.434	0.397	1.200	1	0.273	0.000	0.648
TREATMENT INTERACTION: Chi-Square = 18.77, df = 20, p = .54							

Table 13: Continued

Measure	*B*	*S.E.*	*Wald*	*Df*	*Sig*	*R*	*Odds Ratio*
AA Involvement Scale: Baseline	0.333	0.036	88.024	1	0.000	0.213	1.395
Ethanol Dependence Scale: Alcohol Dependence Severity	-0.004	0.009	0.155	1	0.693	0.000	0.996
Stages of Change Readiness and Treatment Eagerness Scale: Ambivalence Surrounding Change	0.023	0.017	1.738	1	0.187	0.000	1.023
Addiction Severity Index: Psychiatric Severity	-0.279	0.349	0.639	1	0.424	0.000	0.757
Interpersonal Dependency Inventory: Assertion of Autonomy	0.004	0.010	0.202	1	0.653	0.000	1.004
Alcohol Use Inventory: Awareness of Drinking Problem	-0.034	0.028	1.395	1	0.238	0.000	0.967
Alcohol Use Inventory: Uncontrolled Life Disruption	0.015	0.036	0.171	1	0.679	0.000	1.015
Drinker Inventory of Consequences: Lifetime Drinking Consequences Composite Score	0.020	0.013	2.361	1	0.124	0.014	1.021
Alcohol Use Inventory: Guilt or Worry About Drinking	0.121	0.041	8.640	1	0.003	0.059	1.128
Alcohol Use Inventory: Prior Attempts to Deal with Drinking	0.023	0.041	0.298	1	0.585	0.000	1.023
Drinker Inventory of Consequences: Recent Interpersonal Drinking Consequences, Recent	0.010	0.014	0.452	1	0.501	0.000	1.010
Alcohol Use Inventory: Loss of Control over Drinking	-0.031	0.024	1.717	1	0.190	0.000	0.969
Alcohol Use Inventory: Drink to Manage Mood	-0.049	0.038	1.683	1	0.195	0.000	0.952
University of Rhode Island Change Assessment: Motivation	0.067	0.044	2.302	1	0.129	0.013	1.069
Religious Background and Beliefs Scale	0.014	0.006	5.130	1	0.024	0.041	1.014
Alcohol Use Inventory: Readiness for Help	0.018	0.029	0.372	1	0.542	0.000	1.018
Alcohol Use Inventory: Role Maladaptation	-0.029	0.031	0.866	1	0.352	0.000	0.972
Structured Clinical Interview of the DSM-III-R: Alcohol Dependence Symptoms Current	-0.006	0.052	0.013	1	0.910	0.000	0.994
Structured Clinical Interview of the DSM-III-R: Alcohol Dependence Symptoms Worst	0.077	0.049	2.428	1	0.119	0.015	1.080
Alcohol Abstinence Self-efficacy Scale: Temptation Minus Confidence	0.019	0.049	0.158	1	0.691	0.000	1.020

Table 13: Continued

Measure	*B*	*S.E.*	*Wald*	*Df*	*Sig*	*R*	*Odds Ratio*
Psychosocial Functioning Inventory: Social Functioning	0.782	0.663	1.392	1	0.238	0.000	2.185
Stages of Change Readiness and Treatment Eagerness Scale : Self-report to, "I am an alcoholic" (single question)	0.208	0.122	2.937	1	0.087	0.022	1.231
Stages of Change Readiness and Treatment Eagerness Scale: Readiness for Change	-0.012	0.026	0.202	1	0.654	0.000	0.988
Important People and Activities: Social Support for Drinking	-0.268	0.142	3.536	1	0.060	-0.028	0.765
Social Support Questionnaire: Family	-0.035	0.029	1.464	1	0.226	0.000	0.966
Social Support Questionnaire:- Friends	-0.031	0.029	1.123	1	0.289	0.000	0.970
Your Work Place: Support for Consumption at Work	0.016	0.010	2.937	1	0.087	0.022	1.016
Your Work Place: Support for Abstinence at Work	-0.013	0.019	0.468	1	0.494	0.000	0.987
Employment Status (Unemployed)	0.289	0.171	2.856	1	0.091	0.021	1.335
HYPOTHESIZED MEASURES BLOCK: Chi-Square = 276.25, df = 29, p <.001							
Support of Family X Religious Beliefs	0.002	0.003	0.958	1	0.328	0.000	1.002
Support of Family X Social Functioning	0.147	0.163	0.813	1	0.367	0.000	1.158
Support of Family X Motivation	0.006	0.017	0.123	1	0.726	0.000	1.006
Support of Friends X Religious Beliefs	-0.002	0.003	0.502	1	0.479	0.000	0.998
Support of Friends X Social Functioning	0.077	0.166	0.217	1	0.642	0.000	1.080
Support of Friends X Motivation	0.012	0.018	0.431	1	0.512	0.000	1.012
Religious Beliefs X Awareness of Problem	-0.001	0.002	0.371	1	0.543	0.000	0.999
Religious Beliefs X Guilt Worry	0.001	0.003	0.032	1	0.858	0.000	1.001
Social Functioning X Motivation	-0.297	0.227	1.709	1	0.191	0.000	0.743
Unemployed X Religious Beliefs	-0.005	0.015	0.105	1	0.746	0.000	0.995
Unemployed X Social Functioning	0.363	0.915	0.158	1	0.691	0.000	1.438
Unemployed X Motivation	-0.095	0.093	1.031	1	0.310	0.000	0.910
***INTERACTION* TEST BLOCK: Chi-Square = 6.67, df = 12, p = .87**							

outpatient) variables that were used for control. Treatment assignment effects coding for CBT (*odds ratio* = .70, 95% *CI* = .60 to .81, $p = < .001$), and TSF (*odds ratio* = 1.59, 95% *CI* = 1.36 to 1.85, $p < .001$) suggest that those receiving TSF treatment were 1.59 times more likely to be among the moderate to high affiliate group than the disaffiliate group, and that those treated under the CBT condition were 1.43 more likely to be in the disaffiliate group than the moderate to high affiliate group. This of course suggests that treatment condition plays a major role in influencing affiliative outcome, which was not hypothesized or suggested by the literature review. In addition, effects codings for outpatient selection sites 1, 2, 5, and aftercare sites 6, 7, 8 suggested that those selected from outpatient treatment at 3 of the 5 sites were less likely to affiliate than average, while aftercare patients at 3 of the 6 sites were more likely to affiliate than average. This latter finding contradicts prior findings indicating that outpatients were more likely, or at least more consistently likely, to affiliate with AA.

Other demographic findings that were significant included age, where a one category increase raised the chance of membership in the moderate to high affiliate group (*odds ratio* = 1.10, 95% *CI* = 1.04 to 1.16, $p = .001$). In addition, effects coding for marital status, including those who were separated (*odds ratio* = 1.88, 95% *CI* = 1.33 to 2.65, $p < .001$) and divorced (*odds ratio* = 1.26, 95% *CI* = 1.00 to 1.58, $p = .048$), were somewhat more likely to affiliate on average.

Only three of the hypothesized predictive measures included in the last block were found significant. Most notable among these three measures, results of the pretreatment AAI scale suggest that a 1 point increase in score was associated with a 1.4 (95% *CI* = 1.3 to 1.5, $p < .001$) greater chance of membership in the moderate to high

affiliates category than the disaffiliate group. The pretreatment AAI relationship was the most highly predictive among all variables included in the model. In addition, the guilt and worry measure suggested that those with a one point greater score on that measure are 1.13 (95% *CI* = 1.04 to 1.22, $p = .003$) times more likely to belong to the moderate to high affiliation group than the disaffiliate group, and similarly those with a 1 point greater score on the religiosity measure (odds ratio = 1.01, 95% CI = 1.00 to 1.03, $p = .024$) are slightly more likely to affiliate.

Summary of Tests of Individual Variables

Few of the hypothesized relationships were corroborated by the BLR tests of individual variables. Variables that were associated with greater affiliation included (1) pretreatment AA involvement, (2) acceptance of religiosity, and (3) negative feelings surrounding drinking, (4) age (older), and (5) divorced or separated marital status. Finally, the hypothesized interactions failed to corroborate the interactions from the model presented in the literature review.

Treatment related variables, including sampling arm (aftercare or outpatient), treatment assignment and site, appear to predict greater affiliation, with aftercare treatment subjects much more likely to affiliate then outpatient subjects. As previously stated, differences also existed by site, which would seemingly be mostly explained by the variation of sampling arm between sites. In addition, and as might be expected, many more of the TSF subjects were among the moderate to high affiliates, whereas the CBT treatment group predicted disaffiliation. These differences appear to suggest that treatment experience influences long-term affiliation. These results generally suggest

that both treatment providers and personal characteristics (e.g. pretreatment AAI, religiosity, guilt worry) may combine to predict long-term affiliation.

Classification Accuracy

The results of trials aimed at classification using both BLR and ANNs are presented in this section. A total of four predictor variables sets are evaluated for predictive accuracy using both BLR and ANNs. Results include the full a priori variable set along with results of BLR forward and backward variable selection methods and the pretreatment AAI variable. Accuracy was measured in terms of kappa, sensitivity and specificity, however, the 95% confidence intervals for kappa were used to evaluate predictive accuracy of BLR compared to ANN reults.

The pretreatment AAI was included as a predictor variable, given its relative strength in the tests of individual variables results and the fact that pretreatment instruments are commonly found to be highly predictive of the identical instrument administered as a follow-up measure. In addition, and similar to R^2_{change} analysis used in multiple regression, the extent to which other predictor variable results exceed the pretreatment AAI variable result, provides a measure of affiliation explained by inclusion of additional predictor variables.

While specificity is reported, sensitivity is emphasized in the discussion because correctly classifying those in the disaffiliate category was thought to be more valuable for practice considerations, compared to correctly predicting moderate to high affiliation group membership. These dynamics have been described in prior chapters and will be more fully explicated in the discussion chapter. Sensitivity was previously defined as the

percentage of true disaffiliate group members (coded as a "0") accurately classified by the model. Conversely, specificity was defined in terms of the percentage of true negatives, or correct classifications of moderate to high affiliate group membership (coded as "1").

Use of a hold-out sample was previously explained in the methods chapter. A random sample of 25% ($N_{hold\text{-}out\ test}$ = 377) of the data was drawn to create an identical cross validation hold-out data set for use in all trials. In addition, all models in these trials were trained or developed using the remaining 75% ($N_{training}$ = 1,129) of the cases, and models created were cross-validated with the test data (see Table 12 for comparative demographics of PM samples). Furthermore, for ANNs a portion of the training data set was allocated to validation as described previously in the methods chapter. Of the 1,129 cases allocated for training in this study, 847 cases were assigned to training, while 282 cases were used for model validation.

Minor differences in the data preparation were required between BLR and ANN methods. Previously hypothesized interactions were <u>not</u> found significant as a block in the prior BLR analysis and were therefore excluded completely in these tests. However, effects coded categorical variables with over two parameters (e.g. marital and work status, site and treatment assignment) were *"1-of-N coded"* for ANN analysis (SPSS, 1997a). As with dummy coding, 1-of-N coding results in every category being represented by a "1" when the attribute is present or "0" when it is not. Unlike dummy coding, all categories are represented. As previously reported, these categorical variables were effects coded for BLR.

Selection of the ANN Algorithm

Radial basis function (RBF), Bayesian and multi-layer perceptrons (MLP) ANN methods are included in SPSS Neural Connection Version 2.0 and were evaluated for use based upon previous research and a test of accuracy. As previously described in the methods chapter, the RBF ANN performed well among all methods and superior to the MLP method in the rigorous testing conducted in the StatLog project. The Bayesian model was considered but not tested in this project. In a comparison test of classification accuracy among ANN algorithms conducted using the full a priori predictor variable set, the RBF network provided slightly superior results (total correct classifications = 71%) compared to a Bayesian network method (total correct classifications = 70%) and the more traditional MLP (total correct classifications = 70%).

Speed of training was a secondary consideration. Here the RBF algorithm ran appreciably faster on tests involving all predictor variables. Considering all of the above, a decision was made to use the RBF ANN method. Therefore, references and generic use of the term ANN, hereafter refer to the RBF ANN method included with SPSS Neural Connection 2.0.

Other tests were conducted to optimize the results of the RBF models. Using all predictor variables, the RBF random seed influencing initial positioning of centers was assigned based upon a test using six random seed starting points (SPSS 1997a). The best random seed was then maintained throughout all further trials. In addition to varying the initial positioning of centers, attempts to optimize RBF results included varying all significant SPSS settings, more specifically layer distance method (Euclidian default),

radial function method (spline default) and number of centers used in each model training trial (varied between 5 to 50 in increments of 5). In all cases, the default settings resulted in the most accurate model and were therefore maintained.

Review of Classification Accuracy Results

Table 14 presents results of BLR and the RBF ANN trials across the four predictor variable sets. Although subsets of the full a priori variable set are evaluated in the following discussion. In general, a moderate level of predictive accuracy was achieved with both BLR and ANNs in all tests, as measured by kappa. Furthermore, none of the variable sets or methods were significantly better or worse than others given kappa 95% confidence intervals (standard error X 1.96 ∓ kappa) that overlap in all predictor variable tests and across both methods.

Results of Kappa

These results suggest that the null hypothesis can be rejected (H_{null}: $kappa \leq 0$) and that AA disaffiliation can be moderately predicted at approximately 42% above chance. In addition, ANN and BLR methods provided comparable results with the a priori variable test ($kappa_{ANN} = .43$, $95\%\ CI = .34$ to $.52$, $p < .001$; $kappa_{BLR} = .42$, $95\%\ CI = .33$ to $.51$, $p < .001$). Furthermore, analysis of confidence intervals suggests that there is no significant difference in the predictive accuracy attributable to alternative methods (BLR or ANN) or alternative predictor variable sets (variable selection).

Regarding more parsimonious variable selection methods, the BLR backward variable set ($kappa_{BLR} = .42$, $p < .001$; $kappa_{ANN} = .40$, $p < .001$) was comparable to the

Table 14: Results of Classification Trials

SAMPLE #1 TRIALS:	*Binary Logistic Regression*			*RBF Artificial Neural Networks**		
Predictor Variable Sets[b]	*Kappa*[a] */ # Corr*	*SE / Sens*	*t / Spec*	*Kappa*[a] */ # Corr*	*SE / Sens*	*t / Spec*
All a priori variables from original model (other than interaction terms)	0.422 268	0.047 70.0%	8.193 72.2%	0.427 269	0.047 74.2%	8.298 68.4%
BLR Forward Elimination: AAINVA, RBBTOT, INTERCR, SOCQ18, MET, CBT, TSF, SITE 1, SITE 6*	0.390 262	0.047 70.0%	7.570 69.0%	0.390 262	0.047 70.0%	7.570 69.0%
BLR Backward Elimination: AAINVA, RBBTOT, GUILTWO, YWFAC2, SOCQ18, MET, CBT, TSF, SITE 1, SITE 3, SITE 6*	0.416 267	0.047 70.5%	8.087 71.1%	0.401 264	0.047 68.9%	7.781 71.1%
Pretreatment AAI only: AAINVA	0.368 258	0.048 71.6%	7.165 65.2%	0.379 260	0.048 73.2%	7.380 64.7%

Notes: [a]All kappas were significant at $p < .001$. [b]See Table 11 for a key to variable codes. *These BLR categorical "sites" are effects coded to include site 10. *# Corr* = total number of true positives for both groups. *Sens* = sensitivity calculated for the disaffiliate category by dividing the total number of disaffiliate group members predicted correctly by 190 (the total number of disaffiliate group members). *Spec* = specificity calculated for the disaffiliate category by dividing the number of the moderate to high group members correctly classified by 187 (the total number of group members).

forward selection set ($kappa_{BLR} = .39, , p < .001$; $kappa_{ANN} = .39, p < .001$). In terms of parsimony, backward selection ($N_{variables} = 11$) required three more variables than forward selection ($N_{variables} = 9$).

The pretreatment AAI was evaluated as a predictor variable. As with other variable sets, results for the pretreatment AAI variable are statistically equivalent for both BLR and ANN methods. While the overall accuracy ($kappa_{BLR} = .37, p < .001$; $kappa_{ANN} = .38, p < .001$) was lowest among all variable sets, results of parsimony (1 variable) and sensitivity ($sensitivity_{BLR} = 72\%$, $sensivitity_{ANN} = 73\%$) were impressive. The AAI variable set sensitivity was top among the BLR results and second best among ANN outcomes.

As stated above, adding additional predictor variables to the pretreatment AAI improved prediction accuracy by a surprisingly small proportion. The extent to which additional variables improved the results of kappa may provide a measure similar to R^2_{change} in multiple regression. In this regard, results of adding all other a priori variables only improved the percentage of prediction above chance (as measured by kappa) by 5.4% in BLR testing and 4.8% above chance in ANN trials.

Results of Sensitivity and Specificity

As with results of kappa, both sensitivity ($Range_{sensitivity} = 69\%$ to 74%) and specificity ($Range_{specificity} = 65\%$ to 72%) varied little across methods and variable sets. Some models provided slightly superior results on sensitivity (e.g. the ANN model using the a priori variable set = 74%) and specificity (e.g. the BLR model using the a priori

variable sets = 72%). Overall, differences among models are neither remarkable nor significant.

It is interesting to note, however, that 7 of the 8 models were somewhat more accurate at predicting true positive disaffiliate group membership (sensitivity) compared to predicting moderate to high group membership (specificity). In addition, and as previously stated, models using the AAI pretreatment variable provided impressive results of sensitivity ($sensitivity_{BLR}$ = 72%, $sensivitity_{ANN}$ = 73%) compared to other models including several variables, this while maintaining remarkable parsimony (a single variable).

Summary of Significant Classification Results

As previously stated, the primary purpose of this study was to predict post-treatment AA affiliation among individuals treated for alcohol disorders using pretreatment data. In this regard, these results suggest that it is possible to reject the null hypothesis regarding the ability to predict AA affiliation above chance. These results suggest that affiliation can be predicted at approximately 40% above chance (kappa), and that disaffiliates can be correctly predicted approximately 70% of the time (sensitivity).

Other objectives involved comparison of BLR and ANNs, and assessment of utility, if any, derived from the use of redundant classification methods. Both methods provided comparable classification results. It was posited that ANNs would be able to provide superior results given influential interactions that need not be defined with product terms. However, results of tests of individual variables suggested that there may not be significant interactions among a priori predictor variables. Comparable

classification accuracy between BLR and ANN results provides additional evidence that there were no significant interactions among the a priori variables. However, in the absence of known influential interactions, it is impossible to conclude whether unspecified and influential interactions existed. Consequently, it is impossible to determine from results of this study whether ANNs are better equipped to deal with unspecified interactions.

CHAPTER V: DISCUSSION

Major Study Findings

The following section first discusses major findings beginning with variables found significant in tests of individual variables, then generally describes the results of trials to develop a predictive classification model. In general, this study found some factors significantly related to affiliation, and was moderately successful at predicting one year post-treatment affiliation based on information available at pretreatment. This section is followed by a discussion of implications for practice, unexpected findings and study limitations, and concludes with suggestions for future research.

Tests of Individual Variables

Specific findings from tests of individual variables provide evidence of predictors of AA disaffiliation including AA history of affiliation, treatment specific influences, and certain personal characteristics, described below. A total of 57 variables measuring hypothesized constructs were tested. It was somewhat surprising to find so few of these variables ($N = 14$) significantly related to affiliation in the tests of individual variables. Following is a discussion and interpretation of the variables found significant.

Pretreatment History of Affiliation

Perhaps the most meaningful finding in this project was the influence and strength of AA history of affiliation on predicting future affiliation. This is not surprising, given the common research phenomenon of a pretreatment instrument strongly predicting the

same measure at follow-up, as well as the more general tendency to predict future behavior from past behavior.

Biasing effects of multiple testing using the AAI and inadequate measurement of the construct of interest could be raised as criticisms. In the present study, the AAI is an uncommonly good measure of the construct of interest, i.e. AA affiliation defined in terms of both attendance and involvement. Unfortunately, it is impossible to separate the effects of repeated testing from other explanations advanced in the following discussion.

The PM pretreatment form of the AAI was the strongest predictor of twelve-month affiliation. Furthermore, it was influential in every variable elimination method used in the prediction trials. More impressive, prediction accuracy from the pretreatment AAI variable was comparable to all other models that relied upon multiple explanatory variables. More specifically, adding all other variables in the a priori variable set (56 additional variables) only improved prediction above chance by 5.4%, with little improvement to sensitivity (1.6%).

Subsequent analysis found that an easy to interpret pretreatment AAI cut-point of 4.1 correctly predicted 71% of disaffiliates (sensitivity) and 70% of moderate to high affiliates (specificity). Predicting disaffiliates can be improved by increasing the AAI cut-point at the cost of decreasing specificity, e.g. a cut-point of 4.7 correctly predicts 77% of disaffiliates and 64% of moderate to high affiliates; and when the cut-point is raised to 4.9, the AAI correctly predicts 80% of disaffiliates and 60% of moderate to high affiliates. This analysis suggests that the PM pretreatment AAI represents a single, simple, economical and easy to administer index measuring risk of disaffiliation.

Prior history of AA was expected to influence post-treatment affiliation, however the extent of influence was beyond expectations. In this study, the majority of subjects (77%) reported a history of pretreatment AA attendance. It is likely that the motivational and cultural factors that influenced the level of pretreatment affiliative behavior probably continued to influence post-treatment affiliation.

Cultural values and beliefs would logically interact with cultural impressions and attitudes relating to the AA organization and shaped in early attendance. In turn these attitudes and expectations about AA would determine the subjective level of fit or congruence with the AA culture and play an essential role in decisions regarding future affiliative behaviors. This personal assessment of how the organization might benefit the individual was previously defined as organizational climate, which has been found to predict affiliative behaviors (e.g. Glisson, in press; Tao, Takagi, Ishida & Masuda, 1998).

The AAI includes domains of both attendance and involvement. Greater attendance and involvement are logical measures of cultural congruence and acceptance. Among other possibilities, lower pretreatment AAI scores may suggest cultural conflict. Since many motivational constructs were controlled, it would appear that cultural factors are more highly predictive of affiliation than motivational factors. Unfortunately, it is impossible to rule out the effects of poorly represented coping constructs in interpreting these results (e.g. coping resources outside AA or stress level), which could serve to affect both involvement and attendance. Further research is needed to confirm these pretreatment AAI findings and to isolate specific factors most influential in predicting affiliation.

AA's popularity and prominence may have lead to it become the "first stop" prior to formal treatment in many or most cases, consistent with the findings of Humphreys, Kaskutas and Weisner (1998). This finding suggests the importance of assessing AA history and cultural fit in assessing risk of AA disaffiliation. This assessment is logically more effective when combined with screening for low pretreatment AAI scores. Given individuals at-risk for disaffiliation, clinicians should consider alternative treatment strategies discussed below.

Successfully identifying disaffiliates while maintaining a low level of false positives is an important strategy for customization of long-term treatment needs. False positives (1 - specificity) represent the percentage of moderate to high affiliates who are incorrectly classified as disaffiliates. In the previous examples that varied AAI cut-points, the rate of false positives ranged between 30% to 40%. This level of false positives is the *cost* of being able to correctly identify a high proportion of those at risk of future disaffiliation. Further psychometric research (suggested below) may lead to improved predictive accuracy (sensitivity and specificity) and reduce false positives. However, caution is suggested and further research is needed to replicate these findings, which may be based upon chance relationships inherent in the PM data.

Treatment Influences

In general, individual effects coded contrasts (the overall main effects were not tested) provide evidence that treatment providers have a significant impact on affiliative outcome and that affiliation is a seemingly malleable construct. More specifically, the results provide evidence that certain PM treatment assignments (CBT, TSF) and specific

treatment site (different geographical provider sites treating all inpatient aftercare or all outpatient subjects) influenced subsequent long-term affiliation. As would be expected, those completing TSF were significantly more likely to affiliate, while CBT subjects were more likely to disaffiliate. In total, inpatient aftercare subjects were more likely to affiliate than were outpatient subjects. In addition, some treatment sites were significant in predicting affiliation, while others were not, suggesting site specific differences.

Not all treatment sites were found significant in tests of individual variables. Six of eleven sites were consistently split along treatment arm lines, where three sites composed of inpatient aftercare subjects consistently predicted greater affiliation, and three sites composed of outpatient subjects consistently predicted disaffiliation. While this provides evidence of the influence of treatment arm upon affiliation, the fact that only about half (6 of out of 11) of the sites were statistically significant suggests other site specific differences. Factors specific to site therefore would appear to moderate the effects of initial inpatient versus outpatient treatment on affiliation. Given PM random assignment in roughly equal proportions to the three treatment conditions and considerable treatment control, these differences should not be attributable to personal characteristics or variations in treatment (treatment fidelity). Other factors that conceivably could influence affiliative outcome include differences in counselors' styles, AA groups, geographic culture, or physical treatment facilities. It is impossible to explain these differences with the available information. However, given the prominence of cultural factors on affiliation found within this study, regional cultural differences surrounding AA are suspected.

As stated, differences in treatment assignment and treatment arm (subjects selected from inpatient aftercare or outpatient populations) provide evidence that affiliation may be malleable, with greater intensity of initial treatment (inpatient subjects) and greater emphasis on AA treatment content (TSF) resulting in a greater rate of affiliation. Given the prevalence of TSF treatment content within inpatient treatment centers, inpatient subjects were likely to have been more exposed to much greater levels of 12 step philosophies and beliefs. Conversely, outpatient treatment is much briefer and less intense, not allowing nearly as much emphasis and orientation on AA.

In addition to interpretation of the pretreatment AAI, many other findings from this study are interpreted as corroborating the effects of culture. As previously described, AA beliefs, values and norms may conflict with individual beliefs, contributing to dropout. For example, a cultural conflict exists between AA and the CBT approach to treatment. While TSF emphasizes reliance on spirituality, the AA group and other AA beliefs, CBT is more focused on self-reliance, teaching subjects the importance of learning and applying coping skills to deal with life stressors. Evidence corroborating the effects of other cultural factors also is provided by the significance of "personal characteristics" discussed below (e.g. religiosity, age and divorced or separated marital status).

Discomfort and resistance are associated with any acculturation process, representing a barrier to acculturation and contributing to dropout. The predictive ability of TSF assignment is logically explained in terms of aiding and accelerating the process of AA acculturation. Given the TSF emphasis on teaching and encouraging AA philosophy and beliefs, it is suggested that TSF subjects are generally more acculturated,

and find it easier to adopt AA values and beliefs. AA cultural resistance is logically defused by TSF treatment content and acculturation generally is advanced. Conversely, AA resistance and lower levels of acculturation are believed more acute among those who believe that the key to recovery lies in greater self-reliance, a component of CBT treatment.

As previously stated, CBT treatment is a cognitive and behavioral approach to maintaining sobriety through learning and applying interpersonal and intrapersonal coping skills to stressors inherent in daily life. The emphasis is on skill development, which will enable the individual to successfully cope with stressors without depending on alcohol. Accordingly, self-efficacy is emphasized, and the individual is taught the needed skills to deal with stress and temptations to use alcohol. As such, belief in individual empowerment and self-reliance are inherent in the CBT approach. While CBT also emphasizes interpersonal coping, suggesting and encouraging reliance on AA for interpersonal coping was not permitted within the Project MATCH CBT protocol, to maintain treatment fidelity. Therefore, this difference may not generalize to CBT treatment in community samples where it commonly is used in conjunction with TSF approaches and where CBT treatment content can be integrated and reconciled with AA beliefs of powerlessness. This reconciliation can best be characterized in terms of a more holistic approach to recovery, where sobriety is viewed as contingent upon several factors including (1) spiritual practice improving level of coping, (2) group support and healing available from involvement in AA, and (3) development and application of certain skills and practices by the individual. Interestingly, this framework is consistent with the AA

literature, although AA's primary curative focus is placed on initiating and maintaining the spiritual condition (e.g. AA World Services, 1991, 1981, 1976).

Personal Characteristics

Other significant findings include evidence that greater guilt and/or worry surrounding drinking, and greater religious beliefs predict affiliation. In addition, unlike the meta-analytic reviews of prior studies, both age and marital status played a significant role in affiliation.

Greater guilt/worry surrounding drinking was previously posited as a predictor of affiliation due to theory and qualitative research suggesting that those who possessed greater fear of drinking were more likely to affiliate (Smith, 1993). Smith had suggested that these fears were amplified and reinforced within AA, and contributed to greater affiliation. Greater negative emotions surrounding drinking were characterized as part of a motivational system or cycle within the current study. The fact that other motivational constructs were not found significant is surprising.

Greater religiosity is interpreted as a culture factor, which influences affiliation. AA is focused on a spiritual awakening with many references to God in the literature and considerable "God talk" in meetings. Those who are averse to religion or have conflicting religious or spiritual views would find AA's content incongruent with personal beliefs. This finding corroborates considerable theoretical contentions and some empirical support presented earlier.

Those who were separated or divorced were more likely to affiliate. Even though the overall main effect of marital status was not tested; the individual contrasts provide

evidence of the significance of divorced and marital status on affiliation. Prior disruption of a marriage as a predictor of affiliation is explained in terms of the stress and coping model summarized in the literature review, which posits that individuals who are more incumbent in primary roles, including marriage, are less likely to need and seek the interpersonal support available in AA. According to the theory, spouses (or partners) of married alcoholics are viewed as a primary source of interpersonal coping, and relationships available in AA are viewed as an alternative interpersonal coping resource. Oddly, single marital status was not found significant, suggesting that previously married individuals may possess greater needs for interpersonal support, perhaps created by the negative effects of a failed marriage. Alternatively, these findings also could be interpreted as supporting a cultural theory of affiliation, where separated and divorced individuals are more prevalent within AA, and are more likely to share common values and beliefs.

As noted, younger age groups are more likely to disaffiliate, and two possible explanations are offered. One reason may be that younger alcoholics are underrepresented in AA and that this creates a cultural barrier for younger newcomers. Alternatively, older individuals may be generally more motivated and willing to go to greater lengths to maintain their sobriety. The latter effect also could be explained in terms of bottom theory, where motivation is believed to emerge from the accumulation of negative drinking consequences across time. However, the fact that several motivational measures were included in the tests of individual variables and were not found significant, suggests that (1) motivational effects are not as influential as age, (2) may covary with age, or (3) that the current finding is perhaps best explained as a cultural

effect. Interestingly, while sometimes observed, age has been an inconsistent predictor in prior research and theory.

Other demographic variables were not found significant, including years of education, race, job status and other marital status categories (married and single). Interestingly race did not significantly predict affiliation within this study. Common cultural anecdote suggests that race influences affiliation, where AA is depicted as a primarily middle class white organization. Similarly, it sometimes is suggested that certain aspects of AA are not compatible with African-American and other minority cultural worldviews.

Cultural Model of Long-Term Affiliation

A model of affiliation was posited at the conclusion of the literature review that suggested influence and interactions among variables from three domains (motivation, coping skills and AA culture), that determined affiliative outcome. However, evidence generated in this study from cross-domain interaction tests did not support the existence of significant interactions. Furthermore, results did not support motivational constructs, and only limited evidence was found to support the influence of coping constructs (marital status). While results of this study failed to support this model, considerable evidence suggested a dominant cultural domain predicting long-term (one-year) affiliative outcome.

According to the original model, domains of culture, motivation and coping would determine the affiliative outcome, ultimately as the result of cross-domain interactions. However, the entire block of hypothesized interactions was not found

significant in BLR testing, offering evidence that significant interactions do not exist. Comparable results between BLR and ANNs offered further evidence that significant interactions within predictor variable sets do not exist. Failure to support the model may have been related to inadequate measures to represent some of the coping (e.g. stress level, coping abilities and satisfaction with work and home relationships) and cultural domain (e.g. attitudes and beliefs about AA culture) constructs. However, it may be that cross-domain interactions and domains of motivation and coping are not the most direct influences affecting long-term affiliation.

Alternatively, results of this study suggest that cultural factors play a dominant role in influencing and predicting one-year affiliation and that certain treatment, personal and coping variables may facilitate and advance the acculturation process, defined here as adopting or tolerating prominent AA values and beliefs. Two major findings should be integrated into future models: (1) logical measures of a cultural domain (e.g. pretreatment affiliation, age, religiosity, TSF treatment, separated/divorced marital status) play a major role in long-term affiliative outcome; and (2) long-term AA affiliation appears to be enduring yet somewhat malleable, effected by both treatment factors and prior AA affiliation, both believed to influence the individuals values and beliefs, in turn influencing his/her reaction to the AA culture, which ultimately influence affiliation.

Expanding on these findings, enduring individual values and beliefs are believed to interact with the AA normative values and beliefs (or culture), determining long-term affiliative outcome in an individual evaluative process referred to as "organizational climate" in the organizational literature (e.g. Glisson, in press). This fit or congruence between individual values and beliefs, contrasted with the AA culture, determine long-

term affiliation. Factors that have been previously found to predict affiliation (e.g. motivation, external help-seeking, severity, and point-in-time coping deficiencies) are believed to indirectly influence affiliation by increasing periodic attendance or exposure to AA. This exposure thereby improves the likelihood or possibility of acculturation, defined here as adoption of AA normative values and beliefs. These factors may produce more sporadic and less enduring affiliative behavior, lasting days, weeks or months, but longer term (one-year) affiliation is believed to be more related to more enduring aspects of the individual's perception of climate (congruence or fit with AA culture). As anyone who samples AA will attest the AA organizational climate (the collective assessment of the organization) is markedly shared, leaving an outsider possessing differing values and beliefs feeling alienated (individual climate) and more likely to disaffiliate.

Treatment factors including TSF treatment and inpatient treatment are believed to facilitate acculturation through both education on AA and meeting attendance. In addition to cultural factors, guilt/worry surrounding drinking emerged as a significant independent variable. It is difficult to integrate this variable with information available in the present study, and it is presented as a separate and independent factor that predicts longer-term affiliation. Here again, it could be that those with a greater guilt/worry of relapse may be more open to changing otherwise enduring values and beliefs and more inclined to try any remedy that promises relief from drinking. If so, greater guilt/worry surrounding drinking could be construed as a more enduring and profound long-term motivational measure. For purposes of this discussion and the model posited herein, guilt/worry surrounding drinking is presented as an independent factor influencing

longer-term affiliation. Future studies on guilt/worry may determine the nature of the relationship.

Figure 4 is provided to suggest an alternative cultural model explaining one-year affiliation. Motivational and coping constructs are believed to effect periodic episodes of AA attendance. This exposure to AA culture, in turn influences the individuals values and beliefs. Treatment influences and AA exposure are believed to have a more direct effect on individual values and beliefs related to the AA culture. The individual compares and contrasts relevant domains of personal values and beliefs with normative AA values and beliefs (e.g. spiritual and religious beliefs, abstinence vs. control drinking goal, beliefs embodied in the AA literature, etc.). This interaction results in the evaluation and assessment of AA congruence or fit, which influences future decisions on affiliative behaviors. This model suggests that greater congruence between individual and AA values and beliefs will predict affiliation. Alternatively, point-in-time coping and motivational levels are viewed as more dynamic, which cause more sporadic and short-term episodes of affiliation. Guilt/worry surrounding drinking is presented as an independent factor contributing to affiliative outcome.

These results suggest that affiliation processes are best explained in terms of organizational culture and climate theory. This is not a startling finding when one considers that AA represents an organization with a distinct culture, and it logically follows that affiliation (or acculturation) should be consistent with established organizational culture and climate theory (see Glisson, in-press). Given that greater AA involvement has been found to be associated with significantly improved drinking outcomes (even in the Project MATCH study), these findings have significant

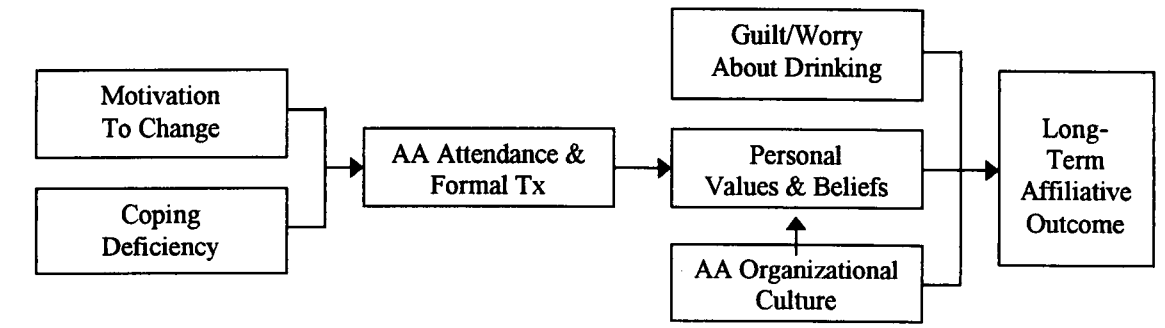


Figure 4: Revised Model of Affiliation

implications for treatment. Whereas, historical belief has tended to suggest that greater crisis or suffering (bottom theory) are necessary conditions of affiliation, these findings suggest that affiliation is a potentially malleable phenomenon at all levels of severity. The high rate of disaffiliation in the first year of AA exposure may be significantly reduced by addressing cultural barriers to affiliation. Alternatively, those assessed as terminally averse to AA cultural values and norms should be provided non-AA treatment content.

Predictive Accuracy

Attempts to predict affiliation were moderately successful with both BLR and ANNs providing comparable results. As expected, variable reduction methods resulted in models that were more parsimonious with comparable accuracy. As was described previously, the use of a single and simple to administer instrument (the AAI) provided similar predictive results compared to all other multiple predictor variable sets. In general, failure of this initiative to develop highly predictive models is difficult to explain.

As suggested above, certain coping and cultural domain constructs were poorly represented in the PM data, which may have contributed to the failure to support the interaction model and attenuated results depicting stress and coping influences. In addition, direct questioning of individuals about future affiliation (e.g. "will you attend/get involved in AA if it is recommended", or "can you see yourself fitting into AA") are obvious indicators of future affiliation and were missing in the PM data. In addition, such direct questioning was not addressed in research literature reviewed herein.

As mentioned, with few exceptions the two methods (BLR and ANNs) provided relatively consistent predictive accuracy across variable sets. It is difficult to conclude whether use of the redundant classification methods was worthwhile or a needless complexity. However, if ANNs can indeed detect and integrate unspecified interactions effectively into the model, this is an apparent advantage over BLR in exploratory research. In this study, the failure of ANNs to arrive at significantly better classification results corroborated results of BLR tests of individual variables of interactions, which suggested there were no significant interactions.

Alternatively, the use of the BLR was instrumental in terms of interpreting and integrating results with theory, where ANNs provided no meaningful information to aid in interpretation. In addition, the absence of variable selection and elimination methods within SPSS Neural Connection Version 2.0 is a potential limitation in ANN research. Thus the decision to use ANNs in exploratory research should be contingent upon the availability of computer methods or resources that will allow a systematic search for highly accurate predictor variable sets.

Unexpected Findings and Limitations

Some unexpected findings have been discussed previously including: (1) the extent of influence of the pretreatment AA affiliation history, (2) the failure to find significant interactions, (3) the apparent malleability suggested by the influence of treatment factors, and (4) the strength of cultural effects on affiliative outcome. In addition, certain promising hypothesized predictors of affiliation were not found significant, despite inclusion of several good psychometrically derived measures. These personal characteristics include external help-seeking, severity and motivation/readiness constructs, which were supported by considerable prior theory and correlational results. This study fails to corroborate these significant affiliative relationships suggested by the research literature.

Given acceptable levels of collinearity, it is suggested these results are attributable to inclusion of a comprehensive set of predictor variables made possible by the extensive baseline testing included in the PM data. Including such a varied set of predictor variables is unlikely to have occurred in previous studies of affiliation. As such, variables found significant within the current study are believed to be more predictive of affiliation than previously posited constructs (e.g. motivational, severity, help-seeking, etc.).

Although no further explanation is offered to explain the insignificance of motivational and severity measures, alternative explanations are suggested for external help-seeking. As stated, prior literature suggested a strong correlation between external help-seeking and affiliation, and despite several good psychometric measures included in the current study (e.g. prior attempts to deal with drinking, self-efficacy, loss of control),

none were significant. It is conceivable that given the increasing prevalence of AA, it has become the "first stop" before formal treatment in more recent years, which could moderate the volume of formal treatment episodes. Alternatively, the PM sample was drawn from formal treatment populations, and it could be that these are the individuals who are higher in terms of external help-seeking, compared to community samples that do not rely as heavily on formal treatment for problems with alcohol. Thus, two alternative explanations are offered for the failure of measures of external help-seeking to prove significant within the present study: the trend towards use of AA as the first stop before treatment, and the characteristics of the PM sample.

As with any secondary analysis, selecting suitable construct measures was a limitation in this study. Operationalization and measurement of constructs in secondary data analyses are based upon selecting the best available measures. Here, PM provided an abundance of quality variables (psychometrically tested and closely related to constructs of interest) and was relatively well suited for this project. In some cases, seemingly ideal measures were available among the PM variables (e.g. religiosity, pretreatment AAI, severity measures, and motivation). In most cases, adequate but less than ideal measurements were available, and in these cases, operationalization of hypothesized constructs was limited by available measures. Finally, some hypothesized constructs were marginally represented with important constructs missing (e.g. pretreatment stress level, coping style, satisfaction with partner and work relationships, and AA attitudinal measures).

In addition, despite the suitability and quality of the PM data, it may be difficult to generalize from the sample. "Real world" populations are normally treated in inpatient

or outpatient treatment regimens, sometimes followed by some form of aftercare. The PM study created a major addition to "normal" treatment that persisted for three months. In addition, treatment content commonly is more eclectic in nature, composed of a mix of PM treatment protocols (TSF, MET and CBT) and other treatment influences. While separating and controlling treatment protocols was required to test matching effects, it nonetheless created a false treatment condition that may not generalize to "real world" conditions. The combined effects of the additional three-month layer of treatment and the narrowly focused treatment protocols are impossible to determine and may create problems in generalizing these results.

As previously mentioned, a limitation in the prediction trials was the lack of variable selection methods within the ANN software (SPSS Neural Connection Version 2.0). Alternatively, BLR included both feed-forward and backward elimination procedures. One method available for ANN methods involves arriving at a more parsimonious variable set by testing all combinations and permutations of predictor variables. This was not attempted in the current study due to limitations of the SPSS Neural Connection program and a lack of computer resources. The number of possible combinations and permutations of approximately 60 predictor variables (2^{60} - 1) exceeds scientific notation 1.15E+18. Short of a methodical approach, alternative methods to arrive at a more parsimonious predictive variable set are essentially ad hoc trial and error, limited by program capabilities, computer resources, and researcher time. Ad hoc trial and error methods are inherently flawed and subject to bias.

Finally, it should be noted that the large number of tests of statistical significance (N = 57) of constructs of interest in this study may have lead to misleading conclusions.

It is possible that some of the variables found to be statistically significant were not, in fact, significantly related to the response variable. More specifically, the larger the number of predictor variables tested, the greater the chance of at least one type I error occurring (Cohen & Cohen, 1983). Accordingly, constructs that were found to be significantly related to the response variable in this study, and interpreted in the discussion, may have no real relationship with affiliation. That is, some of these findings may have been the result of type I errors. Ultimately, the replication of these findings will provide the best evidence as to variables that are related with affiliation.

Implications for Practice

Clinical Decision Support Systems

In addition to the primary objective of predicting affiliation with pretreatment information, a secondary objective of this study was to consider advantages from expanded use of clinical decision support systems. The computer field of decision support systems broadly defined involves any application of computers to improve decision accuracy. This includes development of programs or routines that require computer inputs and provide decision related informational output, or alternatively, a set of decision rules that were derived from computer analyses, modeling or simulation. The key issue is the expanded use of computer routines or rules from computer aided analysis to improve clinical decisions and thereby enhance treatment outcomes.

While considerable attention has been drawn to the issue of AA attrition and the apparent need to screen individuals for suitability for AA referral (e.g. Emrick, 1994; Humphreys, 1997), literature reviewed in this dissertation located no evidence of any

screening instruments or actuarial models used to systematically and objectively screen for risk of dropout. In addition, Humphreys (1997) has suggested that although the American Psychiatric Association has published guidelines, the decision to refer individuals to AA is usually based upon the clinician's personal judgement, which can be biased by individual, agency or industry practice and beliefs.

In addition, clinical judgement has been shown to be consistently inferior to more systematic decision methods. In this regard, Dawes, Faust and Meehl (1989) reviewed approximately 100 studies that compared accuracy of actuarial methods (both statistical and rule based models) to clinical judgment, in a wide variety of human diagnostic and behavioral predictions. The authors concluded that actuarial judgements were consistently superior to clinical judgement. The implications are obvious: treatment effectiveness may be enhanced by the aid of decision support systems that can improve clinical decisions.

The widespread adoption of computers in recent years has resulted in an abundance of databases that contain a wealth of knowledge in the form of undiscovered data relationships. A recent field, knowledge discovery in databases, has emerged in response to the growing number of databases and the realization that knowledge can be "extracted" from these databases. Exploratory statistical methods, including binary logistic regression and artificial neural networks, are examples of statistical tools commonly used in knowledge extraction processes. Researchers are improving tools and methods, and these methods hold great promise in advancing knowledge with secondary data.

Application of these methods is not new, and is being used increasingly.

Knowledge discovery in databases is gaining attention in medical decision support systems and in managed care decisions (Borok, 1997; Szolovits, 1995; Goodwin, et al., 1997; Zielstorff, 1998; Elevitch, Silvers & Sahl, 1997; Prather et al., 1997, Helman & Bhangoo, 1997). Substance abuse and mental health clinical decisions currently are influenced by the imposition of these managed care decision support systems. Unfortunately, managed care resources are directed at minimizing treatment cost and number of services, as opposed to improving treatment outcomes.

Patterson and Cloud (1999) developed a model that predicts rehospitalization of chronically and severely mentally ill patients and provides many examples of decision support systems applications using artificial neural networks to predict human behaviors (e.g. psychiatric hospital length of stay, recidivism patterns of juveniles, survival in trauma patients, utilization of hospital resources, workplace behavior, graduate student success, and prediction of international conflict). In addition, a three volume special issue of the *Journal of Substance Use and Misuse* (January 1998) was dedicated to the theory and application of neural networks applied to substance abuse disorders (e.g. Vicino, 1998; Maurelli & DiGiullo, 1998; Massini & Shabtay, 1998, Sperl et al., 1998). In addition, there are many examples of using these methods to predict or to classify consumer behaviors within the field of marketing, (e.g. Mann, 1997; O'Donnell, 1997; Bejou, Wray & Ingram, 1996; Fish., Barnes & Aiken, 1995).

In summary, moderate predictive results reported in the present study suggests still greater promise given future development and refinement. It is hoped this study may lead to further development of models of affiliation and more generally expand interest and use of decision support systems in clinical decisions.

Need for Extended Care

It can be argued that extended care (beyond initial formal treatment) is an important aspect of treatment effectiveness for many alcohol dependent individuals presenting for formal treatment given: (1) improved drinking outcomes consistently associated with greater post-treatment AA affiliation, (2) the popularity of AA among self-selecting members (where affiliation often lasts many years), and (3) the high rate of relapse into harmful drinking among previously treated individuals. AA is arguably the most affordable and widely accessible source of long-term care available to the majority of alcoholics. Interpersonal support and AA recovery processes (steps, meetings, fellowship, etc) are available to anyone without cost, around the clock (through sponsors), seven days a week, and several AA meetings are held throughout the day in major U.S. cities.

Formal treatment alternatives are no match in terms of availability and affordability, and it is unlikely that limited government funding or managed care will allow expanded services to alcoholics in the United States given the current political, social, cultural and economic environment. The trend towards managing (limiting) care and the stigma associated with using "sliding scale" government subsidized outpatient programs tend to further restrict extended care alternatives. Alternative mutual-aid programs such as Secular Organization for Sobriety, Rationale Recovery, and Women in Recovery at this time have not gained wide acceptance and are not widely available.

Effectiveness studies including PM suggest that while completion of treatment is associated with successful drinking outcomes, the type of treatment may be of secondary importance. Therefore, what an individual will use and apply in his/her life becomes an

important, perhaps critical consideration. Following this logic and the support for AA's effectiveness summarized in the introductory chapter, those who need additional care and who reject AA or waiver in acculturation, are at greater risk of relapse into harmful drinking compared to those who affiliate with AA. Long-term affiliation emerges as a key relapse prevention construct, and disaffiliation as a major relapse risk factor.

The ability to predict who is most likely to disaffiliate would facilitate customized treatment planning for assessed long-term care needs. Treatment providers could consider several alternative strategies depending on the risk of disaffiliation. Several variations to the normal reliance and referral to AA could be considered. Examples of treatment planning options that could be considered given higher risk of disaffiliation include the following: (1) provide longer-term protracted outpatient services to potential disaffiliates, (2) use strategies shown to encourage post-treatment AA affiliation, (e.g. referrals to an inpatient TSF treatment program), (3) assess and develop alternative support resources and networks (e.g. protracted group therapies, other mutual-aid organizations, church involvement, healthy family or friends, etc.) or, (4) provide referrals and support of other mutual aid groups. Another strategy to aid with acculturation includes the AA *Bridging the Gap Program* (AA World Services, 1991), a program designed to introduce and orient newcomers in the early stages of acculturation, which is summarized in the following paragraph.

Some may benefit from introduction of an AA contact while undergoing treatment. Such a contact can provide support and alleviate the discomfort associated with early AA acculturation. The AA *Bridging the Gap Program* does just that (AA World Services, 1991). Dropout is believed to be heaviest during the first 90 days of

exposure to AA, when discomfort associated with acculturation is believed to contribute to attrition. This AA support initiative is designed to aid the newcomer in working through these initial barriers of affiliation by providing a same sex AA contact, who introduces the individual to AA and provides a variety of support services including: (1) introducing the individual to others in AA, (2) providing an AA meeting schedule, (3) aiding with transportation to meetings, and (4) depending on needs, accompanying the individual to the first few meetings. One study has suggested that the introduction of an AA contact during treatment significantly improves the rate of subsequent attendance (Sisson & Mallams, 1981).

Suggestions for Research

This research study demonstrated moderate ability to predict disaffiliation from pretreatment data. Two lines of research are suggested to improve upon these results. The results of the pretreatment AAI suggest that future research may lead to development of a relatively simple instrument that can predict those most at risk for disaffiliation. In addition, future research can improve upon predictive accuracy attained in this study by controlling for covariates and moderating variables, and applying theory advanced herein.

The results of this study suggested a useful index of disaffiliation (the pretreatment AAI). Initiatives directed at developing a more highly predictive disaffiliation screening instrument using the PM data may hold considerable promise, and several sources of questions are suggested. A first step would involve identifying the specific pretreatment AAI items that are associated most with disaffiliation. In addition, exploratory analysis of a variety of other item level PM baseline questions should suggest

other highly predictive questions. Other suggested questions include face valid questions (e.g. asking subjects at pretreatment whether they will attend and get involved in AA, or whether they can see themselves as an AA member). In addition, given the dominant cultural findings from this study, it is suggested that this instrument should include questions that would attempt to establish compatibility. These questions should query the individual's level of congruence with key AA values and beliefs (e.g. religiosity, abstinence, tolerance of groups, etc.) that may create barriers to affiliation.

Several mediating variables have been observed during the course of this study that could be better controlled or manipulated and thereby lead to more accurate models of affiliation. Mediating variables suggested for further analyses include treatment assignment (TSF, MET, CBT), treatment arm (inpatient aftercare and outpatient populations), and return to abusive drinking.

The AA focus on abstinence poses a major affiliative barrier for subjects who have returned to regular drinking. In addition, routine abusive drinking contributes to a loss of global functioning, which contributes further to attrition. Return to abusive drinking is a common condition that contributes to disaffiliation, and it is believed to heavily erode the predictive accuracy of models tested in this study. By retaining subjects who had returned to drinking, without controlling for the effects of relapse on affiliation, these models essentially were required to predict both return to drinking and affiliative outcome. Accordingly, models developed from the PM data that control for drinking outcome, or alternatively, eliminate relapsed subjects, are logical and should significantly improve predictive accuracy. Models controlling for the effects of these

mediating variables would constitute valid and useful support tools for use in clinical decisions and treatment planning.

BIBLIOGRAPHY

BIBLOGRAPHY

AA World Services. (1976). Alcoholics Anonymous (3rd Ed.), New York: Author.

AA World Services. (1981). Twelve Steps and Twelve Traditions, New York: Author.

AA World Services. (1990a). Alcoholics Anonymous 1989 Membership Survey, New York: Author.

AA World Services. (1990b). Comments on AA's Triennial Surveys, New York: Author.

AA World Services. (1991). Bridging the Gap: Between Treatment and AA Through Temporary Contact Programs, New York: Author.

AA World Services. (1997). Alcoholics Anonymous 1996 Membership Survey, New York: Author.

American Psychiatric Association. (1994). Diagnostic and Statistical Manual for Mental Disorders-Fourth Edition (DSM-IV), Washington, DC: Author.

Babor, T. F. (1996). Reliability of ethanol dependence syndrome scale. Psychology of Addictive Behavior, 10, 97-103.

Bean-Bayog, M. (1993). A.A. Processes and Change: How Does It Work. In B.S. McCrady & W.R. Miller (Eds.). Research on Alcoholics Anonymous: Opportunities and Alternatives, (pp. 99-112). New Brunswick, NJ: Rutgers Center of Alcohol Studies.

Bejou, D., Wray, B. & Ingram, T. N. (1996). Determinants of relationship quality: An artificial neural network analysis. Journal of Business Research, 36, 137-143.

Bien, T. H., Miller, W. R. & Tonigan, J. S. (1993). Brief interventions for alcohol problems: A review. Addiction, 88, 315-336.

Borok, L. (1997). Data mining: Sophisticated forms of managed care modeling through artificial intelligence. Jounral of Health Care Finance, 23, 20-36.

Bradley, A. M. (1988). Keep Coming Back: The case for valuation of Alcoholics Anonymous. Alcohol Health and Research World, 12, 192-199.

Brandsma, J. M., Maultsby, M. C. & Welsh, R. J. (1980). Outpatient Treatment of Alcoholism: A Review and Comparative Study, Baltimore, MD: University Park Press.

Brazdil, P. B. & Henery, R. J. (1994). Analysis of results. In D. Michie, D.J. Spielgelhalter & C.C. Taylor. Machine Learning, Neural and Statistical Classification, (pp. 175-211). New York: Ellis Horwood.

Brazdil, P., Gama, J. & Henery, R. (1994). Characterizing the Applicability of Classification Algorithms Using Meta-Level Learning" in Y. Kodratoff (Ed.). Proceedings of MLNet Workshop on Industrial Applications of Machine Learning, September 1994, Dourdan, France, pp. 127-146.

Brown, H. P. & Peterson, J. H. (1991). Assessing spirituality in addiction treatment and follow-up: Development of the Brown-Peterson Recovery Progress Inventory. Alcoholism Treatment Quarterly, 8, 21-50.

Brown, S. D. (1993). Therapeutic Processes in Alcoholics Anonymous. In B.S. McCrady & W.R. Miller (Eds.). Research on Alcoholics Anonymous: Opportunities and Alternatives, (pp. 137-152) New Brunswick, NJ: Rutgers Center of Alcohol Studies.

Bufe, C. (1991). Alcoholics Anonymous: Cult or Cure?, San Francisco: See Sharp Press.

Caldwell, P. E. & Cutter, H. S. G. (1997). Impact of work on early-recovery Alcoholics Anonymous Affiliation. Employee Assistance Quarterly, 13, 1-15.

Caldwell, P. E. & Cutter, H. S. G. (1998). Alcoholics Anonymous affiliation during early recovery. Journal-of-Substance-Abuse-Treatment, 15, 221-228.

Collins, J. M. & Clark, M. R. (1993). An application of the theory of neural computation to the prediction of workplace behavior: an illustration and assessment of network analysis. Personnel Psychology, 46, 503-524.

Cohen, J. & Cohen, P. (1983). Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences (2nd Ed.), Hillsdale, NJ: Lawrence Erlbaum.

Connors, G. J., Allen, J. P., Cooney, N. L., DiClemente, C. C., Tonigan, J. S. & Raymond, F. A. (1994). Assessment Issues and Strategies and Alcoholism Treatment Matching Research. Journal of Studies on Alcohol, Supplement 12, 92-100.

Connors, G. J., Tonigan, J. S. & Miller, W. R. (1996). A measure of religious background and behavior for use in behavior change research. Psychology of Addictive Behaviors, 10, 90-96.

Connors, G. J. & Dermen, K. H. (1996). Characteristics of participants in Secular Organizations for Sobriety (SOS). American-Journal-of-Drug-and-Alcohol-Abuse, 22, 281-295.

Cooke, T.D. & Campbell, D.T. (1979). Quasi-experimentation: Design & analysis issues for field settings, Boston, MA: Houghton Mifflin.

Cooke, R. A. & Rousseau, D. M. (1988). Behavioral norms and expectations: A quantitative approach to the assessment of organizational culture. Group and Organization Studies, 13, 245-273.

Corrington, J. E. (1989). Spirituality and Recovery: Relationships between levels of spirituality, contentment and stress during recovery from alcoholism in AA. Alcoholism Treatment Quarterly, 6, 131-165.

Cross, S. S., Harrison, R. F. & Kennedy, R. L. (1995). Introduction to neural networks. The Lancet, 346, 1075-1079.

Cross, G. M., Morgan, C. W., Mooney, A. J., Martin, C. A. & Rafter, J. A. (1990). Alcoholism treatment: A ten-year follow-up study. Alcoholism: Clinical and Experimental Research, 14, 169-73.

Darlington, R.B. (1990). Regression and linear modes, New York: McGraw Hill.

Dawes, R. M., Faust, D. & Meehl, P. E. (1989). Clinical versus actuarial judgement. Science, 24, 1668-1674.

Dean, P. & Edwards, T. A. (1990). Health locus of control beliefs and alcohol-related factors that may influence treatment outcomes. Journal of Substance Abuse Treatment, 7, 167-172.

DiClemente, C. C. (1993). Alcoholics Anonymous and the Structure of Change. In B.S. McCrady & W.R. Miller (Eds.). Research on Alcoholics Anonymous: Opportunities and Alternatives, (pp. 79-88). New Brunswick, NJ: Rutgers Center of Alcohol Studies.

DiClemente, C. C., Carbonari, J. P., Montgomery, R. P. G. & Hughes, S. O. (1994). The alcohol abstinence self-efficacy scale. Journal of Studies on Alcohol, 55, 141-148.

DiClemente, C. C. & Hughes, S. O. (1990). Stages of change profiles in outpatient alcoholism treatment. Journal of Substance Abuse, 2, 217-235.

Ditman, K. S., Crawford, G. G., Forgy, E. W., Moskowitz, H. & MacAnderew, C. (1967). A controlled experiment of the use of court probation for drunk arrests. American Journal of Psychiatry, 124, 160-163.

Donovan, D. M. & Mattson, M. E. (1994). Alcoholism Treatment Matching Research: Methodological and Medical Issues. Journal of Studies on Alcohol, Supplement 12, 5-14.

Elevitch, F.R., Silvers, A. & Sahl, J. (1997). Projecting corporate health plan utilization and charges from annual ICD-9-CM diagnostic rates: A value-added opportunity for pathologists. Archives of Pathology Laboratory Medicine, 121, 1187-1191.

Emrick, C. D. (1987). Alcoholics Anonymous: Affiliation Processes and effectiveness as treatment. Alcoholism: Clinical and Experimental Research, 11, 416-23.

Emrick, C. D. (1994). Alcoholics Anonymous and other 12-step groups. In M. Galanter & H.D. Kleber (Eds.). American Psychiatric Press Textbook of Substance Abuse Treatment, pp. 351-358. Washington, DC: American Psychiatric Press.

Emrick, C. D. (1989). Alcoholics Anonymous: Membership characteristics and effectiveness as treatment. In M. Galanter (Ed.). Recent Developments in Alcoholism (Vol. 17): Treatment Research , pp. 37-53. New York: Plenum Press.

Emrick, C. D., Tonigan, J. S., Montgomery, H. & Little, L. (1993). Alcoholics Anonymous: What is currently known? In B.S. McCrady & W.R. Miller (Eds.). Research on Alcoholics Anonymous: Opportunities and Alternatives, (pp. 41-78) New Brunswick, NJ: Rutgers Center of Alcohol Studies.

Faraggi, F. & Simon, R. (1995). A neural network model for survival data. Statistics In Medicine, 14, 73-82.

Feragne, M. A., Longabaugh, R. & Stevenson, J. F. (1983). The Psychosocial Functioning Inventory. Eval Health Prof, 6, 25-48.

Fish K.E., Barnes J.H. & Aiken M.W. (1995). Artificial neural networks: A new methodology for industrial market segmentation. Industrial-Marketing-Management, 24, 431-438.

Fowler, J. W. (1993). Alcoholics Anonymous and Faith Development. In B.S. McCrady & W.R. Miller (Eds.). Research on Alcoholics Anonymous: Opportunities and Alternatives, (pp.113-136) New Brunswick, NJ: Rutgers Center of Alcohol Studies.

Fox, J. (1997). Analysis, linear models and related methods, Thousand Oaks, CA: Sage.

Galletly, C. A., Clark, C. R., McFarlane, A. C. & Psychother, D. (1996). Artificial neural networks: A prospective tool for the analysis of psychiatric disorders. Journal of Psychiatry and Neuroscience, 21, 239-247.

Gama, J. & Brazdil, P. (1995). Characterization of Classification Algorithms. In C.Pinto-Ferreira & N. Mamede (eds.). Progress in Artificial Intelligence, 7th Portuguese Conference on Artificial Intelligence, EPIA-95, Springer Verlag, pp.189-200.

Glaser, F. B. (1993). Matchless? Alcoholics Anonymous and the matching hypothesis. Alcoholics. In B.S. McCrady & W.R. Miller (Eds.). Research on Alcoholics Anonymous: Opportunities and Alternatives, New Brunswick, NJ: Rutgers Center for Alcohol Studies.

Glisson, C. (in press). Organizational Climate and Culture. In R. Patti (Ed.). The Handbook of Social Welfare Administration, Sage Publications.

Goodwin, L., Prather, J. & Schlitz, K., Iannacchione, M., Hage, M., Hammond, W.E. & Grzymala-Busse, J. (1997). Data mining issues for improved birth outcomes. Biomedical Science Instrum, 34, 291-296.

Grant, B. F., Harford, T. C., Dawson, D. A., Chou, P., Dufour, M. & Pickering, R. (1994). Prevalence of DSM-IV alcohol abuse and dependence: United States. Alcohol Health and Research World, 18, 243-8.

Harris, S. G. & Mossholder, K. W. (1996). The affective implications of perceived congruence with culture dimensions during organizational transformation. Journal of Management, (4), 527-547.

Hasin, D. S. & Glick, H. (1992). Severity of DSM-III-R alcohol dependence: United States, 1988. British Journal of Addiction, 87, 1725-30.

Helman, P. & Bhangoo, J. (1997). A statistically based system for prioritizing information exploration under uncertainty. IEEE-Transactions-on-Systems,-Man,-and-Cybernetics-Part-A:-Systems-and-Humans, 27, 449-466.

Henery, R. J. (1994). Methods of Comparison. In D. Michie, D.J. Spiegelhalter & CC. Taylor (Eds.). Machine Learning, Neural and Statistical Classification, (pp. 107-124). New York: Ellie Horwood).

Hirschfield, R. M., Klerman, G. L., Gough, H. G., Barrett, J., Korchin, S. J. & Chodoff, P. (1977). A measure of interpersonal dependency. J of Pers Assess , 41, 610-618.

Hopson, R. E. (1993). A thematic analysis of the addictive experience: Implications for psychotherapy. Psychotherapy, 30, 481-493.

Hopson, R. E. & Beaird-Spiller, B. (1995). Why AA works: A psychological analysis of the addictive experience and the efficacy of Alcoholics Anonymous. Alcoholism Treatment Quarterly, 12, 1-17.

Hopson, R. E. & Moses, M. J. (1996). Theology of paradox: A Pauline contribution to the understanding and treatment of addictions. Journal of Ministry in Addiction & Recovery, 3, 7-15.

Humphreys, K. (1997). Clinicians' Referral and Matching of Substance Abuse Patients to Self-Help Groups After Treatment. Psychiatric Services, 48, 1445-1449.

Humphreys, K., Finney, J. W. & Moos, R. H. (1994). Applying a stress and coping framework to research on mutual help organizations. Journal of Community Psychology, 22, 312-27.

Humphreys, K., Kaskutas, L. A. & Weisner, C. (1998). The relationship of pre-treatment Alcoholics Anonymous affiliation with problem severity, social resources and treatment history. Drug and Alcohol Dependence, 49, 123-131.

Humphreys, K., Moos, R. H. & Cohen, C. (1997). Social and community resources and long-term recovery from treated and untreated alcoholism. Journal of Studies on Alcohol, 58, 231-8.

Humphreys, K., Moos, R. H. & Finney, J. W. (1996). Life domains, Alcoholics Anonymous, and role incumbency in the 3-year coarse of problem drinking. Journal of Mental Disorders, 184(475-481).

Institute of Medicine. (1990). Broadening the Base of Treatment for Alcohol Problems, Washington, D.C.: National Academy, pp. 279-302.

Isenhart, C. E. (1997). Pretreatment readiness for change in male alcohol dependent subjects: Predictors of one-year follow-up status. Journal-of-Studies-on-Alcohol, 58, 351-3571.

Johnson, D. E. (1998). Applied Multivariate Methods for Data Analysts, Pacific Grove, CA: Brooks/Cole Publishing.

Kurtz, L. F., Garvin, C. D., Hill, E. M., Pollio, D. & et al. (1995). Involvement in Alcoholics Anonymous by persons with dual disorders. Alcoholism-Treatment-Quarterly, 12, 1-18.

Long, J. S. (1997). Regression Models for Categorical and Limited Dependent Variables, Thousand Oaks, CA: Sage Publications.

Machell, D. F. (1992). A psychological rationale in support of the Alcoholics Anonymous concept of fellowship. Journal of Alcohol and Drug Education, 37, 1-16.

Mann, L. H. (1997). Gaining global insights. Marketing-Research:-A-Magazine-of-Management-and-Applications, 9, 24-30.

Martlatt, G. & Gordon, J. R. (1985). Relapse Prevention: Maintenance Strategies in the Treatment of Addictive Behaviors, New York: Guilford Press.

Massini, G. & Shabtay, L. (1998). Use of a constant satisfaction network model for the evaluation of the methadone treatments of drug addicts. Substance Use and Misuse, 33, 625-656.

Maurelli, G. & DiGiullo, M. (1998). Artificial neural networks for the identification of the differences between light and heavy alcoholics, starting from five nonlinear biological variables. Substance Use & Misuse, 33, 693-708.

McCrady, B. S. & Delaney, S. I. (1995). Self-help groups. In R.K. Hester & W.R. Miller (Eds.) . Handbook of Alcoholism Treatment Approaches: Effective Alternatives (2nd Ed.), ((pp. 160-175). Boston, MA: Allyn and Bacon).

McCrady, B. S., Epstein, E. E. & Hirsch, L. S. (1996). Issues in the implementation of a randomized clinical trial that includes Alcoholics Anonymous: Studying AA-related behaviors during treatment. Journal-of-Studies-on-Alcohol, 57, 604-612.

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. Journal of Nervous Mental Disorders, 168, 26-33.

Michie, D., Spiegelhalter D. & Taylor C. (1994). Machine Learning, Neural and Statistical Classification, New York: Ellis Horwood.

Miller, N. S., Ninonuevo, F. G., Klamen, D. L., Hoffmann, N. G. & Smith, D. E. (1997). Integration of treatment and post-treatment variables in predicting results of abstinence-based outpatient treatment after one year. Journal of Psychoactive Drugs, 29, 239-248.

Miller, W. R. (1998). Researching the spiritual dimensions of alcohol and other drug problems. Addiction, 93, 979-990.

Miller, W. R., Brown, J. M., Simpson, T. L., Handmaker, N. S., Bien, T. H., Luckie, L. F., Montgomery, H. A., Hester, R. K. & Tonigan, J. S. (1995). What Works? A Methodological Analysis of the Alcoholic Treatment Outcome Literature. In R.K. Hester & W.R. Miller (Eds.). (pp. 12-44). Needham Heights, MA: Allyn & Bacon.

Miller, W. R. & Hester, R. K. (1995). Treatment for Alcohol Problems: Towards an Informed Eclecticism. In R. K. Hester & W.R. Miller (Eds.) Handbook of Alcoholism Treatment Approaches: Effective Alternatives (2nd Ed.), (pp. 1-11). Needham Heights, MA: Allyn & Bacon.

Miller, W. R. & Kurtz, E. (1994). Models of Alcoholism Used in Treatment: Contrasting AA and Other Perspectives with Which It Is Often Confused. Journal on Studies in Alcohol, 55, 159-166.

Miller, W. R., Leckman, L., Delaney, H. D. & Tinkcom, M. (1992). Long-term follow-up of behavioral self-control training. Journal of Studies on Alcohol, 53, 249-261.

Miller, W. R. & McCrady, B. S. (1993). The importance of research on Alcoholics Anonymous. In B.S. McCrady & W.R. Miller (Eds.). Research on Alcoholics Anonymous: Opportunities and Alternatives, (pp. 3-12) New Brunswick, NJ: Rutgers Center of Alcohol Studies.

Miller, W. R. & Munoz, R. F. (1982). How to Control Your Drinking (Rev. Ed.), University of New Mexico Press: Albuquerque.

Miller, W. R. & Rollnick, S. (1991). Motivational Interviewing: Preparing People to Change Addictive Behaviors, New York: Guilford.

Miller, W. R., Tonigan, J. S. & Longabaugh, R. (1995). Rockville, MD, National Institute on Alcohol Abuse and Alcoholism, 1995.

Miller, W. R. & Tonigan, J. S. (1996). Assessing drinkers' motivations for change: The Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES). Psychology-of-Addictive-Behaviors, 10(2), 81-89.

Mitchell, J. M. O. (1994). Classical Statistical Methods. In D. Michie, D.J. Spiegelhalter & C.C. Taylor (Eds.). Matching Learning, Neural and Statistical Classification, (pp. 17-27). New York: Ellis Horwood.

Montgomery, H. A., Miller, W. R. & Tonigan, J. S. (1995). Does Alcoholics Anonymous involvement predict treatment outcome? Journal-of-Substance-Abuse-Treatment, 12, 241-246.

Monti, P. M., Abrams, D. B., Kadden, R. M. & Cooney, N. L. (1989). Treating Alcohol Dependence: A Coping Skills Training Guide, New York: Guilford.

Morgenstern, J. & McCrady, B. S. (1993). Cognitive Processes and Change in Disease-Model Treatment. In B.S. McCrady & W.R. Miller (Eds.). Research on Alcoholics Anonymous: Opportunities and Alternatives, (pp. 153-166) New Brunswick, NJ: Rutgers Center of Alcohol Studies.

Morgenstern, J., Labouvie, E., McCrady, B. S., Kahler, C. W. & Frey, R. M. (1997). Affiliation with Alcoholics Anonymous after treatment: A study of its therapeutic effects and mechanisms of action. Journal-of-Consulting-and-Clinical-Psychology, 65, 768-777.

Nealon-Woods, M. A., Ferrari, J. R. & Jason, L. A. (1995). Twelve-step program use among Oxford House residents: Spirituality or social support in sobriety? Journal-of-Substance-Abuse, 7, 311-317.

Norusis, M. J. (1994). SPSS Advanced Statistics 6.1, Chicago: SPSS.

Nowinski, J., Beker, S. & Carroll, K. (1994). Twelve Step Facilitation Therapy Manual: A Clinical Research Guide for Therapists Treating Individuals With Alcohol Abuse and Dependence., Project MATCH Monograph Series, Vol. 1, Rockville, MD: NIAAA.

O'Donnell, D. (1997). Teaching old models neural tricks. Bank-Marketing, 29, 26-29.

Orme, J. G. (1986). Erroneous use of observed percentage agreement in discriminant analysis. Social Work Research and Abstracts, 22, 2.

Orme, J. G. & Reis, J. (1991). Multiple regression with missing data. Journal of Social Service Research, 15, 61-91.

Patterson, D. P. & Cloud, R. N. (1998). The application of artificial neural networks for outcome prediction in a cohort of severely mentally ill outpatients. 1998 Information Technologies for Social Work Practitioner's and Educators Converence Proceedings , (pp. 252-258), Columbia, SC: University of SC.

Pedhazur, E.J. (1997). Multiple regression in behavioral research: Explanation and prediction, Fort Worth, TX: Harcourt Brace.

Peele, S. (1989). Diseasing of America: Addiction Treatment Out of Control, Lexington, MA: Lexington Books.

Peters, T. J. & Waterman, R. H. Jr. (1982). In Search of Excellence: Lessons From America's Best-Run Companies, New York: Harper & Row.

Polcin, D. L. (1997). The etiology and diagnosis of alcohol dependence: differences in the professional literature. Psychotherapy, 34, 297-306.

Prather, J.C., Lobach, D.F., Goodwin, L.K., Hales, J.W., Hage, M.L. & Hammond, W.E. (1997). Medical data mining: Knowledge discovery in a clinical data warehouse. Proc AMIA Annual Fall Symp, 1997, 101-105.

Prochaska, J. O. & DiClemente, C. C. (1986). Toward a comprehensive model of change. In W.R. Miller & n. Heather (Eds.). Treating Addictive Behaviors: Processes of Change, ((pp. 3-27)), New York: Plennum.

Prochaska, J. O. & DiClemente, C. C. (1982). Transtheoretical therapy: Toward a more integrative model of change. Psychotherapy: Theory, Research, and Practice, 19, 276-88.

Prochaska, J. O., DiClemente, C. C. & Norcross, J. C. (1992). In search of how people change: Applications to addictive behaviors. American-Psychologist, 47(9), 1102-1114.

Project MATCH Research Group. (1997b). Matching alcoholism treatments to client heterogeneity: Project MATCH post-treatment drinking outcomes. Journal on Studies of Alcohol, 58, 7-29.

Project MATCH Research Group. (1998). Matching alcoholism treatments to client heterogeneity: Project MATCH three-year drinking outcomes. Alcoholism: Clinical and Experimental Research, 22, 1300-1311.

Project MATCH Research Group. (1993). Project MATCH: Rationale and methods for a multisite clinical trial matching patients to alcoholism treatment. Alcoholism: Clinical and Experimental Research, 17, 1130-1145.

Project MATCH Research Group. (1997a). Project MATCH secondary a priori hypothesis. Addiction, 92, 1671-1698.

Reigle, N. E. (1997). Predicting alcoholics anonymous affiliation using measures of personality factors and coping processes. Dissertation-Abstracts-International-Section-A:-Humanities-and-Social-Sciences, 57(10-A) 4275, Dissertation Abstracts International Section-A: Humanities and Social Sciences.

Rohwer, R., Wynne-Jones, M. & Wysotzki, F. (1994). Neural Networks. In D. Michie, D.J. Spiegelhalter & CC. Taylor (Eds.). Machine Learning, Neural and Statistical Classification, ((pp. 84-106). New York: Ellie Horwood).

Room, R. (1993). Alcoholics Anonymous as a Social Movement. In B.S. McCrady & W.R. Miller (Eds.). Research on Alcoholics Anonymous: Opportunities and Alternatives, (pp. 167-188). New Brunswick, NJ: Rutgers Center of Alcohol Studies.

Room, R. & Greenfield, T. (1993). Alcoholics Anonymous, other 12 step movements and psychotherapy in the U.S. population, 1990. Addiction, 88, 555-562.

Sandoz, C. J. (1991). Locus of control, emotional maturity and family dynamics as components of recovery in recovering alcoholics. Alcoholism Treatment Quarterly, 8, 17-31.

Sarle, W. S. (1997). Neural Network FAQ, Part 1 of 7: Introduction and Periodic Posting to the Usenet Newsgroup Comp.Ai.Neural-Nets, URL: Ftp://Ftp.Sas.Com/Pub/Neral/FAQ.Html.

Sisson, R. W. & Mallams, J. H. (1981). The use of systematic encouragement and community access procedures to increase attendance at Alcoholics Anonymous and Alanon meetings. American Journal of Drug and Alcohol Abuse, 8, 371-376.

Smith, A. R. (1993). The social construction of group dependency in Alcoholics Anonymous. The Journal of Drug Issues, 23, 689-704.

Snow, M. G., Prochaska, J. O. & Rossi, J. S. (1994). Processes of change in Alcoholics Anonymous maintenance factors in long-term sobriety. Journal-of-Studies-on-Alcohol, 55, 362-371.

Sobell, L. C., Sobell, M. B. & Toneatto, T. (1992). Recovery from alcohol problems without treatment. In N. Heather, W.R. Miller & J. Greeley (Eds.). Self-Control and Addictive Behaviors, (pp. 198-242) New York: Maxwell Macmillan.

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.

Sobell, M. B. & Sobell, L. C. (1993). Problem Drinkers: Guided Self-Change Treatment, New York: Guilford.

Speiglman, R. (1997). Mandated AA attendance for recidivist drinking drivers: Policy issues. Addiction, 92, 1133-1136.

Sperl, L., Schiliro, G., Bezzetto, A., Cifelli, G., DeBattisti, L., Marchi, S., Modenese, M., Varalta, F. & Consigllere, F. (1998). The use of artificial neural networks methodology in the assessment of vulnerability to heroin use among Army Corps soldiers. Substance Use & Misuse, 33, 555-586.

SPSS. (1997a). Neural Connection 2.0: Applications Guide, Chicago: Author.

SPSS. (1997b). Neural Connection 2.0 User's Guide, Chicago: Author.

SPSS. (1999). SPSS Base 9.0 Applications Guide, Chicago: Author.

StatLog Partners. (1994). Dataset descriptions and results. In D. Michie, D.J. Spiegelhalter & C.C. Taylor. Machine Learning, Neural and Statistical Classification, (pp. 131-174). New York: Ellis Horwood.

Szolovits, P. (1995). Uncertainty and decisions in medical informatics. Methods Inf Med, 34, 1-2.

Tao, M., Takagi, H.; Ishida, M., Masuda, K (1998) A study of antecedents of organizational commitment. Japanese-Psychological-Research, 40, 198-205.

Timko, C., Finney, J. W., Moos, R. H. & Moos, B. S. (1995). Short-term treatment careers and outcomes of previously untreated alcoholics. Journal of Studies on Alcohol, 56, 597-610.

Timko, C., Finney, J. W., Moos, R. H., Moos, B. S. & Steinbaum, D. P. (1993). The process of treatment selection among previously untreated help-seeking problem drinkers. Journal of Substance Abuse, 5, 203-20.

Timko, C., Moos, R. H., Finney, J. W. & Moos, B. S. (1994). Outcome of treatment for alcohol abuse and involvement in Alcoholics Anonymous among previously untreated problem drinkers. Journal-of-Mental-Health-Administration, 21, 145-160.

Tonigan, J. S., Connors, G. J. & Miller, W. R. (1996). Alcoholics Anonymous Involvement (AAI) Scale: Reliability and norms. Psychology of Addictive Behaviors, 10, 75-80.

Tonigan, J. S., Toscova, R. & Miller, W. R. (1996). Meta-Analysis of the literature on Alcoholics Anonymous: Sample and study characteristics moderate findings. Journal of Studies on Alcohol, 57, 65-72.

Tonigan, J. S. & Hiller-Sturmhoefel, S. (1995). Alcoholics Anonymous: Who benefits? Alcohol-Health-and-Research-World, 18, 308-310.

Tucker, J. A. & Gladsjo, J. A. (1993). Help-seeking and recovery by problem drinkers study of 3 groups: Characteristics of drinkers who attended Alcoholics Anonymous or formal treatment or who recovered without assistance. Addictive Behaviors, 18, 529-542.

Tuite, D. R. & Luiten, J. W. (1986). 16PF research into addiction: Meta-analysis and extension. International Journal of the Addictions, 47, 41-47.

U.S. Secretary of Health and Human Services. (1997). Ninth Special Report to the U.S. Congress on Alcohol and Health, NIH #97-4017, Rockville, MD: Author.

U.S. Secretary of Health and Human Services. (1993). Eighth Special Report to the U.S. Congress on Alcohol and Health, NIH #94-3699, Rockville, MD: Author.

Vaillant, G. E. (1996). A long term follow-up of mail alcohol abuse. Archives of General Psychiatry, 53, 253-249.

Vaillant, G. E. (1995). The Natural Course of Alcoholism: Revisited, Cambridge, MA: Harvard University Press.

Vicino, F. (1998). Some reflections on artificial neural networks and statistics: Two ways of obtaining solutions by working with data. Substance Use & Misuse, 33, 221-231.

Walsh, D. C., Hingson, R. W., Merrigan, D. M., Morelock-Levenson, S., Cupples, A., Heeren, T., Coffman, G. A., Becker, C. A., Barker, T. A., Hamilton, S. K., McGuire, T. G. & Kelly, C. A. (1991). A randomized trial of treatment options for alcohol abusing workers. New England Journal of Medicine, 325, 775-782.

Wanberg, K. W., Horn, J. L. & Foster, F. M. (1977). A differential assessment model for alcoholism: The scales of the alcohol use inventory. Journal of Studies on Alcohol, 38, 512-543.

Watson, C. G., Hancock, M., Gearhart, L. P., Mendez, C. M., Malovrh, P. & Raden, M. (1997). A comparative outcome study of frequent, moderate, occasional, and non-attenders of alcoholics anonymous. Journal of Clinical Psychology, 53, 209-14.

Weiss, S. M. & Kulikowski, C. A. (1991). Computer Systems That Learn: Classification and Prediction Methods From Statistics, Neural Nets, Machine Learning and Expert Systems, San Mateo, CA: Morgan Kaufman Publishers.

Wilcox, D. M. (1998). Alcoholic thinking: Language, culture, and belief in Alcoholics Anonymous.

Zielstorff, R. (1998). Online practice guidelines: Issues, obstacles, and future prospects. Journal of the American Medical Inform Assoc, 5, 227-236.

VITA

Richard N. Cloud was born in Lexington, Kentucky on January 20, 1952. He was awarded a Bachelor of Science degree in Accounting in 1976 from the University of Kentucky in Lexington, and subsequently was awarded a Certified Public Accounting (CPA) license while working at a "big eight" national accounting firm. After 17 years of diverse for-profit business management and entrepreneurial experiences, and as the result of a midlife search for greater meaning, in January 1994 he began work on his Masters in Social Work (MSW) at the University of Kentucky. He focused his MSW studies on substance abuse, his substantive area of interest. After receiving the MSW degree in December 1995, he worked as an outpatient substance abuse counselor with adults and adolescents for 19 months within the large community mental health care system in Lexington, KY.

Pursuing a lifelong dream of a career in research and academia, he initiated doctoral studies at the University of Tennessee at Knoxville (UTK) in August 1997 and successfully defended this dissertation on November 9, 1999. He is presently providing criminal thinking interventions, chemical dependency education and substance abuse therapy to offenders at Forensic Services of Bluegrass Comprehensive Care Center in Lexington. He is currently interviewing for social work faculty positions and anticipates beginning work as an assistant professor in the fall 2000.