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AND PSYCHOLOGICAL DISTRESS TO ADDICTION SEVERITY
AMONG KENTUCKY SUBSTANCE ABUSE TREATMENT
PARTICIPANTS**

Elizabeth A. Wahler
University of Kentucky, beth.wahler@gmail.com

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Elizabeth A. Wahler, Student

Dr. Melanie D. Otis, Major Professor

Dr. David Royse, Director of Graduate Studies

THE RELATIONSHIP OF SOCIAL STRESS, ECONOMIC HARDSHIP, AND
PSYCHOLOGICAL DISTRESS TO ADDICTION SEVERITY AMONG KENTUCKY
SUBSTANCE ABUSE TREATMENT PARTICIPANTS

DISSERTATION

A dissertation submitted in partial fulfillment of the
requirements for the degree of Doctor of Philosophy in the
College of Social Work at the University of Kentucky

By
Elizabeth A. Wahler

Lexington, Kentucky

Director: Dr. Melanie D. Otis, Associate Professor of Social Work

Lexington, Kentucky

2012

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ABSTRACT OF DISSERTATION

THE RELATIONSHIP OF SOCIAL STRESS, ECONOMIC HARDSHIP, AND PSYCHOLOGICAL DISTRESS TO ADDICTION SEVERITY AMONG KENTUCKY SUBSTANCE ABUSE TREATMENT PARTICIPANTS

Stress is associated with poor mental health, specifically anxiety and depression, and stress and mental health problems are predictors of substance dependence and relapse. Social characteristics, such as racial/ethnic minority status, female gender, and low socioeconomic status, are often associated with increased psychological distress and substance use disorders. Pearlin's social stress theory postulates that this association is due to increased exposure to stress and subsequent experiences of distress related to social disadvantage and decreased access to resources for coping with stress. This project uses a social stress theoretical perspective to examine predictors of substance use after treatment entry and follow-up addiction severity in a large sample of Kentucky substance abuse treatment participants (N = 1123). A conceptual model is tested to determine if social characteristics along with psychological distress, perceived stress, and economic hardship are predictors of substance use and follow-up addiction severity. In addition, since recovery support, efficacy, and self-control have been previously identified as mediators in the stress and relapse processes these factors were included as mediators in the model tested. The conceptual model was tested with three outcome variables, substance use between baseline and 12-month follow-up, follow-up alcohol addiction severity, and follow-up drug addiction severity. Bivariate and multivariate analyses, including logistic regression and ordinary least squares regression, were used to test conceptual models with the full sample and also with a subsample with baseline substance use indicative of potential substance dependence. Findings indicated that significance of predictors varied depending on outcome variable, although recovery support, efficacy, and self-control were significant predictors of all three dependent variables. Findings for each outcome variable are discussed, as well as limitations of the present study, implications for social work practice, and implications for future research.

KEY WORDS: addiction severity, relapse, substance abuse, social stress, poverty

Elizabeth A. Wahler
Student Signature

April 27, 2012
Date

THE RELATIONSHIP OF SOCIAL STRESS, ECONOMIC HARDSHIP, AND
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SUBSTANCE ABUSE TREATMENT PARTICIPANTS

By
Elizabeth A. Wahler

Melanie D. Otis, PhD
Director of Dissertation

David Royse, PhD
Director of Doctoral Studies

April 27, 2012
Date

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Chapter One

Introduction

Drug and alcohol addiction is a social problem that has extremely high costs to individuals, families, and society as a whole. It has been estimated that drug and alcohol addiction costs the United States over \$600 billion annually (National Institute on Drug Abuse [NIDA], 2011), taking into consideration the expense of criminal activity and incarceration associated with drug and alcohol use and attainment, cost of treatment, loss of productivity, and expense of medical problems secondary to chronic drug and alcohol use. This, of course, is the cost in purely financial terms; anyone who has lived with addiction, or has loved someone experiencing addiction, could argue that the emotional, mental, and physical toll it takes on its victims and their families is even greater.

Many people experiencing addiction participate in treatment, but often relapse afterward and are not able to obtain or maintain complete abstinence from drugs and alcohol (NIDA, 2009). Despite the traditional emphasis on abstinence during and after treatment, newer harm reduction treatment approaches focus on reducing damage caused by drug and alcohol addiction; guided by this approach, any reduction in addiction severity can be viewed as a positive treatment outcome (Tatarsky & Marlatt, 2010). Thus, understanding factors impacting addiction severity after treatment may be as important as understanding factors affecting relapse.

One of the primary factors impacting post-treatment substance use is stress. The extant literature shows that stress is a predictor of initial drug and alcohol use (DeHart, Tennen, Armeli, Todd, & Mohr, 2009; Frone, 2008; Hatzenbuehler, Nolan-Hoeksema, & Erickson, 2008), drug and alcohol dependence (Liu & Weiss, 2002; Mattoo, Chakrabarti,

& Anjaiah, 2009; Tate et al., 2008; Wang et al., 2005), and addiction relapse after periods of abstinence (Alverson, Alverson, & Drake, 2000; Mattoo et al., 2009; Sinha, 2008; Tate et al., 2008). In addition to the direct effect of stress on substance use, stress also contributes to psychological distress, often experienced as symptoms of depression and anxiety (Mirowsky & Ross, 2003; Pearlin et al., 1981). Notably, symptoms of depression and anxiety are also predictors of post-treatment substance use (Brown et al., 1998; Cornelius et al., 2004; Greenfield et al., 1998; Hasin et al., 2002; Tate, Brown, Unrod, & Ramo, 2004; Tate et al., 2008).

Social placement, or one's position on the continuum of social status, is often associated with exposure to stressors, experiences of stress, and subsequent psychological distress (Mirowsky & Ross, 2003; Pearlin, 1989). Specifically, gender, race/ethnicity, and low socioeconomic status (SES) are among the social categories most highly associated with stress and distress (Mirowsky & Ross, 2003). This dissertation explores the relationship between social stress, psychological distress, and post-treatment addiction severity.

Rationale for the Study

Social workers are responsible for working with the most vulnerable persons in our communities, including those living with addictions, mental health problems, and poverty. Poverty and other characteristics that place people at a social disadvantage, such as gender, race/ethnicity, unemployment, and low educational attainment, are correlated with addiction (Buka, 2002; Festinger, Rubenstein, Marlowe, & Platt, 2001; Hatzenbuehler et al., 2008; Mulia, Ye, Zemore, Greenfield, 2008; SAMHSA, 2010; Vaillant, 1988; Wallace, 1999; Williams, Mohammed, Leavell, & Collins, 2010) and

mental health problems (Everson, Maty, Lynch, & Kaplan, 2002; Lantz, House, Mero, & Williams, 2005; Lorant et al., 2003; Lynch, Kaplan, & Shema, 1997; Marmot, 2004; Mirowsky & Ross, 2003; Weich & Lewis, 1998). Although these relationships have been well-established in the extant literature, the nature of these associations is not fully understood. Thus, it is important to examine these relationships further in order to learn how to best intervene.

In this chapter, I will initially provide an overview of the relationship between stress, psychological distress, and relapse. Then, I will review factors associated with social disadvantage that can increase exposure to stress and experiences of distress. Next, I will discuss physiological effects of stress, since these effects help explain associations between stress, distress, and substance use. I will also review the similarities between the stress and relapse processes, including mediators that affect potential outcomes in both processes. Finally, I will discuss the theoretical framework that guides this research and propose a model to test relationships between social stress, psychological distress, and post-treatment addiction severity.

Stress, Psychological Distress, and Addiction Relapse

The associations between stress, psychological distress, and relapse are complex and closely interwoven. Stress is associated with psychological distress, primarily experienced as symptoms of depression and anxiety (Mirowsky & Ross, 2003; Pearlin et al., 1981). Previous studies have established that depression is often the result of stress (Fox, Halpern, Ryan, & Lowe, 2010), and there have been similar findings for the relationship between anxiety and stress (Fox et al., 2010). Not only does stress affect symptoms of depression and anxiety, but having a diagnosis of a mental health disorder is

also a predictor of greater perceived stress post-diagnosis (Waaktaar, Borge, Fundingsrud, Christie, & Torgerson, 2004).

Stress and addiction relapse also go hand-in-hand, and stress is one of the most frequently-cited factors contributing to relapse in individuals recovering from addictions (Alverson et al., 2000; Hyman et al., 2009; Mattoo et al., 2009; McMahon, 2001; Sinha et al., 2009; Tate et al., 2008; Tuchman, 2010). The association between stress and relapse has been noted for numerous drugs of abuse, including alcohol (Mattoo et al., 2009; Sinha et al., 2009), cocaine (McMahon, 2001), and opiates (Mattoo et al., 2009). Both chronic and acute stressors contribute to shortened periods of time between treatment completion and relapse when compared to individuals experiencing fewer stressors (Tate et al., 2008), and stress is also associated with greater addiction severity upon relapse (McMahon, 2001). Specific stressors such as unemployment (Festinger et al., 2001; SAMHSA, 2010), economic hardship (Tate et al., 2008), and discrimination (Marshall, Friedman, Stall, & Thompson, 2009) have been implicated as specific relapse risk factors.

Social Factors Impacting the Stress Process

Notably, stress is not experienced the same for everyone, and some individuals are at a greater risk for experiencing psychological distress from stress than others. Social placement, one's position on the social status spectrum, often impacts exposure to stressful life events and chronic strains (Pearlin, 1989). People who occupy groups of lower social status, such as women, racial/ethnic minorities, people with low educational attainment, individuals with disabilities, and people of low socioeconomic status (SES) often experience greater distress than people higher in social status (Mirowsky & Ross,

1986; Mirowsky & Ross, 2003). While poverty is a strong predictor of stress and distress (Buka, 2002; Laaksonen et al., 2009; Mirowsky & Ross, 2003; Mulia et al., 2008; Ross, 2000; Wang, Schmitz, & Dewa, 2009; Weich & Lewis, 1998), many researchers have indicated that it is actually social inequality predicting distress rather than poverty alone (Marmot, 2004); individuals at the lower end of the spectrum in unequal societies experience greater helplessness, lack of control over life, chronic stress, and exposure to conditions conducive for development of physical and mental health problems (Lantz et al., 2005; Marmot, 2004). Notably, women often experience stress differently than men, reporting more somatic and psychological symptoms (Moksnes, Moljord, Espnes, & Byrne, 2010; Olf, Langeland, Drajer, & Gersons, 2007; Vrijmoet-Wiersema et al., 2008).

Physiological Effects of Stress

Physiology helps explain associations between stress, psychological distress, and addiction, and elucidates the reason social disadvantage is a predictor of distress and addiction. Negative effects of stress are related to an individual's allostatic load, which refers to the body's ability to maintain equilibrium in the face of environmental changes (McEwen, 2000; McEwen, 2004). The more the body has to compensate for external stimuli in order to create equilibrium, the higher the allostatic load. Overexposure to chronic environmental stressors causes high allostatic load over time, and a continuously-activated stress response system alters the body's normal way of responding to external changes (McEwen, 2000). Nowhere can this be seen better than in the field of chronic stress; long-term exposure to stress has been associated with a dysfunctional stress response system and suppression of the body's normal stress reaction (McEwen, 2000;

McEwen, 2004). While the body's stress response system is normally adaptive and helps an individual respond and cope to acute short-term stressors, chronic stress reduces normal, adaptive functioning of the stress response system. High allostatic load over time is associated with both physical and psychiatric symptoms, including depression and anxiety, impaired memory, increased risk for heart disease, and a suppressed immune system (McEwen, 2004). People of lower social status, specifically persons of low socioeconomic status (SES), would understandably experience higher allostatic load due to the stress of living in poverty. Additionally, persons who fall into other groups associated with social disadvantage, such as race/ethnicity, women, or even persons diagnosed with an addiction or mental illness, might experience additional stress and higher allostatic load.

Individuals experiencing high allostatic load seek ways to return to equilibrium, and substance use may initially appear to achieve this goal. Addiction research shows that almost every drug of abuse, including alcohol, marijuana, cocaine, and nicotine mimics the body's natural stress response when initially used (Cleck & Blendy, 2008). However, just as chronic stress damages the stress response system over time, drugs of abuse do the same and eventually increase allostatic load and consequently increase the desire to amplify substance use (Cleck & Blendy, 2008). Thus, individuals recovering from drug and alcohol addictions who are also experiencing chronic stress would understandably be at high risk for relapse, and high addiction severity after relapse, due to allostatic load.

Stress and Relapse Processes

There are similarities between the stress process and the process whereby an individual attempting abstinence from substances begins to use again. The stress process refers to the process whereby an individual experiences an event that challenges, threatens, or places a physical or psychological demand on them, appraises the event as stressful, and experiences physiological or psychological consequences from the event (Lazarus & Folkman, 1984). Stressors can be acute and short-term, such as experiencing a change in housing or loss of a job, or chronic, such as long-term economic hardship or relationship problems; many times chronic strains have a larger impact on psychological well-being than acute stressors (Pearlin, 1989). Several mediators have been identified in the stress process which reduce psychological distress after experiencing a stressor, including coping ability, social support, self-efficacy, self-esteem, and personality factors such as resilience (Pearlin, 1989). Notably, the relapse process often mirrors the stress process and includes these same mediators (McMahon, 2001; Tate et al., 2008; Walton, Blow, Bingham, & Chermack, 2003).

Purpose of the Study

Social factors impact the stress process and subsequent psychological distress (Mirowsky & Ross, 1986; Mirowsky & Ross, 2003; Pearlin, 1989), and stress and psychological distress are associated with substance use after treatment (Alverson et al., 2000; Hyman et al., 2009; Mattoo et al., 2009; McMahon, 2001; Sinha et al., 2009; Tate et al., 2008; Tuchman, 2010). Therefore, it is important to understand how social placement and stress might impact post-treatment substance use. Pearlin's social stress theory is a useful heuristic for understanding these relationships since it posits that

chronic stress and strain associated with social disadvantage is a strong predictor of distress, even stronger than many traumatic life events or acute stressors (Pearlin et al., 1981; Pearlin, 1989).

The purpose of the current study is to use Pearlin's social stress theory as a heuristic to guide the examination of relationships between social stress factors (gender, income, race/ethnicity, educational level, unemployment, marital status, and social inequality), economic hardship, perceived stress, psychological distress (depression and anxiety), and post-treatment addiction severity in a sample of Kentucky substance abuse treatment participants. While many studies have examined the relationship between stress and post-treatment substance use, only one known study examined post-treatment substance use from a social stress perspective to explore how social placement and poverty impacted use (Rhodes & Jason, 1990). In this study, it was found that substance using behavior of impoverished adolescents living in inner-city Chicago was explained by social stress, and when context was taken into account, behavior that would otherwise appear dysfunctional was understandable and adaptive. The authors called for more research examining social stress and addiction (Rhodes & Jason, 1990), but no other known studies have been conducted using this framework to study this problem. In addition to the current dissertation filling this gap in the literature, it will also fill a gap about addiction severity after treatment. The majority of studies cited examined factors impacting relapse and did not explore addiction severity upon relapse. Since a harm reduction standpoint emphasizes that any reduction in addiction severity is a positive outcome (Tatarsky & Marlatt, 2010), understanding factors impacting change between pre- and post-treatment addiction severity is important. Also, most existing studies

examining relapse have used limited treatment samples, and none have used a broad statewide sample consisting of participants in many different levels of care as in this dissertation. Using a broader sample enables the hypothesized model to be applied to different subsets of participants based on specific characteristics, such as comparing those who appeared to have met criteria for substance dependence to those who did not.

Study Aims

This study aims to:

- Test the relationships between social stress factors, psychological distress, economic hardship, and relapse addiction severity in a sample of substance abuse treatment participants. Specifically, is post-treatment addiction severity able to be predicted by the presence of social stress factors, psychological distress, and economic hardship?
- Determine if coping factors mediate the relationship between social stress, psychological distress, and addiction severity in this sample.

Definition of Terms

Stress-related Terminology

Throughout this dissertation, I use the terms “stress”, “stressor”, and “distress”. Stress refers to the process of experiencing, perceiving, responding, and adapting to a detrimental, demanding, threatening, or challenging event (Lazarus & Folkman, 1984). A stressor is an occurrence or event that causes experiences of stress; stressors can be negative time-limited incidents, traumas, or chronic strains. While stress theorists such as Selye (1973) have also discussed the stressful nature of positive changes or events, for the purposes of this dissertation I am focused on the negative impact of stress. Finally,

distress is the negative psychological effect of stress, most often experienced as symptoms of depression or anxiety.

Substance-related Terminology

In this dissertation, I also use the terms “substance use”, “substance abuse”, “substance dependence” and “addiction”. Substance use refers to any use of drugs or alcohol, licit or illicit, that does not meet diagnostic criteria for substance abuse or dependence. Substance abuse and dependence are defined according to criteria established in the Diagnostic and Statistical Manual, 4th Edition, Text Revision ([DSM-IV-TR], American Psychiatric Association, 2000). To meet criteria for substance abuse, drugs or alcohol must continue to be used after experiencing one of the following within the previous 12 months: failure to fulfill role obligations due to substance use, use of substances when it is physically hazardous, experience of legal problems related to substance use, and/or experience of social problems related to substance use. To meet criteria for substance dependence, drugs or alcohol must continue to be used after experiencing three or more of the following within the previous 12 months: increased tolerance, withdrawal upon abstinence, use of more substances or for longer periods of time than intended, continued attempts or desire to quit or reduce use, neglect of important activities due to substance use, a great deal of time spent planning, using, or recovering from substance use, and/or continued use despite physical or psychological problems caused or worsened by use (American Psychiatric Association, 2000).

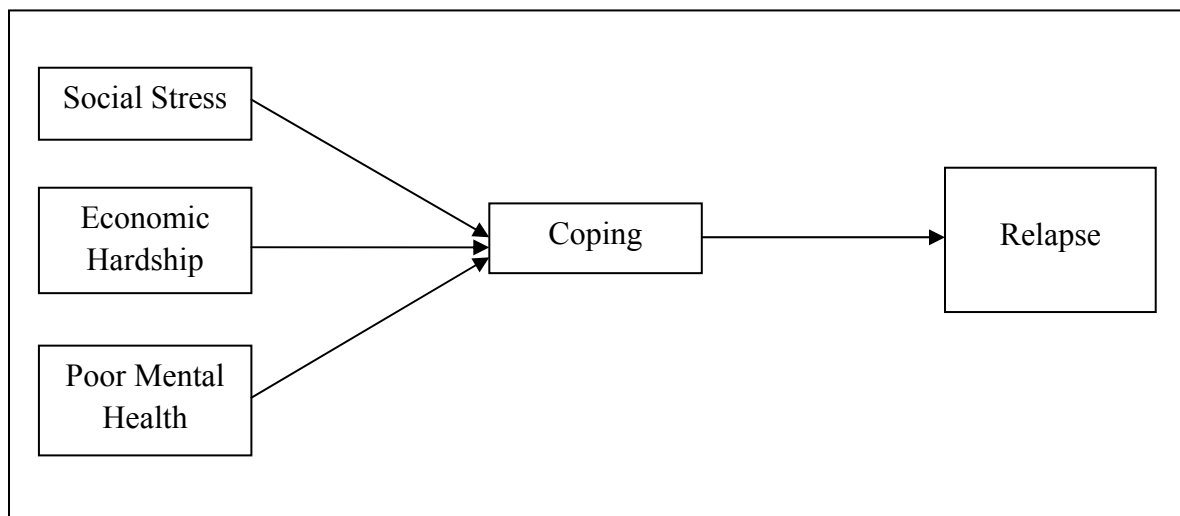
Addiction is often used interchangeably with substance dependence, although they can be two distinct concepts. Substance dependence can refer to solely physical dependence on a substance, such as that which often occurs with long-term use of many prescription

medications, while addiction is often used to imply the presence of loss of control and continued use despite consequences (Maddox & Desmon, 2000). However, since the diagnostic criteria for substance dependence includes loss of control over use (American Psychiatric Association, 2000), this dissertation will use the terms substance dependence and addiction interchangeably to refer to drug and alcohol use meeting criteria for substance dependence. Also, while the study of addiction can include many other things besides drugs and alcohol, such as food, sex, and gambling, for the purposes of this dissertation the focus will be drugs and alcohol only.

Conceptual Model

The conceptual model for the present study is shown in Figure 1. This study tests whether social stress, economic hardship, and psychological distress are predictors of addiction severity after treatment. Also, the study tests whether coping factors mediate the relationship between social stress, economic hardship, psychological distress, and post-treatment addiction severity.

Figure 1. Conceptual Model



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Chapter Two

Theoretical Perspective

In this section, I will describe the historical development of stress theory and some of the pioneers in the field of stress research. I will then focus on Pearlin's social stress theory, the guiding theoretical perspective for this study, which uses sociological principles to understand social patterns of stress exposure and psychological distress. Finally, I will discuss research conducted from a social stress theoretical perspective about the effect of poverty and social disadvantage on psychological well-being.

History of Stress Theory

The stress process has been studied by many over the past several decades. Stress has become a commonly known term as a result of Selye's pioneering research on stress's effects on the body (Thoits, 2010). Selye, an endocrinologist, was the first researcher to discover physiological effects of environmental triggers and to use the word "stress" to describe the unpleasant stimuli that seemed to trigger responses such as high blood pressure, gastrointestinal problems, and changes in the brain (Viner, 1999). Selye conceptualized life as a series of reactions to external stimuli, and by working with animal studies he was able to identify three stages of the physiological stress response; the alarm, resistance, and exhaustion stages (Thoits, 2010).

Stress researchers soon began to focus on cumulative stress, believing that multiple stressful events caused a greater stress response than singular events. Holmes & Rahe (1967) conceptualized stress as resulting from events, both positive and negative, that cause a readjustment in one's way of life. Events such as marriage, moving, beginning a new job, or the death of a loved one can all cause psychological and

physiological reactions that contribute to rates of illness. Rather than solely measured by number of events occurring, they believed that the stress response resulted from the magnitude of each event and their cumulative effects over time. Holmes & Rahe's Social Readjustment Rating Scale (1967) was developed in order to measure the extent one's life changed in reaction to various life events.

In contrast to earlier theories that saw stress as a reaction to events, Lazarus introduced the importance of personal cognition into the conceptualization of the stress process. Noting that multiple people often experience the same events and yet have different reactions, Lazarus speculated that effects of stress are related to personal appraisal of events as stressful and individual coping ability (Lazarus & Folkman, 1984). Stress, to Lazarus, is based on 'relational meaning' and states that psychological processes involved in appraisal of environmental threat, perceptions of severity of the threat, and ability to cope with stressors are more important in determining effects of stressors than environmental threat alone (Lazarus, 1999).

While some stress theorists have focused on psychological processes involved in the stress process, others have incorporated a sociological focus and studied how social factors impact individual outcomes. Agnew's general strain theory (GST) is one example that focuses on the impact of social factors on individual behavior (Agnew, Brezina, Wright, & Cullen, 2002). Agnew hypothesizes that chronic strain from negative social relationships is often responsible for observed associations between SES and delinquency/crime. GST indicates that there are three different types of social strain; other people preventing an individual from achieving positive goals such as economic gain or higher social status, others removing or threatening to remove positively-

associated people or possessions, and an individual being treated negatively, verbally abused, physically attacked, or generally treated as if in a lower social status. These strains often cause the individual to experience negative emotions and subsequently lead to acting out, delinquency, or commission of crime. However, the process between experiences of strain and acting out is affected by coping skills, financial resources, positive social support, self-esteem, and self-efficacy, and presence of these resources reduces the likelihood of criminal behavior (Agnew et al., 2002). Other research has supported Agnew, finding that strain theory explains associations between stressful life events and delinquency/drug use in both males and female adolescents (Hoffman & Su, 1997).

Pearlin's social stress theory, a sociological theory of the stress process, grew out of the observation that psychological distress was observed more frequently in persons of low socioeconomic status or other groups socially disadvantaged (Pearlin et al., 1981). Noting the connection between psychological processes, social position (one's placement in the spectrum of social status), and shared experiences as a result of social position, Pearlin has extensively researched the connection between psychological distress and social environment (Pearlin, 1989). Pearlin posits that the stress process is composed of life events, chronic life strains, stress mediators such as social support, resources, and coping, and stress effects/outcomes such as depressive symptoms (Pearlin et al., 1981). The main tenets of Pearlin's social stress theory will be described in this section.

Social Stress Theory

Social stress theory states that a person's placement in the social environment greatly impacts exposure to stress, perceptions of stress, and resources available for

coping with stress (Aneshensel, 1992; Pearlin, 1989). Sources of stress vary, but are a combination of life events and chronic problems, often associated with social categories such as race, age, gender, disability status, or social class. Stress is not randomly experienced, but is often a common experience shared by people in the same social circumstances, and there are social patterns to stressors, mediators, and stress effects. Pearlin believes “the structural contexts of people’s lives are not extraneous to the stress process but are fundamental to the process. They are the sources of hardship and privilege, threat and security, conflict and harmony” (Pearlin, 1989, p. 242). To be female, a racial/ethnic minority, a sexual minority, unemployed, of low SES, or with low educational attainment places a person at social disadvantage; all of these factors are associated with increased stress and psychological distress (Aneshensel, 1992; Mirowsky & Ross, 2003; Pearlin, 1989). Even one’s membership in the social category alone can be a source of chronic stress (Pearlin, 1989). For instance, the stigma associated with substance dependence could be a source of stress for someone attempting to recover. Being Black, female, and poor might magnify the stress of substance dependence due to membership in multiple groups associated with hardship and discrimination.

Stress research has historically focused on experiences of stressful life events. Pearlin acknowledges the importance of life events, which have often been central to other theorists’ understanding of the stress process, but posits that it’s often the effect of the life event on role strain that contributes to the stress process (Pearlin et al., 1981). Life events lead to role strain, which can diminish self esteem and mastery, subsequently increasing effects of stress (Pearlin et al., 1981). Addicts and alcoholics could often experience role strain, since their addiction can cause difficulty with maintaining

employment, being a parent, or other roles held. Poverty and economic hardship would only serve to increase role strain since it adds to difficulty providing for one's self and family. Role strain is not limited to traditional roles; it is conceivable that a drug user whose prized identity is that of a drug dealer might experience role strain if prevented from selling drugs. Similarly, an addict or alcoholic whose identity has revolved around substance dependence for many years would potentially experience great role strain when new in recovery and attempting to find and fill new life roles.

A critique Pearlman has of psychologically-focused stress theory is that life events often cited as stressful in other research, such as those measured in Holmes & Rahe's Social Readjustment Rating Scale (1967), are typically not discrete events but might instead be episodes that mark the end or beginning of a long-term change or chronic stressor (Pearlin, 1981). For instance, being arrested and going to jail might be an acute stressor for some; however, it could actually reduce stress for an addict who is homeless, unemployed, and unable to stop using illicit drugs. Measuring the event alone does not tell us in what context the event occurred or how distressing it was for the person experiencing it.

Effects of Stress

A large body of literature has documented the psychological and physiological effects of stress. Experiences of stress often result in psychological distress, often evidenced by symptoms of depression and anxiety (Mirowsky & Ross, 2003; Pearlman et al., 1981). However, effects of stress are minimized when high levels of positive social support, self-efficacy, and self esteem are present (Thoits, 2010). Notably, chronic stress

and strain often results in a reduction of self esteem and self-efficacy, resulting in lowered ability to deal effectively with stressors (Pearlin et al., 1981).

Chronic strains are often as distressing, if not more distressing, than stressful life events (Pearlin, 1989). While role strain is one such chronic strain, others include frequent discrimination based on social status, chronic difficulty meeting financial obligations due to SES, long-term marital or relationship dissatisfaction, or the daily difficulty faced by a person with a disability trying to navigate systems designed for non-disabled people. Social placement often impacts exposure to both stressful life events and chronic strains. Also, the experience of one type of stressor can increase the likelihood of experiencing other stressors (Pearlin, 1989).

Research has supported Pearlin's social stress theory, and there are often social factors associated with psychological distress. People at a social disadvantage, specifically those living in lower SES groups, with lower educational levels, women, and single persons, report higher rates of distress and depressive symptoms than their more advantaged counterparts (Mirowsky & Ross, 1986; Ross & Mirowsky, 2006). Stress is often a direct result of social position, and the level of stress associated with social position is a predictor of distress (Aneshensel, 1992). In addition, chronic strains such as poverty, living in unsafe neighborhoods, health problems, or single parenthood can greatly affect mental health (Pearlin, 1989). Further demonstrating a potential connection between social stress and addiction relapse, the same social factors associated with psychological distress are also associated with relapse (Walton et al., 2003).

For low-income women with children, in particular, previous research has demonstrated an association between chronic stress and mental health problems.

Children in the home increase economic hardship and psychological distress, particularly for unmarried women (Brown & Moran, 1997; Mirowsky & Ross, 2003). Ross (2000) found that chronic stress from living in disordered neighborhoods significantly impacted depression for poor, single mother-headed households. Poor support systems, difficulty parenting, inaccessible resources, and financial difficulties significantly affect coping, distress, and subsequent depressive symptoms in single mothers (Baffour, Gourdine, Domingo, & Boone, 2009; Wijnberg & Reding, 1999). While all single mothers are at risk for increased depression, rurality also impacts mental health. Rural single mothers have additional stressors and experience more subjective distress due to increased difficulty obtaining employment and fewer resources for assistance (Turner, 2007).

Social Factors Increasing Exposure to Stress

Social stress theory states that social disadvantage is directly related to experiences of stress and distress (Mirowsky & Ross, 2003). In particular, persons living in low SES groups, racial/ethnic minorities, and women are at an increased risk for stress and distress because of social placement (Mirowsky & Ross, 2003). Notably, these same social patterns have also been found to be associated with substance abuse and relapse.

Socio-economic Status

Effects of stress have particularly been noted for persons of low SES. Lower SES, when defined by income, education level, and un/underemployment, is consistently associated with higher levels of psychological distress (Marmot, 2004; Mirowsky & Ross, 2003). Epidemiological studies have established a strong association between lower SES and depression in general adult samples, and have suggested that this relationship might be related to the experience of chronic psychological stress often

experienced by people living in poverty (Everson et al., 2002; Mirowsky & Ross, 2003). For people of low SES, lack of power, minimal control over their own lives, and financial strain appear to be responsible for high levels of distress (Cole, Logan, & Walker, 2011; Weich & Lewis, 1998).

Rather than SES conceptualized as a single construct, the components comprising SES (employment, income, and education) all play distinct roles in development of distress and should be considered separately (Mirowsky & Ross, 2003). Education increases opportunity for higher-income employment and is the main predictor of upward mobility, and higher education levels are associated with decreased depression in both men and women when compared to less-educated counterparts. Employment often equates with identity, and persons employed in jobs that allow creativity, control, and continued growth experience lower distress than those employed in monotonous and low-power jobs (Mirowsky & Ross, 2003). Often related to employment, income should be considered separately and represents ability to meet financial obligations; financial strain is a predictor of both the onset and maintenance of depression and anxiety (Mirowsky & Ross, 2003; Weich & Lewis, 1998). Research has shown that raising the income of low-income individuals by even \$10,000 annually has a much greater effect on depression than the same amount of money for a higher-income person (Mirowsky & Ross, 2003). However, studies examining income level alone and depressive symptomology have not found significant associations (Gavin et al., 2010). Education, employment, and income must all be considered to understand chronic stress and distress in persons of low SES.

Physiological changes associated with chronic poverty-related stress can impact the body's ability to deal with future stress. The more the body has to compensate for

external stimuli in order to create equilibrium, the higher the allostatic load (McEwen, 2000; McEwen, 2004). Chronic stress and long-term high allostatic load change the body's way of responding to stress and damage the stress response system (McEwen, 2000; McEwen, 2004). Studies of adolescents growing up in poverty indicate that chronic long-term stress in childhood impacts the stress regulation system (Evans & Kim, 2007). Chronic lifetime stress not only causes dysregulation of the stress response system, but also appears to damage parts of the brain that control emotions and impulses (Sinha, 2008). The higher the unpredictability, lack of control, and intensity of stressors, the more damage is done to the body's normal ways of coping with stress (Sinha, 2008). Dysfunctional stress regulation systems could be partially responsible for difficulty remaining abstinent from drugs and alcohol in adults faced with stress, particularly for people living in poverty. Furthermore, two primary psychological resources needed for effective coping, self-esteem and self-efficacy, are often lowered with chronic stress (Pearlin et al., 1981). With reduction in these resources, ongoing hardship experienced by people living in poverty might reduce ability to cope with high levels of stress experienced.

Stress also impacts development of working memory in adults who grew up in poverty (Evans & Schamberg, 2009). Working memory refers to the process of retaining information in the short-term to be able to process and store it in long-term memory if needed; without working memory functioning properly, language comprehension, reading, problem-solving, and long-term memory are impeded. The higher the allostatic load experienced as children, the more difficulty adults have with working memory (Evans & Schamberg, 2009). Challenges with working memory could hinder problem-

solving needed to handle stressful situations without using substances, also leading to difficulty remaining abstinent from drugs and alcohol for individuals living in poverty.

Gender

Women experience stress differently than men. Research on various populations indicates that women often feel more somatic and psychological symptoms of stress than men (Moksnes et al., 2010; Mirowsky & Ross, 2003; Olf et al., 2007; Vrijmoet-Wiersema et al., 2008). Differences between men and women may be partially due to social norms; since many studies are based on self-report, men may be less likely to admit experiencing symptoms of stress due to social norms and perceived weakness if seen as unable to handle stressful experiences. Gender differences in stress responses may also be due to different experiences of threat level, perceptions of loss of control, and increased exposure to stressors or experiences of multiple stressors (Olf et al., 2007). Social stress research has indicated that female status is inherently stressful; women often bear the brunt of family responsibilities, are traditionally valued less in employment settings, and tend to have less control at home, which all contribute to psychological distress (Mirowsky & Ross, 2003).

In addition to experiencing more distress than men, women may depend on substances to cope more than men. Although men use illicit drugs more than women, women more frequently cite emotional reasons for using both drugs and alcohol (Mirowsky & Ross, 2003; Poole & Dell, 2005). This does not only pertain to illicit drugs; women seek medical help for emotional problems more often and are prescribed significantly more psychotropic medications than men, including drugs with high abuse potential such as Valium and Xanax (Mirowsky & Ross, 2003; Poole & Dell, 2005).

Race

Much like with gender and low SES, to be an ethnic/racial minority is inherently stressful. Minority status is associated with increased stress due to greater experiences of discrimination, lower sense of control, and less power and status (Mirowsky & Ross, 2003). In fact, race-related discrimination and associated chronic stress is a greater predictor of psychological distress for Black persons than stressful life events (Ong, Fuller-Rowell, & Burrow, 2009; Utsey, Giesbrecht, Hook, & Stanard, 2008).

Contributing to the stress experience is the relationship between race/ethnicity and SES in the United States; Black persons are disproportionately represented in lower SES groups and are 2-3 times more likely to live in poverty than Whites (Williams et al., 2010). Blacks often are less educated than Whites, and have lower income even when similarly educated (Mirowsky & Ross, 2003; Williams et al., 2010). Blacks have poorer health than Whites, and have higher allostatic load as a result of stress, even after controlling for poverty (Williams et al., 2010).

Despite greater experiences of stress, some studies indicate that Blacks feel less distress than Whites (Williams et al., 2010). This may be at least partially due to substance use, however; one study found that the relationship between stress and distress was moderated by self-reported alcohol and cigarette usage as well as other unhealthy behaviors (Mezuk et al., 2010). This study indicated that higher self-reported alcohol and cigarette use was associated with lower distress even when participants experienced greater numbers of stressful life events (Mezuk et al., 2010). In spite of stressful experiences, Blacks develop depression less often than Whites. However, when

depressed, symptoms tend to be more severe, untreated, and longer-lasting for Blacks than Whites (Williams et al., 2010).

Mediators Impacting the Stress Response

Pearlin's conceptualization of the stress process also includes mediators between stress and psychological distress. Coping, social support, self-efficacy, self esteem, and personality factors such as hardiness or resilience are all mediators in the stress process (Pearlin, 1989). Notably, these same factors also mediate the addiction recovery process after treatment or periods of abstinence (DeHart et al., 2009; Kelly, Stout, Magill, & Tonigan, 2011; Padgett & Drake, 2008; Walton et al., 2003).

Coping refers to an individual's ability to manage a stressor and thus reduce physiological and psychological distress, and the extant literature indicates coping ability often is a mediator in the stress process (Aneshensel, 1997; Banyard & Graham-Bermann, 1998; Pearlin, 1989). Coping serves three functions: changing situations that lead to stress reactions to reduce their noxiousness, changing the meaning of the situation so it is not perceived as stress-inducing, and changing the ability to manage stress symptoms (Pearlin, 1989). Inadequate coping is related to higher mental health problems; for example, avoidant coping strategies such as trying to ignore the problem have been associated with higher depression rates in low-income women (Banyard & Graham-Bermann, 1998). While coping is an individual psychological resource, type of coping used is often learned from a person's social group (Pearlin, 1989).

Research on social stress also suggests that social support reduces negative effects of stressors (Aneshensel, 1997; Pearlin, 1989; Thoits, 2010). Social support does not merely refer to the number of people in one's social circle, but the *quality* of those

relationships. Positive social support is a significant factor in helping impoverished single mothers cope effectively with stress and reduce distress (Baffour et al., 2009). Social relationships are also important for substance abuse recovery, particularly for persons who have co-occurring mental illness or have been homeless (Padgett & Drake, 2008). In fact, one of the primary reasons 12-Step programs such as AA and NA appear to be helpful in maintaining abstinence from substance use is through the development of a recovery-promoting support network (Moos, 2008).

Control over personal life circumstances and control over personal behavior both act as mediators in the stress process. A primary correlate of increased distress in social stress literature is decreased control over one's life (Ross & Mirowsky, 2003; Thoits, 2010). Mastery, or efficacy, is a psychological resource that mediates the stress response (Pearlin, 1989; Pearlin et al., 1981; Raikes & Thompson, 2005; Thoits, 2010). For example, research on parenting stress of poor, single mothers shows that self-efficacy moderates the relationship between income and stress (Raikes & Thompson, 2005). However, chronic poverty could potentially decrease self-efficacy, since people living in poverty often have few options for choosing housing, transportation, or employment and thus have little control over their life circumstances.

Similarly, self-control, or control over one's own actions, is also associated with lower perceived stress and less psychological distress in the face of stressors (Cole et al., 2011; Tangney, Baumeister, & Boone, 2004). Self-control is a problem for many addicts and alcoholics, though, since long-term substance use can damage neurological pathways responsible for impulse control (Sinha, 2008). Even among persons addicted to substances, variation in self-control affects perceptions of stress. A study of substance

abuse treatment participants found that participants with lower rated self-control reported higher perceived stress, and this relationship was magnified for individuals who also felt they were at a lower subjective social standing (Cole et al., 2011). Thus, people living with addiction and experiencing poverty would probably experience even higher perceived stress. Notably, self-control appears to be limited; if one performs activities which require much self-control they have less self-control in subsequent activities (Baumeister, Vohs, & Tice, 2007). This finding has important implications for recovering persons who must use self-control on a regular basis to avoid drug and alcohol use.

Self esteem also mediates the stress response (Moksnes et al., 2010; Thoits, 2010). In adolescents, self esteem is a protective factor that buffers the impact of relationship and school stress on emotional state, including anxiety and depression (Moksnes et al., 2010). Male adolescents, in particular, had higher self esteem than females (Moksnes, et al., 2010). Three longitudinal studies examining impact of stressful life events on adults found that low self esteem was a risk factor that predicted higher depression in all three studies (Orth, Robins, & Meier, 2009). Homeless adults with low self esteem report greater emotional distress and higher alcohol and drug use (Stein, Dixon, & Nyamathi, 2008). Addicts and alcoholics may have lower self esteem than general samples, since low self esteem as adolescents predicts later addiction (Boden, Fergusson, & Horwood, 2008). With low self esteem, addicts and alcoholics might be at an additional risk for mental health problems and difficulty coping effectively with stress.

Summary

In summary, Pearlin's social stress theory provides a framework for understanding the disproportionate amount of psychological distress observed in populations at a social disadvantage. Poverty, low education level, un/underemployment, racial/ethnic minority status, and being female are all associated with increased depression and anxiety as a result of experiences of stress. Resources such as social support, efficacy and self-control, and self-esteem mediate the relationship between stress and distress. Since distress, namely depression and anxiety, is associated with relapse, social stress factors could put persons in socially disadvantaged populations at an increased risk of relapse. Consequently, social stress theory offers promise for understanding rates of substance dependence and relapse noted in socially disadvantaged groups. The parallel nature of the stress and relapse processes will be discussed further in Chapter Three.

Chapter Three

Literature Review

Social stress theory provides a conceptual framework for understanding substance abuse in impoverished and other socially disadvantaged populations. A previous study utilizing a social stress theoretical perspective examined substance abuse and adolescents and found that social stress theory held promise for understanding inner-city adolescent drug use (Rhodes & Jason, 1990). This study demonstrated that behaviors seen as dysfunctional in general populations can be quite functional for some subgroups after examining contingencies of behaviors and social norms in the specific community. In fact, the authors consider substance use as a function of the individual's stress level, and to what extent stress level was buffered by social support, competencies, and resources (Rhodes & Jason, 1990). Although their study examined adolescents, findings can potentially be used to guide conceptualization of research on other impoverished, substance using populations and understanding of the factors impacting relapse in these populations.

In this section, I will review extant literature about social stress, psychological distress, and post-treatment substance use. I will begin by describing social patterns of substance use and addiction, focusing specifically on race, gender, and SES and relationship of these social factors to addiction relapse. I will then discuss the relationship between stress and addiction, focusing on the physiological stress response. Next, I will review literature on the frequent co-occurrence of addiction and mental health problems, specifically depression and anxiety, which may be related to stress experiences. Coping factors such as self-esteem, efficacy, and social support will be

discussed next, reviewing their role as frequent mediators in the relapse process. Finally, I will discuss other factors known to impact the relapse process, including motivation for change and exposure to drug and alcohol-related cues. This review of the literature will lay the foundation for the current study detailed in Chapter Four.

Social Patterns of Substance Use and Addiction

Similar to the relationship between social characteristics and experiences, social characteristics such as gender, race, education, and employment status also appear to affect patterns of drug and alcohol use. In general, men use both alcohol and illicit drugs more than women (OAS, 2009), although women use more licit substances (Poole & Dell, 2005). Race appears to impact the specific type of substance used; biracial and Black individuals report more drug use, while Whites drink alcohol more than other racial/ethnic groups (OAS, 2009). Drug use is also associated with lower educational attainment and unemployment, while alcohol use conversely is associated with higher educational attainment and full-time employment. However, *heavy* alcohol use is reported more often by unemployed individuals than their employed counterparts (OAS, 2009).

Not only are patterns of use different among groups based on demographic factors, but consequences of use also vary (Galea & Vlahov, 2002). Disproportionate rates of morbidity and drug-related mortality occur in low SES populations, potentially due to sharing drug paraphernalia or engaging in other high-risk behaviors, having decreased access to medical and substance abuse treatment, and lacking financial resources. Impoverished drug users who have inadequate housing are more likely to contract and spread infectious diseases, and homeless drug users are more likely to also

practice risky sexual behaviors and have higher chances of contracting sexually transmitted infections. Since racial/ethnic minorities are over-represented in low SES populations, harmful consequences of substance use affect minorities more than Whites (Galea & Vlahov, 2002). Substance use is a vicious cycle, with use often in response to social inequality, yet one of the primary factors in perpetuating inequality due to its impact on health, financial well-being, and social standing of users (Wilkinson & Marmot, 2003).

Even though social characteristics are often associated with use patterns for substances of abuse, traditional relapse prevention interventions for recovering individuals focus on making individual changes to reduce likelihood of relapsing and often seem to ignore the presence of social factors; the identification of personal “triggers” is central, followed by learning to avoid triggers when possible and increase coping skills to effectively deal with unavoidable triggers (Brandon, Vidrine, & Litvin, 2007). However, factors other than individual, psychological ones impact risk of relapse, and biological and social factors should also be considered when attempting to prevent or understand return to substance use after periods of abstinence (Festinger et al., 2001). Characteristics such as being single and of low SES, having a drug or alcohol-using support system, and having low self-efficacy or co-occurring psychiatric disorders all have been associated with relapse (Walton et al., 2003). Negative affective states, poor coping ability, increased cravings, interpersonal difficulties, and a lower level of commitment to abstinence have also been associated with a return to substance use post-treatment (McKay, 1999).

People of low SES may have additional risk factors than their higher-income counterparts, since unemployment and low educational levels are associated with higher rates of substance abuse and dependence (SAMHSA, 2010). Despite the association between low SES and substance use disorders, many previous studies on substance abuse and relapse have not focused on specific needs of low-SES individuals. However, special focus on individuals living in poverty is needed since many of the established predictors of relapse are observed frequently in low-income populations. One study examining low-income participants (TANF recipients) found that high rates of neighborhood distress, regular exposure to drugs and alcohol, greater risk of exposure to crime, experiences of chronic stress, higher risk of acute stress related to neighborhood crime, and lower social support were all related to the development of problematic drinking patterns (Mulia, Schmidt, Bond, Jacobs, & Korcha, 2008). Although it was argued over three decades ago that substance abuse interventions reflected middle class values and beliefs, were often designed with middle class samples, and research should be conducted with low-income populations using a social stress perspective (Rhodes & Jason, 1990), no further research has been done specifically examining relationships between poverty, social stress, and substance abuse. However, to fully address the complex problem of drug and alcohol addiction, it is not sufficient to only treat the individual user and ignore social factors impacting use and relapse of persons of low SES (Wilkinson & Marmot, 2003).

Social Factors, Addiction, and Relapse

Low Socio-economic Status. Differences in substance abuse, as well as health and mental health, follow a gradient across socioeconomic groups, with individuals in lower SES groups consistently experiencing more problems than individuals in higher

SES groups (Buka, 2002; Marmot, 2004). However, the exact nature of the relationship between SES and substance abuse is not fully understood and could be related to many factors, including stress, childhood experiences, financial barriers to treatment, or social inequality.

Low SES in Adulthood. Low SES places recovering individuals at higher risk for relapse, which appears to be related to a number of causal mechanisms. First, poverty decreases opportunities for needed treatment, particularly for women (Greenfield et al., 2007). Women with childcare responsibilities may not be able to find a suitable caretaker for children in order to participate in treatment (Tuchman, 2010). If unable to obtain adequate treatment, low-income participants may be more likely to relapse than higher-income participants who can afford treatment at the level most appropriate for the severity of their addiction.

Second, poverty potentially increases exposure to other drug and alcohol users. Individuals living in poverty often live with other alcohol or drug-using individuals out of necessity; poor urban inhabitants often live in drug and alcohol-infested income-based neighborhoods (Boardman, Finch, Ellison, Williams, & Jackson, 2001), and both poor urban and rural inhabitants are often forced to live with other family and friends who may be using substances as a result of inability to afford independent housing (Padgett & Drake, 2008). Few options for housing may place impoverished recovering addicts and alcoholics at high risk for relapse.

Third, poverty increases stress, chronic strain, and depressive symptomology (Mirowsky & Ross, 2003), which could subsequently increase risk of relapse. Unemployment and low educational level, two primary indicators of low SES, are

associated with substance abuse and dependence (SAMHSA, 2010). The relationship between low SES and substance abuse could be related to experiences of depression; experiencing chronic poverty more than triples the likelihood of meeting the diagnostic criteria for depression (Lynch et al., 1997), and other studies have also found that lower SES individuals are more likely to be depressed than their higher-SES counterparts (Lorant et al., 2003; Mirowsky & Ross, 2003). Both depression (Brown et al., 1998; Greenfield et al., 1998; Hasin et al., 2002; Walton et al., 2003) and chronic stress (Hyman et al., 2009; Tate et al., 2008; Tuchman, 2010) are predictors of relapse.

Notably, a longitudinal study of alcohol and opiate addicts found that stable employment history was a stronger predictor of long-term abstinence from drugs and alcohol than any other factor, including severity and length of addiction or inpatient treatment participation (Vaillant, 1988). In fact, heroin addicts with stable employment for four years immediately prior to treatment were nearly 4 times as likely to remain abstinent 12 years after treatment than individuals who did not have a stable work history. Even more striking, sixty percent of participants who reported working half of their adult life or more were abstinent 12 years after treatment, while 0% were abstinent who had not worked for half of their adult life (Vaillant, 1988).

While poverty might contribute to substance use, the opposite might also be true and the relationship between SES and substance abuse could partially result from the economic consequences of addiction. Addiction often increases risk of remaining in poverty, both by decreasing employment opportunities and decreasing access to governmental assistance needed if unemployed. In studies of welfare recipients, substance abuse has been identified as a serious barrier to employment (Taylor &

Barusch, 2004) and has been associated with lower earned income in individuals who are employed (Dworsky & Courtney, 2007). In a longitudinal study of a large sample of AFDC and general assistance (food stamps and Medicaid) recipients, substance abuse was associated with a higher percentage of repeat and multiple welfare-receipt episodes for individuals receiving general assistance, although not for participants receiving AFDC (Schmidt, Weisner, & Wiley, 1998). Women, in particular, who have SUDs and mental disorders, often have low educational attainment and poor work histories that cause difficulty with obtaining employment (OAS, 2004).

Also contributing to difficulty with self-sufficiency, individuals addicted to drugs and alcohol are often convicted of substance-related crime which can cause difficulty finding employment and disqualification from federal financial and food assistance. Studies have shown that many drug felons have addictions which need to be treated (Chandler, Fletcher, & Volkow, 2009). Due to difficulty obtaining and maintaining employment, individuals with drug felonies may have more trouble meeting financial obligations after conviction and require assistance from charitable organizations, including help obtaining food (Kubiak, Siefert, & Boyd, 2004). However, due to U.S laws pertaining to drug felonies, these individuals are often ineligible for governmental benefits. The 1996 Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA), which established Temporary Assistance for Needy Families (TANF) to provide cash, food, and medical assistance for people with dependent children who meet income eligibility, includes a provision (§115) banning assistance for any person convicted of a felony for drug possession, use, or distribution since passage of the act in 1996.

Housing may also be a problem for low-income drug offenders, potentially causing more strain and placing these persons at an increased risk of relapse. The Quality Housing and Work Responsibility Act of 1996 (QHWRA) includes a prohibition against providing income-based housing for people convicted of drug crimes, and allows landlords to deny housing to any leaseholder with a household member who has been caught using illegal drugs. Since safe and stable housing is important for preventing relapse (Padgett & Drake, 2008), the ban on income-based housing might contribute to relapse rates for low-income individuals with SUDs. If unable to find income-based housing, many people attempting to recover from substance abuse problems could be homeless or forced to live with unsafe family or friends who may still abuse substances (Padgett & Drake, 2008). Remaining abstinent from drugs and alcohol could be quite difficult, if not impossible, for people forced to live with others who have drug or alcohol problems.

Because TANF, food benefits, and public housing are provided for families below federal poverty levels, women are affected by the ban on governmental benefits for drug felons more than men, given that custodial parents are primarily women and single mothers are more likely to be poor (Cawthorne, 2008). In fact, although there is a consistent gender disparity in poverty rates, this disparity increases significantly for women during childbearing years, and single mothers' poverty rates are double those of single fathers (Cawthorne, 2008). People living in poverty might depend on these federal benefits in order to have safe housing, food, and money for basic needs. Thus, women may have more poverty-related stress than men if caring for children and unable to meet basic needs.

Inequality. The relationship between SES and substance abuse may be related to income inequality and the subsequent effects of inequality (Marmot, 2004). Marmot coined the term “status syndrome” to refer to the social gradient observed for many health and mental health problems. Rather than simply a difference between rich and poor, this gradient demonstrates that no matter where one falls on the SES scale, the person highest in SES will have fewer problems, on average, than people lower than them. This gradient does not appear to be directly related to income, but rather the helplessness, lack of control over life, increase in chronic stress, and increased exposure to conditions conducive for development of physical or mental health problems that come with living in low-SES brackets (Lantz et al., 2005; Marmot, 2004).

In a study examining perceived stress of substance abuse treatment participants, discrimination and economic hardship were positively related to perceived stress, and personal control and self-control were negatively related to perceived stress (Cole et al., 2011). Social exclusion factors, such as lower perceived social status, were also related to an increase in perceived stress. Approximately two-thirds of the participants in this sample of nearly 800 people felt they had been discriminated against, with over half perceiving that discrimination was due to their substance use history (Cole et al., 2011). Relapse rates in low-SES groups could be related to inequality and perceived discrimination or from chronic stress and strain.

Poverty in Childhood. Many studies examining associations between poverty and substance abuse have focused on the impact of poverty on childhood. Since substance use is often initiated in adolescence, childhood experiences often impact initial experimentation with substances that precedes development of substance dependence. A

meta-analysis shows that children who grew up in poverty are more likely to use illicit drugs as adults (Daniel et al., 2009), implying that there is something unique about the experience of growing up poor that impacts likelihood of using substances. However, this same study found no association between childhood poverty and adult alcohol use, and also was not able to study the relationship between *substance dependence* and childhood disadvantage due to most studies reviewed examining only use and not dependence (Daniel et al., 2009). In addition to the relationship between childhood poverty and substance use, childhood poverty has also been associated with addiction relapse, specifically predicting continued use in a two-year study of participants with co-occurring mental illness and substance abuse who were attempting to remain abstinent (Alverson et al., 2000).

Stress could be responsible for high rates of adult substance abuse in individuals who grew up in poverty. Children raised in poverty experience more stressors, such as overcrowded living conditions, unsafe housing, violence, or family turmoil, than their middle-class counterparts (Evans & English, 2002). Even when middle-class children experienced the same type of stressor, impoverished families indicated that experiences of stressors were higher in intensity and more severe than middle-class families. Overall, one study indicated that low-income families experienced three or more stressors, while middle-class families experienced less than two. In addition, physiological changes were noted for children who experienced multiple stressful events, including higher blood pressure, cortisol, and epinephrine levels (Evans & English, 2002). These changes result from high allostatic load over time, and allostatic load is directly related to substance dependence and relapse (Cleck & Blendy, 2008).

Race. Many researchers have noted higher rates of substance abuse in minority groups, such as racial/ethnic minorities (Wallace, 1999). While Whites have higher rates of alcohol use and dependence than Blacks, alcoholism persists longer for Blacks than Whites (Williams et al., 2010). Also, Blacks are more likely to use illicit drugs than Whites (OAR, 2009). High rates of addiction in minority groups appear to be a result of social stress; studies of high prevalence of substance use in racial minorities have established that socioeconomic status and increased exposure to environmental factors impacting addiction are responsible for most of the higher rates observed in this population (Wallace, 1999). In fact, while many studies have identified significant racial differences in health, mental health, and substance abuse outcomes, with Blacks experiencing much worse outcomes than Whites, much of the statistical difference between racial groups is accounted for by socioeconomic status (Buka, 2002) and social disadvantage (Mulia, Ye, et al., 2008). Because of chronic stress experiences, Blacks have higher allostatic load (Williams et al., 2010), which could contribute to relapse.

While participants of racial/ethnic minorities often experience higher stress (Ong et al., 2009; Utsey et al., 2008), they do not always experience higher distress (Mezuk et al., 2010). To explore this further, a large epidemiological study examining race, social disadvantage, stressful life events, depression, and health behaviors including alcohol use, found the relationship between race and depression was moderated by health behaviors including substance use (Mezuk et al., 2010). Black participants, while expected to report higher rates of stressful life events and subsequent depression, reported lower depression than whites even though they reported more life stress. However, Black participants reported significantly higher poor health behaviors, including smoking and

drinking alcohol. The association between stressful life events and subsequent depression was reduced for every increase in poor health behaviors reported by participants (Mezuk et al., 2010).

Gender. Women might be at a higher risk of relapse due to social stress when compared to men. Women are more likely to live in poverty (Cawthorne, 2008), particularly relevant since there is evidence that social disadvantage due to living in poverty is related to an increase in psychological distress and an increase in problematic substance use (Mulia, Ye, et al., 2008). Unsafe housing and neighborhoods are frequently a problem for impoverished women, and living in disordered neighborhoods increases drug use, possibly due to increased access to drugs and drug dealers, increased chronic stress and strain, and an increase in exposure to acute stressors such as crime (Boardman et al., 2001).

Women have more barriers to treatment than men (Greenfield et al., 2007), which perpetuates substance dependence or could lead to relapse if women are not able to receive sufficient treatment for their level of addiction severity. Research suggests that women with economic and educational disadvantages or few social supports have the most difficulty accessing and completing substance abuse treatment, and dependent children in the home may also decrease the likelihood a woman will seek treatment. Even without these added challenges, there has historically been a greater stigma for addicted women that has decreased the likelihood that women will be assessed and diagnosed with substance use disorders and subsequently decreases women's opportunities for treatment (Greenfield et al., 2007). Without adequate treatment to meet women's needs, relapse risk might be increased.

Stress and Addiction

One of the primary reasons social factors are correlated with addiction and relapse could be due to stress and chronic strain associated with social disadvantage (Buka, 2002; Laaksonen et al., 2009; Mirowsky & Ross, 1986; Mirowsky & Ross, 2003; Mulia et al., 2008; Pearlin, 1989; Ross, 2000; Wang et al., 2009; Weich & Lewis, 1998). All of the factors mentioned above are associated with higher levels of stress than in populations of higher social advantage. Stress often leads to psychological distress (Mirowsky & Ross, 2003), and also increases vulnerability to addiction relapse (Brown, Vik, Patterson, Grant, & Shuckit, 1995). In addition, likelihood of relapse is impacted by severity and chronicity of the stressful experiences (Brown et al., 1995).

Experiences of stress for recovering persons are important to understand further since stress has been identified in numerous studies as a strong predictor of relapse for persons attempting to abstain from substance use (Alverson et al., 2000; Hyman et al., 2009; Mattoo et al., 2009; McMahon, 2001; Sinha et al., 2009; Tate et al., 2008; Tuchman, 2010).

Poverty-related stress is one source of chronic stress that appears to be highly related to relapse. Chronic financial, legal, or social difficulties have been associated with relapse rates in veterans, particularly for participants with low self-efficacy, and one study found that financial difficulty was the most common stressor associated with relapse (Tate et al., 2008). For people with severe mental illness and addiction, stressors such as childhood poverty, unsafe housing, and poor social support are often predictors of substance abuse and difficulty remaining abstinent (Alverson et al., 2000). Notably, experiences of chronic stress might change the body's experience of intoxication from

substance use; the intoxicating effect of alcohol appears to be lessened for people with backgrounds of chronic stress as opposed to people who have not experienced chronic stressors (Breslin, Hayward, & Baum, 1995).

Childhood and adult experiences of adversity and chronic stress are associated with neurological and physiological changes that occur and alter the body's ability to cope with ongoing stressors (Sinha, 2008). The higher the unpredictability, lack of control, and intensity of the stressor, the more the body's systems for dealing with stress become dysregulated (Sinha, 2008). Notably, stress appears to damage the parts of the brain that regulate emotions and control impulses. However, regular substance use can damage the same parts of the brain and alter mechanisms for dealing with stress effectively. Addicted individuals have strong cravings and increased anxiety during stressful situations, but some researchers have postulated that this response could be due to either effects of chronic substance use *or* effects of chronic stress on the brain (Sinha, 2008). If both substance use and chronic stress damage the same part of the brain, it is possible that there is a cumulative effect if a person is affected by chronic stress *and* substance use.

Animal research supports the premise that the physiological stress response is related to addiction and relapse (Liu & Weiss, 2002; Wang et al., 2005). Previously alcohol-dependent rats in remission and exhibiting no alcohol-seeking behaviors immediately begin seeking alcohol after being exposed to either a stressor or conditioned alcohol-related stimuli (Liu & Weiss, 2002). In this study, a significant interaction also was observed, and rats exposed to both a stressor and conditioned stimuli simultaneously exhibited significantly greater and longer alcohol-seeking behavior than rats exposed to

one factor alone. Researchers in this study tested medications to prevent relapse, and naltrexone, an opiate antagonist often given to people recovering from alcoholism, was observed to only prevent relapse due to conditioned alcohol stimuli. A corticotrophin-releasing factor antagonist had to be administered in conjunction with naltrexone to reverse the interaction effect and prevent relapse due to stress, indicating that there are two separate neurological processes at work (Liu & Weiss, 2002). Since low-income individuals often experience chronic stress, and often live in neighborhoods or in households full of drug and alcohol-associated stimuli, this could mean they are at an increased risk for relapse.

Mental Health and Addiction

Complicating the relationship between stress and addiction relapse is mental health. There is a large body of literature documenting the association between substance use disorders, relapse, and mental health problems. Approximately 4 million adults in the United States are identified as having co-occurring mental disorders and substance abuse or dependence (OAS, 2003), and depression and anxiety are the most commonly observed disorders (Ahmadi & Ahmadi, 2005; Scorzelli & Chaudhry, 2005; Watkins et al., 2004). Mental illness is associated with increased substance dependence; in 2002, 23.2% of adults with a mental disorder met diagnostic criteria for substance dependence, while only 8.2% of adults without a mental disorder met criteria (OAS, 2003). Overall, individuals with co-occurring substance use and mental health disorders often have difficulty with physical, social, and emotional functioning, and many report recent homelessness and unemployment (Watkins et al., 2004). While women are more likely to have co-occurring disorders, they are also more likely than men to receive treatment

(OAS, 2004). However, women with co-occurring mental and substance use disorders also tend to have additional difficulties that are barriers to self-sufficiency such as poor employment skills and work histories, low educational attainment, and physical health problems than their male counterparts (OAS, 2004), potentially contributing to poverty rates for women with substance use disorders. Although there is a high rate of co-occurrence between substance dependence and mental health problems, only 35% of all public and private treatment centers have programs designed for co-occurring disorders (OAS, 2006).

Depression is the mental disorder most highly associated with substance abuse and dependence; depressive episodes and symptoms are related to both the initiation of substance use (OAS, 2007b) and difficulty abstaining from use after treatment (Brown et al., 1998; Greenfield et al., 1998; Hasin et al., 2002). A depression diagnosis has been associated with increased cravings for drugs (Brown et al., 1998), and with shorter times of abstinence in both adults (Greenfield et al., 1998) and adolescents (Cornelius et al., 2004) with diagnosable alcohol use disorders, as well as adults with other substance use disorders (Hasin et al., 2002). In a meta-analysis of studies on relapse of opiate users post-treatment, depression was one of the strongest longitudinal predictors of relapse (Brewer, Catalano, Haggerty, Gainey, & Fleming, 1998). Notably, a study of veterans indicated that participants with co-occurring depression and substance use disorders were more likely to relapse due to a negative emotional state than participants with substance use disorders only (Tate et al., 2004). Depression also complicates addicts' ability to deal with stress in recovery and increases risk of relapse when faced with life stressors (Tate

et al., 2008). Low income women, in particular, often have substance use disorders worsened as a result of stress and depression (Tuchman, 2010).

Anxiety is also commonly associated with substance use and abuse, often coinciding with the use of depressant substances such as alcohol, opiates, or benzodiazepines which may reduce symptoms (Ahmadi & Ahmadi, 2005). Studies of opiate addicts indicate that the majority meet the diagnostic criteria for an anxiety disorder and report their use is related to experiences of symptoms (Ahmadi & Ahmadi, 2005; Scorzelli & Chaudhry, 2009). Relapse to marijuana use has also been associated with symptoms of anxiety (Bonn-Miller & Moos, 2009). Social anxiety, in particular, is associated with high rates of alcohol use disorders (Buckner, Timpano, Zvolensky, Sachs-Ericsson, & Schmidt, 2008).

Different theories attempt to explain frequent co-occurrence of mental and substance use disorders. While some think that mental health problems increase risk of developing an addiction (Khantzian, 1985), others think that substance use disorders increase risk of developing mental disorders (Ahmadi & Ahmadi, 2005; Fergusson, Boden, & Horwood, 2009). There are common factors associated with the development of both disorders, such as low self-esteem in childhood and adolescence which is associated with both development of anxiety and substance use disorders (Boden et al., 2008). Also, many have noted that addicts' substances of choice do not appear to be random; effects of each substance used often reduce psychiatric symptoms experienced by the individual (Khantzian, 1985). If addicts are self-medicating mental disorders, abstinence could be difficult if psychiatric symptoms are not treated or otherwise reduced. Notably, depression and anxiety are the two most common mental health

problems for persons of low SES (Weich & Lewis, 1998), so this could place low-income recovering persons at an increased risk for relapse.

The self-medication hypothesis is the most common theory explaining high rates of co-occurring mental and substance use disorders. It has been observed that many addicts appear to choose substances to use in order to treat symptoms of mental illness experienced (Blume, Schmaling, & Marlatt, 2000; Khantzian, 1985; Robinson, Sareen, Cox, & Bolton, 2011), and some individuals reporting baseline psychiatric symptoms indicate a reduction in symptoms in the days or weeks after substance use (Tomlinson et al., 2006). Since symptoms of depression and anxiety are often the result of stress (Fox et al., 2010), individuals living with social stress might be at an increased risk for relapse after treatment. Chronic stress also decreases a person's ability to deal with depression (Tate et al., 2008), further increasing risk of relapse according to the self-medication hypothesis.

Another theory explaining co-occurring mental and substance use disorders is the rebound hypothesis (Frone, 2008; Tomlinson et al., 2006). This hypothesis states that ingestion of drugs and/or alcohol causes physiological and psychological changes that result in an occurrence or worsening of psychiatric symptoms after substance use. Only recently studied when compared to research examining the self-medication hypothesis, this theory is increasing in empirical support. A study of veterans in substance abuse treatment found that over two-thirds of participants experienced more symptoms of depression and anxiety within a two-week period after substance use than they did before use, with depression reported more often than anxiety (Tomlinson et al., 2006). However, since these were individuals attempting to abstain from use, reported

psychiatric symptoms could be the result of shame over use rather than physiological changes.

It is possible that some symptoms of depression and anxiety are related to stress rather than mental disorder. Studies of addicts entering treatment have examined perceived stress and coping, and found that addicts report higher stress levels than healthy controls, and fewer adaptive coping skills such as problem solving, affect regulation, and conflict resolution (Hyman et al., 2009). Previous studies have established that depression is often the result of stress (Fox et al., 2010; Pianta & Egeland, 1994), and there have been similar findings for the relationship between anxiety and stress (Fox et al., 2010). Females, in particular, appear to experience more psychological distress from stressors than males (Waaktaar et al., 2004). In addition, while stress can contribute to mental health problems, studies have also found that mental health problems lead to later stress. A longitudinal study of adolescents found that baseline depression predicted greater experiences of stress at follow-up (Waaktaar et al., 2004).

An association between SES and depression and anxiety has been established in many empirical studies in varied cultures and countries, including the United States (Mirowsky & Ross, 2003), Great Britain (Laaksonen et al., 2009; Weich & Lewis, 1998), Finland (Laaksonen et al., 2009), and Canada (Wang et al., 2009). Important for understanding the relationship between depression and low SES is that depression is often measured in empirical studies using the CES-D or other established scales which measure objective symptoms of depression (Lorant et al., 2003). However, without context to understand if symptomology is an appropriate expression of normal sadness or

a sign of disorder, results on any measure of depression could potentially be misleading since the endorsement of symptoms alone does not equate mental disorder (Horwitz & Wakefield, 2007). With higher stress and fewer effective coping skills, addicts are at risk for experiencing psychological distress which could mimic mental disorder. This could be particularly true with individuals in poverty, who might endorse symptoms of depression that are appropriate considering the stressful experiences of everyday life in a low SES bracket.

Stress, Addiction, and Coping

Self-esteem

Depression and anxiety are also related to other factors that decrease ability to effectively cope with stress, including low self-esteem (deJong, Sportel, deHullu, & Nauta, 2011). Low self-esteem is an established predictor of both substance abuse and depression (Boden et al., 2008). Low self-esteem decreases coping ability (Orth et al., 2007), and increases perceived stress and psychological distress (Pearlin et al., 1981; Thoits, 2010), thereby potentially increasing risk of relapse after stressful situations. In fact, high self-esteem is a mediator in the stress process, reducing subsequent emotional distress after experiences of stress (Pearlin, 1989). Since substances are often used to cope with stress (Alverson et al., 2000; Tate et al., 2008), low self-esteem might predict future substance use. Research has indicated that people with low self-esteem report higher alcohol usage after stressful interpersonal situations than others with higher self-esteem (DeHart et al., 2009). If self-esteem reduces coping ability, then financial or other stress experienced by addicts and alcoholics after treatment could place them at risk of relapse.

Efficacy

Efficacy has been implicated as another factor potentially contributing to experiences of both stress (Cole et al., 2011; Mirowsky & Ross, 2003) and relapse (Mattoo et al., 2009; Walton et al., 2003; Walton, Reischl, & Ramanathan, 2002). Addicts and alcoholics might have lower self-control prior to beginning to use substances, since low behavioral and emotional self-control and regulation is related to the initiation of substance use in adolescents (Chartier, Hesselbrock, & Hesselbrock, 2010). However, substance use worsens problems with self-control and long-term substance use impacts the brain's ability to control impulses (Sinha, 2008). Consequently, recovering addicts might have increased difficulty with self-control. This has been substantiated in previous research, and low efficacy is often a predictor of relapse (Walton et al., 2003). One study found that substance abuse treatment participants newly abstinent from alcohol had lower self-control than a comparison group of social drinkers, reducing their ability to successfully manage behavior and emotions (Fox, Hong, & Sinha, 2008). Another study of recovering men found that participants who relapsed during the study reported significantly lower self and social efficacy than participants who were able to remain abstinent (Mattoo et al., 2009). However, 12-step meetings have been found to increase efficacy and confidence in ability to maintain abstinence (Moos, 2008), so participation in AA or NA might decrease relapse risk. Lack of efficacy or self-control could increase relapse risk for people recovering from addictions if faced with alcohol or drug-related triggers (Walton et al., 2002).

Notably, experiences of stress might lessen efficacy, potentially further increasing risk of relapse for people in recovery in low SES groups. Another study of substance

abuse treatment participants found that both self-control and control over life were positively associated with perceived stress, and a significant interaction was found between subjective social standing and personal control (Cole et al., 2011). Participants' experiences of perceived stress increased if they had low personal control and were of low social standing when compared to participants of higher social standing (Cole et al., 2011). Since stress is a predictor of relapse (Sinha, 2007; Sinha, 2008), poverty might increase risk of relapse if participants have feel that they have little personal control over stressors.

Social Support

Social support is another factor associated with decreased stress and also contributes to relapse. However, while general social support has been identified as a mediator in the stress process (Aneshensel, 1997; Pearlin, 1989; Thoits, 2010), general social support alone may not be sufficient for preventing relapse. It is possible that people recovering from SUD have extensive social networks, yet those social support systems might contribute to relapse more than recovery. Relationships with other addicts often contribute to initial substance use (Chartier et al., 2010; Hughes, 2007), and in fact often affect initiation of use, development of addictive behavior, and perpetuation of addiction more than physiological or psychological processes (Hughes, 2007). Involvement in social relationships with other drug users is a predictor of illicit drug use, including cocaine and heroin (Schroeder et al., 2001), and has been identified as a predictor of relapse for some recovering persons (Harris, Fallot, and Berley, 2005). As the individuals' drug use progresses, relationships with non-users are reduced and relationships with users increase, and this change in social support leads to becoming

more and more entrenched in an addiction lifestyle. Becoming abstinent from drug use requires a change in social support and development of a non-using identity (Hughes, 2007). Thus, relapse prevention should focus on developing new peer support groups that support recovery. Recovery support, rather than social support alone, is particularly important for persons attempting to remain abstinent from drugs and alcohol.

Building a recovery-supporting social network is important in early recovery to help the individual maintain long-term abstinence. In fact, one of the primary reasons for frequently encouraging attendance at 12-step programs such as Alcoholics Anonymous or Narcotics Anonymous during and post-treatment is to help individuals enter and sustain long-term recovery through the assistance of a pro-abstinence social support group (Kelly et al., 2011). People who actively participate in 12-step programs have fewer substance-using friends and more recovery-supporting social ties than people who do not attend 12-step programs (Kelly et al., 2011; Moos, 2008).

Other Factors Affecting Relapse

Motivation for Change

Low motivation for change is associated with addiction relapse (McKay, 1999); all substance abuse treatment participants might not be fully motivated to change their addiction lifestyle. The Transtheoretical Model of Change explains the complex process through which people go when attempting to make life changes (DiClemente, Schlundt, & Gemmell, 2004). The first phase is precontemplation, when people are in denial or unaware of the need for change. As awareness grows of potential need for change, individuals develop awareness of their problem and move into the contemplation phase. The preparation phase begins when the individual is beginning to take steps to plan for

change, and the action phase is when the person begins to take action to make changes. The last step is maintenance, when the change has already been made and the individual is attempting to maintain new behavior (DiClemente et al., 2004). Motivation for change is a series of steps that take place during the precontemplation and preparation stages of change, beginning with problem recognition and followed by desire for help and motivation for treatment (Simpson & Joe, 2004).

Low motivation impacts treatment participation and subsequent relapse. A qualitative study of outpatient substance abuse participants indicated that low problem recognition was responsible for early treatment dropout (Laudet, Stanick, & Sands, 2009), and quantitative studies have found similar results (Hiller, Knight, Leukefeld, & Simpson, 2002). Desire for help and treatment readiness are associated with engagement in treatment for samples of court-ordered treatment participants (Hiller et al. 2002). Motivation for recovery is important for long-term abstinence, and motivational enhancement techniques might be useful to increase treatment compliance and long-term abstinence (Witkiewitz, Hartzler, & Donovan, 2010). Participation in 12-step groups has also been associated with increased motivation for recovery (Moos, 2008) and may improve treatment outcomes.

Exposure to Drug/Alcohol-related Cues

Traditional relapse prevention literature often focuses on reduction of “triggers”, or drug and alcohol-related cues (Brandon et al., 2007). Triggers can be people with which the addict used substances, places where they used, or sights or smells associated with drug or alcohol use. Notably, poverty might impact exposure to drug and alcohol-related cues. In urban areas, low-income neighborhoods have been found to have a

higher number of alcohol outlets (Bluthenthal et al., 2008) and drug trafficking (Ensminger, Anthony, & McCord, 1997; Shroeder et al., 2001). Even in rural areas without high density urban housing “projects”, people living in poverty might often be forced to live with friends or relatives due to financial need. Since people using alcohol and drugs often have social circles of other drug and alcohol users, this means that someone trying to abstain from alcohol or drugs may be forced to live with someone still using thus increasing their exposure to drug and alcohol-related cues. Because of increased exposure to drug and alcohol-related cues, the limited nature of self-control (Baumeister et al., 2007) has important implications for persons in poverty. If placed in situations where numerous drug and alcohol-related cues are present, self-control could be depleted rapidly from attempting to avoid using substances despite triggers. This could potentially lead to decreased ability to avoid substance use and increased relapse or addiction severity.

Summary and Implications

Stress is closely associated with relapse, and many predictors and mediators in the stress process are also similarly implicated with relapse. Although social factors are implicated in the relapse process, traditional methods of relapse prevention often focus on individual factors such as increasing cognitive understanding of relapse triggers, increasing coping skills, and decreasing exposure to drugs and alcohol (Brandon et al., 2007). But what if someone cannot simply decrease stressors and exposure to triggers due to their social placement? People in poverty have very little control over their social environment when compared to people of higher-SES status (Mirowsky & Ross, 2003) and thus may have less control over exposure to triggers. What if participating in

treatment and returning to a poverty-stricken, stressful environment increases chances of future relapse? It is possible that social factors impact relapse as much, if not more, than the psychological factors typically treated and included in relapse prevention planning.

Rhodes and Jason (1990) argue that substance abuse interventions targeting the individual imply that substance abuse is a result of a personal deficit, when the focus should be on environmental factors and the transactions between the person and their environment (Rhodes & Jason, 1990). Based on the multitude of factors impacting relapse, a social stress theoretical perspective requires the consideration of a multi-dimensional model for understanding relapse considering both psychological and social variables and the inter-relationships between them.

While a considerable amount of research has been conducted examining the relationship between poverty, social stress, and mental health outcomes, very few researchers have examined how poverty, social stress, and psychological distress impact addiction relapse. Many current models of relapse prevention utilize individual interventions, rather than addressing social-environmental factors that are also correlated with relapse (Brandon et al., 2007). While individual behavioral changes certainly are positive and can help with increasing coping ability, social and environmental factors that also heavily impact substance use and relapse should not be ignored.

In summary, this literature review indicates that social stress factors are often relapse risk factors (Festinger et al., 2001; SAMHSA, 2010). While the exact nature of the relationship is not fully understood, it could be related to effects of social inequality and exposure to stress since poverty and social inequality are associated with chronic stress and psychological distress (Everson et al., 2002; Mirowsky & Ross, 2003) and

stress and psychological distress are often contributing factors to addiction and relapse (Brown et al., 1998; Greenfield et al., 1998). Thus, it is possible that social and poverty-related stress are predictors of relapse. This study will build on previous research exploring predictors of relapse by filling a gap in the literature and specifically examining the relationship between social stress factors, economic hardship, psychological distress, and relapse.

Chapter Four

Methods

In this section, I will discuss the research design of the current study, including the source of secondary data used, the sample and research methods of the original study from which the secondary data came, conceptual and operational definitions of all model variables, and the analytic plan.

The Current Study

This quantitative study examined secondary data collected from a nonprobability sample of individuals who participated in the Kentucky Substance Abuse Treatment Outcome Study (KTOS) baseline and follow-up surveys (Walker et al., 2011). KTOS is a longitudinal study that uses a pre-test/post-test design to examine baseline information about substance use and mental health and follow-up information for 12-months post-baseline. Data from KTOS was used for this study to examine factors predicting post-treatment addiction severity for Kentucky substance abuse treatment participants. Specifically, the role of social stress factors, economic hardship, subjective distress, perceived stress, desire for help, and self-control were examined to test whether they predicted follow-up addiction severity.

Sample

Secondary data was used for this study from the Kentucky Substance Abuse Treatment Outcome Study (KTOS). KTOS is a state-funded, legally mandated study collecting baseline data on substance abuse, criminal justice involvement, recovery supports, living situation, and employment for all participants in Kentucky state-funded substance abuse treatment programs (Walker et al., 2011). In addition to baseline data,

KTOS also collected follow-up data on a randomly selected sample of baseline survey participants 12 months post-baseline.

Secondary data utilized in the study consisted of baseline and follow-up results from a sample of individuals who participated in the KTOS baseline survey between July 1, 2008 and June 30, 2009 and subsequent follow-up survey between July 1, 2009 and June 30, 2010. KTOS used a pre- and post-test design, collecting baseline data at the time a participant enters treatment and follow-up data approximately 12 months post-baseline (Walker et al., 2011). At the time of the baseline survey, all participants gave informed consent for the study and provided contact information to be reached for follow-up. They were assured that participation was voluntary and would not impact treatment services in any way. Their baseline information was collected using a structured questionnaire via a web-based system. Participants consented to being contacted for follow-up 12 months post-baseline, and a randomly selected subsample of consenting participants was selected for follow-up surveys. If selected, participants were contacted for follow-up surveys, and if consenting, were interviewed by phone. Participants were paid \$20 for participation in each survey. Original KTOS research protocol was approved by the Institutional Review Boards at UK and the Kentucky Cabinet for Health and Family Services, and this author was approved as key personnel to have access to secondary data (Walker et al., 2011).

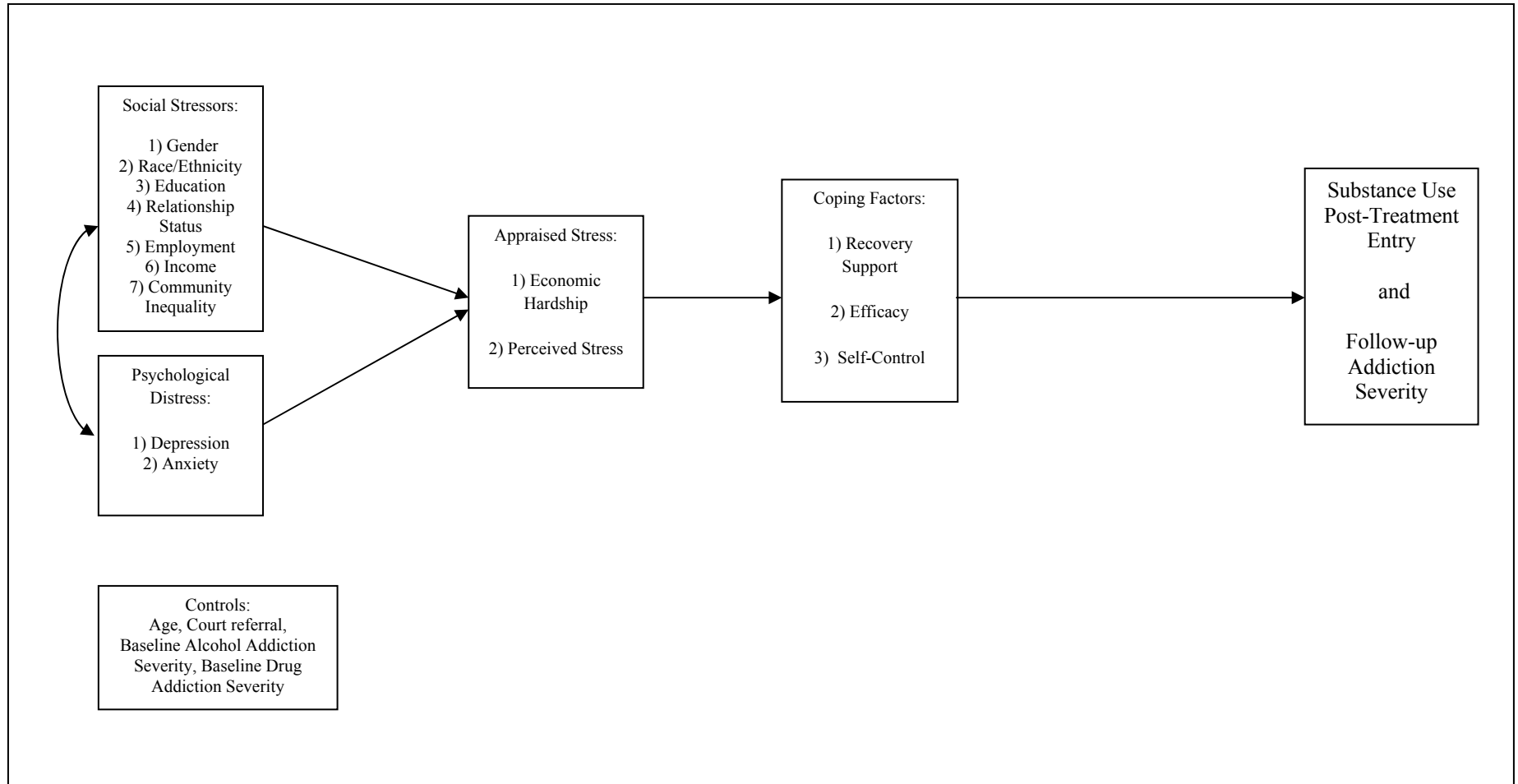
Research Questions

The following model (Figure 2) was tested to answer the following questions:

1. Will the model significantly predict substance use between baseline and follow-up?

- a. Specifically, how do baseline social stress factors and psychological distress relate to substance use post-treatment entry?
 - b. Is the relationship between baseline social stress factors, psychological distress, and substance use after treatment entry mediated by perceived stress and economic hardship?
 - c. Do coping factors, such as recovery support, efficacy, and self-control, mediate the relationship between perceived stress, economic hardship, and substance use after treatment entry?
 - d. Which of the factors will most strongly predict substance use after treatment entry?
2. Will the model significantly predict addiction severity at follow-up?
- a. Specifically, how do baseline social stress factors and psychological distress relate to addiction severity at follow-up?
 - b. Is the relationship between social stress factors, psychological distress, and follow-up addiction severity mediated by perceived stress and economic hardship?
 - c. Do coping factors, such as recovery support, efficacy, and self-control, mediate the relationship between perceived stress, economic hardship, and addiction severity at follow-up?
 - d. Which of the factors will most strongly predict follow-up addiction severity?

Figure 2. Empirical Model



Model Variables and Measures

Two models were analyzed; one regressing post-treatment entry substance use on the independent variables and the second regressing follow-up drug and alcohol addiction severity on the independent variables. Since drug and alcohol addiction severity are two different variables, this model was examined twice to determine predictors' relationships with alcohol and drug addiction severity separately. Independent variables included baseline social stress factors (including income, gender, education, employment, relationship status, and community inequality) and psychological distress (depression and anxiety). Baseline alcohol and drug addiction severity, age, and referral to treatment by the court system were included as control variables. Mediating variables included perceived stress, economic hardship, recovery support, efficacy, and self-control. Conceptual and operational definitions of model variables are as follows:

Dependent variables.

Substance use post-treatment entry. Substance use post-treatment entry was included as a dependent variable in the model, and was operationally defined by whether participants had reported any alcohol or illicit drug use between baseline and follow-up. Substance use could have occurred at any point in the 12-month period between baseline and follow-up surveys.

Addiction severity. Because report of use during the 12 month period does not necessarily mean participants continued to use throughout the 12 months or returned to pre-treatment patterns of use, further analysis of addiction severity was warranted rather than solely examining the model's ability to predict substance use post-treatment entry. It was possible that some participants used only once, or returned to use for a short period

of time early in the follow-up period and therefore still reduced use since baseline. To measure addiction severity, the Addiction Severity Index (ASI) alcohol and drug composite scores (McLellan et al., 1992) pertaining to substance use patterns in the 30 days prior to both baseline and follow-up were examined. Follow-up composite scores were used as the dependent variables, and baseline composite scores were used as control variables. The full ASI measures substance use as well as physical, social, and psychological problems experienced by people with drug and alcohol problems, and typically asks about substance use at two data points: lifetime and 30 days prior to the interview (McLellan, Cacciola, Alterman, Rikoon, & Carise, 2006). Composite scores are determined using variables measuring problem severity in the previous 30 days, and were created as a baseline measure of problem severity that could be replicated and compared at different points in time to measure problem improvement (McGahan, Griffith, Parente, & McLellan, 1986).

For this study, both alcohol and drug composite scores were computed based on McGahan et al.'s (1986) scoring instructions. The alcohol composite score was comprised of six questions: days of alcohol use in the past 30 days, days of alcohol use to intoxication in the past 30 days, number of days troubled or bothered by alcohol problems, how troubled or bothered participants have been in the past 30 days by alcohol problems (scale of 0 [not at all] to 4 [extremely]), perceived importance of treatment for alcohol problems (scale of 0 [not at all] to 4 [extremely]), and how much money (in dollars) the participant spent on alcohol in the past 30 days. In the KTOS baseline survey, one original ASI question, "How many days in the past 30 have you been troubled or bothered by alcohol problems?" was modified to "How many days did you experience

alcohol problems (craving, withdrawal, wanting to quit but being unable) in the past 30 days?” To compute the score, the first three questions were divided by 30 to represent the number of days, and then again by 6 to represent the number of questions comprising the composite score. Responses for questions about how troubled participants have been by alcohol problems and the importance of treatment were divided by 4, the top possible likert scale response, and then again by 6 to represent the number of questions comprising this score. Lastly, responses for number of dollars spent on alcohol were log transformed, divided by 6 for the number of questions in this composite score and divided again by the highest log value. These scores are then added together to create the composite score.

The drug composite score was comprised of 13 questions: number of days in the past 30 participants used heroin, methadone, other opiates/analgesics, barbiturates, other sedatives/tranquilizers/hypnotics, cocaine, amphetamines, cannabis, and hallucinogens (one question is asked in the ASI for each substance), number of days more than one drug was used, how many days in the past 30 participants have experienced problems with drug use, how troubled or bothered participants have been in the past 30 days by drug use, and perceived importance of treatment for drug use. Similarly to the alcohol composite score, a question was modified in the KTOS baseline survey from, “How many days in the past 30 have you been troubled or bothered by drug problems?” to “How many days did you experience drug problems (craving, withdrawal, wanting to quit but being unable) in the past 30 days?”. Composite scores were calculated by dividing each of the questions about specific drug use in previous 30 days by 30 and then again by 13 (the highest possible number of days drug use could be reported and the number of

questions comprising this composite score), and dividing the responses of the last two questions by 4 and then again by 13 (the highest response possible and the number of questions comprising this score), and then summing all scores.

Independent variables.

Social Stress. Social stress has been associated with greater psychological distress (Aneshensel, 1997; Pearlin, 1989; Pearlin et al, 1981), and psychological distress has been associated with relapse (Brown et al., 1998; Greenfield et al., 1998; Hasin et al., 2002; Scorzelli & Chaudhry, 2005; Watkins et al., 2004). Thus, it was expected that higher social stress would be a predictor of substance use post-treatment entry and higher problem severity at follow-up. There were no specific measures of social stress in the dataset, so proxies were used. Imputed social stress factors included income, baseline educational level attained, follow-up employment status, community inequality, and demographic factors including race, gender, and relationship status. While these factors alone do not measure the amount of stress participants might feel in these categories of social disadvantage, low income, unemployment, low educational attainment, high income inequality, minority racial/ethnic group membership, single/unmarried status, and being female have all previously been associated with psychological distress and/or substance abuse in the extant literature and thus will be used as approximate measures of social stress (Boardman et al., 2001; Buka, 2002; Greenfield et al., 2007; Marmot, 2004; Mirowsky & Ross, 2003; Moksnes et al., 2010; Olf et al., 2007; Padgett & Drake, 2008; Pearlin, 1989; SAMHSA, 2010; Thoits, 2010; Vrijmoet-Wiersema et al., 2008; Wallace, 1999; Walton et al., 2003; Williams et al., 2010). Each variable was measured as follows:

1. Income- Income was measured using participants' self-reported monthly pre-tax income in dollars at baseline. The baseline survey asked participants to consider and estimate all wages, unemployment, disability, pensions, and/or non-legal income earned in the 30 days prior to the interview. Although income is an indicator of SES, and low SES is associated with addiction and relapse (Walton et al., 2003), income alone has not been associated with negative outcomes in previous studies when controlling for other income-related variables such as financial strain (Cole et al., 2011; Weich & Lewis, 1998) and thus it was expected to be unrelated to substance use post-treatment entry and follow-up addiction severity in the current study.
2. Education level- Education level was measured by asking participants' last level of education completed. Since lower educational attainment has been associated with higher rates of substance abuse (SAMSHA, 2010), it was expected that participants with lower educational attainment would be more likely to use substances post-treatment entry and have higher follow-up addiction severity composite scores.
3. Employment status- Participants' self-reported employment status at baseline was included as a social stress factor since unemployed or underemployed individuals often experience additional role strain and increased stress. Since stable employment has been associated with maintaining abstinence from drugs and alcohol (Vaillant, 1998; Walker et al., 2011), it was expected that participants who were employed at follow-up would be more likely to report

substance use post-treatment entry and have lower alcohol and drug addiction severity scores.

4. Community inequality- Inequality was included as a social stress factor since higher inequality could increase chances that participants would experience chronic strain, disadvantage, and potential discrimination. Inequality is associated with increased negative health outcomes, including mental health and addiction (Buka, 2002; Marmot, 2004; Wilkinson & Pickett, 2009), and was therefore expected to be related to substance use post-treatment entry and higher addiction severity scores at follow-up. Inequality was defined according to the Gini coefficient of the county in which participants entered treatment. The Gini coefficient is the most common measure of income inequality and is easily accessible from the U. S. Census Bureau (Wilkinson & Pickett, 2009). Normally, Gini coefficients range from 0-1, and 0 indicates perfect equality and 1 indicates total inequality. For this study, the 2010 Gini coefficient was obtained for zip codes in Kentucky from the University of Wisconsin Population Health Institute website (<http://www.countyhealthrankings.org/kentucky>). Instead of reporting Gini coefficient in its usual form, this website multiplied each coefficient by 100 to create a range of Gini scores between 0 and 100.
5. Race- Race/ethnicity was measured in the original dataset by the category with which participants identified. Choices were non-Hispanic White, non-Hispanic Black, American Indian, Alaskan Native, Asian/Pacific Islander, Hispanic-Mexican, Hispanic-Puerto Rican, Hispanic-Cuban, Other Hispanic,

or Other. Due to increased social stress, it was expected that people of racial/ethnic minorities would be more likely to report substance use post-treatment entry and have higher addiction severity scores at follow-up.

6. Gender- Since women often experience greater subjective distress when faced with stressors (Moksnes et al., 2010; Olff et al., 2007; Vrijmoet-Wiersema et al., 2008) and also often experience barriers to sufficient substance abuse treatment (Greenfield et al., 2007), it was expected that women would be more likely to report post-treatment entry substance use and have higher addiction severity scores at follow-up than men.
7. Relationship status- In the original dataset, marital status was measured as single/never married, married, cohabitating, widowed, separated, and divorced. While marriage has been associated with decreased psychological distress (Mirowsky & Ross, 2003), other studies examining differences between cohabitation, marriage, and single relationship status have found that cohabitation with an intimate partner is similarly associated with decreased distress (Brown, Bulanda, & Lee, 2005; Horwitz & White, 1998). Thus, cohabitation was captured rather than only examining marriage. If participants reported being married or cohabitating they were combined into a cohabitating group, and all other marital statuses reported were collapsed into a non-cohabitating group. It was expected that single participants would be more likely to report substance use post-treatment entry and have higher follow-up addiction severity scores than cohabitating participants.

Psychological distress.

1. Depression- Symptoms of depression are often used as indicators of psychological distress (Clark, Loscalzo, Trask, Zabora, & Phillip, 2010; Cuevas, Finkelhor, Clifford, Ormrod, & Turner, 2010; Dyrbye, Thomas, & Shanafelt, 2006; Elkington, Bauermeister, & Zimmerman, 2010; Mezuk et al., 2010; Quinn & Chaudoir, 2009). For this project, depression was measured using a single question adapted from the ASI measure of emotional health (McLellan et al., 1992), inquiring about whether participants experienced “serious depression” that was “not a direct result of drug/alcohol use” in the 12 months prior to baseline. The original ASI measure of emotional health includes questions about hallucinations, difficulty concentrating or remembering, and difficulty controlling violent behavior, but since depression and anxiety have been found in the extant literature to be most predictive of addiction and relapse (Bonn-Miller & Moos, 2009; Brown et al., 1998; Greenfield et al., 1998; Hasin et al., 2002; Scorzelli & Chaudhry, 2005; Watkins et al., 2004), questions indicative of these mental health problems have been singled out for the proposed study rather than using the entire emotional health measure.

There are several potential flaws with this indicator of depression, although this was the only question indicative of depression in the dataset which thus necessitated its use as an indicator of psychological distress. First, a single-question dichotomous indicator is often not ideal since variability is lost in severity and type of depression experienced, although some research

indicates that there is not a significant difference between single question indicators of depression and multi-item depression scales (Zimmerman et al., 2006). In the study conducted by Zimmerman and colleagues, score on a single question asking participants to rate depression on a 5-point likert scale was significantly correlated with all DSM-IV depressive symptoms. However, Zimmerman et al. (2006) used a likert scale which allowed some variability to remain in the participants' experienced severity of depression, but the question used in the current study only allows a dichotomous yes/no response by participants. Depression exists on a continuum, and a dichotomous response prevents the measure from capturing the variability inherent in the experience of depressive symptoms (Flett, Vredenburg, & Krames, 1997). Finally, another flaw with this question is that it asks participants to consider only depression that was not related to drug and alcohol use. Yet, this is a sample of individuals admitted to substance abuse treatment programs; it can safely be assumed that many of them might have been using levels of drugs and alcohol that prevent them from being able to separate substance-related mood problems from non-substance related mood problems. Despite flaws in this question, it is the only indicator of depression included in the dataset. Also, while other studies have found significant discrepancies between self-reported depression and diagnoses (Flett et al., 1997), the self-reported experience of depression as the participant understands it remains an indicator of participants' subjective distress. It was expected that participants reporting experiences of serious depression would be more likely to report

substance use post-treatment entry and have higher addiction severity scores at follow-up.

2. Anxiety- Similar to depression, symptoms of anxiety are often considered an indicator of psychological distress (Clark et al., 2010; Cuevas et al., 2010; Dyrbye et al., 2006; Elkington et al., 2010; Mezuk et al., 2010; Quinn & Chaudoir, 2009). For the current study, experiences with anxiety in the 12 months prior to baseline were measured using a question adapted from the ASI measure of emotional health (McLellan et al., 1992). Participants were asked whether they experienced “serious anxiety or tension” that was not directly due to drug or alcohol use. The same concerns exist for this measure of anxiety as did the concerns for the single-question dichotomous indicator of depression mentioned above. Since anxiety is associated with addiction and relapse (Ahmadi & Ahmadi, 2005; Scorzelli & Chaudhry, 2005; Watkins et al., 2004), it was expected that participants reporting serious anxiety would be more likely to report substance use post-treatment entry and have higher alcohol and drug severity scores at follow-up.

Mediating variables.

Perceived Stress. Follow-up measures included the Perceived Stress Scale (Cohen, Kamarck, & Mermelstein, 1983), a 14-item scale designed to measure participants’ perceptions of non-specific stress in their lives over the last 30 days. The PSS includes likert-scale responses (0-4, with 0 = never, 4 = very often) to questions asking how often participants have experienced general indicators of stress, such as “Been upset because of something that happened unexpectedly”, “felt nervous or

stressed”, and “”found that you could not cope with all the things you had to do”. This scale has been found to have adequate reliability (alpha = .80-.86) and validity across a number of general and clinical samples (Cohen et al., 1983; Hewitt, Flett, & Mosher, 1992). Notably, previous research has found that scores on the Perceived Stress Scale are a stronger predictor of health outcomes and health service utilization than scales of stressful life events (Cohen et al., 1983), supporting the notion that persons’ appraisal of an event as stressful is often more important to understand in regard to outcomes than occurrences of events alone. For the current study, this scale was scored according to original scale instructions stating that positively-worded questions (“How often have you dealt successfully with irritating life hassles”) should be reverse-coded and then all responses summed. Higher scores indicate higher perceived stress. Since stress is associated with addiction and relapse (Hyman et al., 2009; Tate et al., 2008; Tuchman, 2010), higher perceived stress was expected to be positively related to substance use post-treatment entry and follow-up addiction severity.

Economic Hardship. Post-baseline economic hardship is included as a mediator in the model since it reflects the amount of difficulty meeting medical, housing, and nutritional needs due to income. While income is measured separately, income alone does not indicate how much hardship participants experience since they may have multiple dependents to support, or may have additional financial support from family or friends to help them meet their needs. Economic hardship will be measured using a modified version of a scale derived from the Survey of Income and Program Participation designed to measure financial hardship and food insecurity (She & Livermore, 2007). This survey contains 8 items designed to measure participants’ difficulty over the 12

months between baseline and follow-up with paying rent/mortgage or utilities, getting medical needs met, and providing food for the household due to financial restrictions. The survey included in the KTOS follow-up survey has been modified from the original by leaving out one question about food insecurity and hunger and adding a question about ability to fill a medication prescription due to cost. The survey in its current form has been used in other research examining economic hardship and stress in Kentucky substance abuse treatment clients, and respondents in that study endorsed a mean 1.8 items (Cole et al., 2011). Since economic hardship is a stressor commonly associated with relapse (Tate et al., 2008), it was expected that higher economic hardship would be a predictor of substance use post-treatment entry and positively associated with follow-up addiction severity.

Coping Factors

1. Efficacy- Efficacy was included as a mediator between economic hardship and perceived stress and follow-up addiction severity. It was measured using a single question in the KTOS follow-up survey, “Based on what you know about yourself and your situation, how good are the chances that you can get off and stay off of drugs/alcohol?” Responses ranged from “not at all” to “extremely”. Since efficacy is associated with increased ability to cope with stress (Pearlin, 1989; Pearlin et al., 1981; Raikes & Thompson, 2005; Ross & Mirowky, 2003; Thoits, 2010) and remain abstinent from drugs and alcohol (Mattoo et al., 2009; Walton et al., 2003), it was expected that participants with higher efficacy would be less likely to report substance use post-treatment entry and have lower alcohol and drug severity scores at follow-up.

2. Recovery Support- Recovery support was also included as a mediator, and was measured using three questions asked at baseline; how many 12-step meetings participants had attended in the 30 days prior, how many faith-based support groups attended, and whether they had contact with an AA or NA sponsor in the 30 days prior. Responses were summed to create a single variable for recovery support. Relationships supportive of recovery are predictors of maintained abstinence from substances (Kelly et al., 2011; Moos, 2008), so it was expected that higher change scores would be associated with lower addiction severity at follow-up.
3. Self-Control- Follow-up measures used the 13-item Brief Self-Control Scale (Tangney, Baumeister, & Boone, 2004) to measure self-control, which was included as a mediator in the model. This scale asks participants to rate the frequency of activities including, “I am good at resisting temptation”, “I am lazy”, “I refuse things that are bad for me”, and “I wish I had more self-discipline” on a scale of 1-5 (1 = not at all, 5 = very much). This scale has been found to have adequate reliability (Cronbach’s alpha = .80) in a previous study of Kentucky substance abuse treatment participants (Cole et al., 2011). Negatively-worded questions were reverse-scored, and responses on all items were summed to create a cumulative score of 13- 65 according to the scale authors’ original scoring instructions (Tangney et al., 2004). Since lower self-control is associated with addiction relapse (Chartier et al., 2010; Fox et al., 2008; Mattoo et al., 2009; Sinha, 2008), it was expected that participants

scoring lower on this scale would be more likely to report substance use post-treatment entry and have higher addiction severity scores at follow-up.

Control Variables.

Age. Age was included as a control variable. There have been mixed results in research examining association of age with relapse to substance use after treatment. While some studies have found that younger participants were more likely to relapse after treatment (Walker et al., 2011) and to relapse earlier (Smyth, Barry, Keenan, & Ducray, 2010), others have not found a relationship between age and relapse (Charney, Zikos, & Gill, 2010).

Referral by court system. Any referral to treatment by the court system, including Child Protective Services (CPS), criminal justice system, and DUI referral sources, was also included as control variables, since court involvement might reduce likelihood of using substances or the amount of substance used during the 12 month follow-up period. Participants were asked at baseline whether the referral to treatment was initiated by CPS, the criminal justice system, or DUI services. Court-involvement has been associated with treatment retention for longer periods of time in adults (Snyder & Anderson, 2009) and adolescents (Pagey, Deering, & Sellman, 2002), and longer retention in treatment is often associated with reduced substance use and relapse (Snyder & Anderson, 2009).

Approach to Analysis

Data were analyzed using univariate, bivariate, and multivariate procedures. Primary analyses were conducted using binary logistic regression and ordinary least squares (OLS) regression. All statistical analyses were performed with SPSS 18.0.

Before multivariate analysis, data were screened using descriptive statistics, frequency distribution, and examination of scatterplots and graphical representations of variables to check for missing data and potential violations of assumptions. Bivariate correlations were used to examine relationships between all independent variables and dependent variables, and also between independent variables. Preliminary OLS regression models were run to calculate mahalanobis distance values, and frequencies and distribution of outliers for these values were examined for normality and to detect multivariate outliers. Remedies to satisfy assumptions and detailed results from the analysis are described in Chapter 5.

Chapter Five

Results

As described in earlier chapters, very little research has been conducted examining post-treatment substance use from a social stress perspective and very few studies examining relapse have specifically examined the impact of stress on addiction severity after relapse. In addition, most studies on relapse have been conducted with limited substance abuse treatment samples. This study examined effects of social stress factors, psychological distress, and economic hardship on post-treatment substance use and follow-up addiction severity with a broad statewide sample of individuals who participated in various types of substance abuse treatment in Kentucky. Data analyses for this study consisted of examining descriptive statistics and bivariate and multivariate relationships between variables to determine whether post-treatment substance use and follow-up addiction severity were predicted by social stress factors, psychological distress, perceived stress, economic hardship, self-control, recovery support, and efficacy. Although not the focus of the study, age, court involvement, and baseline alcohol and drug addiction severity were included as control variables since they have been found in the extant literature to potentially affect relapse after treatment. This chapter will detail the results of the analyses used to answer the research questions from Chapter 4.

Sample Descriptives

Secondary data was used from KTOS baseline and follow-up surveys. The sample consisted of 1,188 individuals who completed baseline interviews between July 1, 2008 and June 30, 2009 and subsequent follow-up interviews between July 1, 2009 and June 30, 2010. KTOS follow-up data consisted of a sample of randomly selected

participants who consented for follow-up contact. While 6,191 participants completed baseline surveys upon entry into treatment, only 3,848 gave consent to be contacted for follow-up (Walker et al., 2011). Approximately half of the total number of participants consenting for follow-up were randomly selected by month of intake (n = 2,039). Out of all chosen participants, 393 were not eligible due to incarceration, residing in residential treatment, or death. Eligible participants (n= 1,646) were contacted for a phone survey by members of the University of Kentucky Center on Drug and Alcohol Research team approximately 12 months after completion of the baseline survey and invited to participate in the follow-up interview. If participants consented for the follow-up survey, it was administered over the phone by a trained member of the research team. A total of 1,188 individuals participated in the follow-up survey, representing a participation rate of 72.2% (Walker et al., 2011).

Study Variable Descriptives

All variables were examined for missing data, and 65 cases were missing data for key variables. This comprised approximately 5% of the total sample. Missing data were examined for patterns, but data were missing completely at random. Thus, participants with missing data for any key variable in the study were excluded from analyses, leaving a final n of 1123 (see Table 4.1 for descriptive statistics).

Table 4.1
Descriptive Statistics for all Model Variables (n = 1123)

	n	%		
Gender				
Male	599	53.3		
Female	524	46.7		
Race/Ethnicity				
White	996	88.7		
Black	103	9.2		
Other	24	2.1		
Relationship Status				
Cohabiting	284	25.3		
Not Cohabiting	839	74.7		
Education Level				
Less than High School	298	26.5		
High School/GED	483	43.0		
More than High School/GED	342	30.5		
Employment Status				
Yes	617	54.9		
No	506	45.1		
Income				
\$429 and below	562	50.0		
\$430 and above	561	50.0		
Court Referral Source				
Yes	714	63.6		
No	409	36.4		
Serious Depression 12 Months Pre-baseline				
Yes	309	27.5		
No	814	72.5		
Serious Anxiety 12 Months Pre-baseline				
Yes	411	36.6		
No	712	63.4		
	Mean	SD	Skewness	Kurtosis
Age	31.85	9.37	.71	-.26
Community Inequality (Gini)	46.47	3.52	-.03	.71
Perceived Stress	24.86	9.24	.22	-.37
Economic Hardship	2.14	2.01	5.56	-.83
Self-Control	45.27	8.31	-.29	-.09
Recovery Support	8.25	11.82	2.00	4.73
Efficacy	4.42	.92	-1.81	3.15
Baseline ASI				
Alcohol	.19	.23	1.51	1.61
Drug	.15	.14	.92	.22
Follow-up ASI				
Alcohol	.11	.15	2.31	7.22
Drug	.07	.09	1.97	4.63

Dependent variables.

Substance use after treatment entry. This variable was operationally defined by whether participants had reported any alcohol or illicit drug use between baseline and follow-up. Dichotomous responses were coded 0 for no substance use after treatment entry and 1 for at least one use of alcohol or illicit drugs after treatment entry (coding scheme and descriptive statistics for all measures are included in Table 4.2). Almost two-thirds of participants ($n = 724$, 64.5%) reported using illicit drugs and/or alcohol at least once between baseline and follow-up.

Addiction severity. To measure addiction severity, the Addiction Severity Index (ASI) alcohol and drug composite scores (McLellan et al., 1992) were examined measuring addiction severity in the 30 days prior to baseline and follow-up. The follow-up composite scores were used as the dependent variable, and the baseline composite scores were used as control variables. ASI drug and alcohol composite scores can range from 0 to 1, with higher scores indicative of higher problem severity (McGahan et al., 1986). For this study, both alcohol and drug composite scores were computed based on McGrahan et al.'s (1986) scoring instructions. At follow-up, mean alcohol composite score was .11 ($SD = .15$) and drug composite score was .07 ($SD = .09$). However, it is worth noting that 40.3% of the sample scored a 0 for alcohol composite score and 36.3% for drug composite score, indicating that they were fully abstinent from drugs and alcohol at follow-up.

Since baseline substance use has been associated with relapse after treatment (Charney et al., 2010; Walker et al., 2011), baseline alcohol and drug composite scores

were also included in the model as a control variable. Mean baseline alcohol composite score was .19 (SD = .23) and drug composite score was .15 (SD = .14).

ASI norms, as established from a nationally representative sample of over 8,000 participants in various treatment domains collected over a 3-year period (McLellan et al., 2006), indicate a mean alcohol composite score of .21 (SD = .26) and drug composite score of .12 (SD = .13). Interestingly, mean alcohol scores for the current sample are slightly lower than the national norm, while drug scores are higher than the national norm.

Although a diagnosis of substance dependence cannot be assumed, Rikoon and colleagues examined the ability of the ASI composite scores to predict substance dependence and found that alcohol composite scores of .17 and drug composite scores of .16 were predictive of meeting diagnostic criteria for alcohol and drug dependence, respectively (Rikoon, Cacciola, Carise, Alterman, & McLellan, 2006). These cutoff scores accurately predicted over 85% of participants meeting diagnostic criteria for dependence, and predicted over 80% of those not meeting criteria. For both alcohol and drug dependence, the higher the score above the established cutoff, the more likely a diagnosis of dependence was present (Rikoon et al., 2006). The mean baseline alcohol composite score for the current sample was above the cutoff indicated by Rikoon et al. (2006) to be indicative of potential alcohol dependence, and the mean baseline drug score was .01 below the cutoff indicative of potential drug dependence.

Independent Variables.

Social Stress. Imputed social stress factors examined for the analyses included income, baseline educational level attained, follow-up employment status, community

inequality, and demographic factors including race, gender, and cohabitation status. A factor analysis was conducted to determine if the included social stress factors could be treated as measuring a distinct construct, but items did not load on a single factor. Thus, while these factors have all been noted to be associated with social stress, they do not work in combination to measure amount of “social stress” and must be considered individually.

1. Income- Income was measured using participants’ self-reported monthly pre-tax income in dollars at baseline. Mean reported monthly income was \$814.18 (R = 0-\$65,000, SD = \$2361.24). Due to distribution problems and several outliers, a decision was made to divide participants into two equal groups based on median income (\$430). When split based on median, 562 participants reported making \$429 or below at baseline, and 561 made \$430 or above. Over one-third reported no income prior to entering treatment (n = 446, 37.6%).
2. Education level- Participants were divided into three groups for education level, those who had less than a high school education or GED (n = 298, 26.5%), those with a high school diploma or GED (n = 483, 43.0%), and those with any education or training above a high school diploma/GED (n = 342, 30.5%).
3. Employment status- Participants were coded 1 if they were employed part-time or full-time and 0 if they were unemployed. Just over half of the sample was employed (n = 617, 54.9%) and just under half (n = 506, 45.1%) were unemployed.

4. Community inequality- Inequality was defined according to the Gini coefficient of the county in which participants participated in treatment, multiplied by 100. Mean Gini coefficient was 46.47 (SD = 3.52, R = 36-59).
5. Race- Race/ethnicity was measured in the original dataset as non-Hispanic White, non-Hispanic Black, American Indian, Alaskan Native, Asian/Pacific Islander, Hispanic-Mexican, Hispanic-Puerto Rican, Hispanic-Cuban, Other Hispanic, or Other. White participants comprised the majority of the sample (n = 996, 88.7%), 103 were Black (9.2%), and 24 identified as other races (2.1%). For the analyses, White participants were coded 0, Black participants were coded 1, and participants from other racial/ethnic groups were coded 2. Although much of the extant literature on social stress focuses on the importance of race, a decision was made to exclude the variable 'race' from the regression analyses due to distribution issues. However, bivariate relationships between race and other key variables were examined.
6. Gender- Gender was measured in the dataset as male (coded as 0) and female (coded as 1). The sample was 53.3% male (n = 599) and 46.7% female (n = 524).
7. Relationship status- Participants were coded 1 if they were cohabitating with an intimate partner (n = 284, 25.3%) and 0 if they were not (n = 839, 74.7%).

Psychological Distress.

Depression. A total of 309 participants reported serious depression (27.5%) and 814 (72.5%) reported no serious depression in the 12 months before baseline. Responses were coded 1 for yes and 0 for no.

Anxiety. Participants were coded 1 if they reported experiencing serious anxiety in the 12 months prior to baseline and 0 if they did not. Over one-third (n = 411, 36.6%) reported serious anxiety and 712 (63.4%) did not.

Mediating variables.

Perceived Stress. Perceived stress was measured using Cohen's Perceived Stress Scale (Cohen, Kamarck, & Mermelstein, 1983). This scale has been found to have adequate reliability (alpha = .80-.86) and validity across a number of general and clinical samples (Cohen et al., 1983; Hewitt, Flett, & Mosher, 1992), and had a Cronbach's alpha of .84 with the current sample. Higher scores indicate higher perceived stress. In this sample, the range of scores was 2-50, with a mean score of 24.86 (SD = 9.24). For comparison, mean score of an inpatient psychiatric sample was 29.07 (Hewitt et al., 1992) and a college student sample was 23.18 (Cohen et al., 1983).

Economic Hardship. Economic hardship was measured using a modified version of an 8-item scale derived from the Survey of Income and Program Participation (She & Livermore, 2007). Each item asked about a specific area of economic hardship over the 12 months between baseline and follow-up, including difficulty obtaining enough food, going to the doctor when needed, or paying rent/mortgage, electric/gas, or telephone bills. Each response was coded 1 if participants endorsed experiencing difficulty in that specific area and 0 if they did not. Responses for all items were summed (R = 0-7, M = 2.14, SD = 2.01) to create a scale of economic hardship (Cronbach's alpha = .79).

Efficacy. Efficacy was measured using a single question in the KTOS follow-up survey, "Based on what you know about yourself and your situation, how good are the chances that you can get off and stay off of drugs/alcohol?" Responses ranged from "not

at all” to “extremely” with “not at all” scored as 1 and “extremely” scored as 5. Mean response was 4.42 (SD = .92, R = 1-5).

Recovery Support. Recovery support was measured by summing responses to three questions asked at follow-up; how many 12-step meetings participants had attended in the 30 days prior, how many faith-based support groups attended, and whether they had contact with their AA or NA sponsor within the 30 days prior. The original range of responses was 0-181, but only 1% of the sample reported more than 61 for total recovery support at follow-up. A total score of 61 would be the equivalent of one 12-Step meeting per day, one recovery support meeting per day, and contact with a sponsor. Thus, a decision was made to collapse responses from 61-181 into a single group and code them as 61. Mean amount of recovery support was 8.25 (R = 0-181, SD = 11.82). Notably, 44.8% of participants reported zero recovery support.

Self-control. Self-control was measured using the 13-item Brief Self-Control Scale. This scale has been found to have adequate reliability (Cronbach’s alpha = .80) in a previous study of Kentucky substance abuse treatment participants (Cole et al., 2011), and also in the current sample (Cronbach’s alpha = .82). Range of possible scores was 13- 65. In this sample, the range was 16-65 with a mean score of 45.27 (SD = 8.31).

Control Variables. Age was included as a control variable, and participants in this sample had a mean age of 31.85 (R = 18-61, SD = 9.37). In addition, referral to treatment by the court system including Child Protective Services (CPS), the criminal justice system, or DUI programs were also included as a control variable (“court referral”), and 63.6% of the sample reported being referred to treatment by one of these systems. Participants were coded 1 if referred by the court system and 0 if not.

Table 4.2

Coding Scheme and Descriptive Statistics for Measures

Predictor	Level of Measurement	Range	M	SD	Key	%
Substance use post-treatment entry	Nominal	0-1			0 = No 1 = Yes	35.5% 64.5%
Follow-up ASI- Alcohol	Interval	0-1	.11	.15		
Follow-up ASI- Drugs	Interval	0-1	.07	.09		
Income	Nominal	0-1			0 = ≤ \$429 1 = ≥ \$430	50.0% 50.0%
Education Level	Ordinal	0-2			0 = < High School/GED 1 = High School/GED 2 = More than High School/GED	26.5% 43.0% 30.5%
Employment Status	Nominal	0-1			0 = Unemployed 1 = Employed at least part-time	45.1% 54.9%
Community Inequality	Interval	0-100	46.47	3.52		
Race	Nominal	0-1			0 = White 1 = Non-White	88.7% 11.3%
Gender	Nominal	0-1			0 = Male 1 = Female	53.3% 46.7%
Relationship Status	Nominal	0-1			0 = Single 1 = Cohabiting w/Intimate Partner	74.7% 25.3%
Depression in 12 months pre-baseline	Nominal	0-1			0 = No depression 1 = Depression	72.5% 27.5%
Anxiety in 12 months pre-baseline	Nominal	0-1			0 = No anxiety 1 = Anxiety	63.4% 36.6%
Perceived Stress	Interval	2-50	24.86	9.24		
Economic Hardship	Interval	0-7	2.14	2.01		
Efficacy	Ordinal	1-5	4.42	.92		
Recovery Support	Interval	0-61	8.25	11.82		
Self Control	Interval	13-65	45.27	8.31		
Age	Interval	18-61	31.85	9.37		
Court Referral	Nominal	0-1			0 = Not referred through the court 1 = Referred by the court	36.4% 63.6%
Baseline ASI- Alcohol	Interval	0-1	.19	.23		
Baseline ASI- Drugs	Interval	0-1	.15	.14		

Data Analyses

Prior to conducting multivariate analyses, all variables were examined for univariate normality and education level, income, and recovery support were recoded as noted above. Several variables, including follow-up ASI alcohol and drug scores used as dependent variables, had non-normal distributions. Both follow-up ASI alcohol and drug scores were positively skewed (skewness values of 2.31 and 1.97 respectively) and leptokurtic (kurtosis values of 7.22 and 4.63 respectively). Log, natural log, square root, and inverse transformations were made of the dependent variables, but none effectively corrected the non-normal distribution. Although univariate normality is normally required to establish multivariate normality and meet assumptions of linear regression, some have reported that in large samples the analysis is robust to violations of this assumption. For example, researchers examining public health data found that linear regression results were accurate with sample sizes larger than 500 even with highly non-normal dependent variable data distributions (Lumley, Diehr, Emerson, & Chen, 2002). In fact, the dependent variable in their study had a skewness value of 8.8 and kurtosis value of 131.

To examine multivariate normality, linearity, and homoscedasticity, a preliminary OLS regression was run for each of the continuous dependent variables. Mahalanobis distances and residual values were saved for further analysis. Curve estimation was used to ensure a linear model was appropriate for analysis, and supported the use of linear regression. Residuals plots were then examined to determine if data adequately met assumptions for linear regression. Examination of residuals statistics, plots, and case diagnostics revealed that participants with high alcohol and drug composite scores had

high residuals and were multivariate outliers. To remedy this, the top 1% of both addiction severity composite scores (.74 and above for alcohol ASI and .40 and above for drug ASI) were collapsed and scores were capped at the top score for 99% of the sample. Preliminary regression models were run again and data adequately met assumptions for OLS regression. Residuals plots showed mild heteroscedasticity, so further tests were conducted to ensure this would not pose a problem for OLS regression. Since it is difficult to tell by viewing scatterplots alone whether the assumption of homoscedasticity has been violated enough to affect regression outcomes, it has been recommended that homoscedasticity be empirically tested by regressing residuals on predicted values of the dependent variable (Hayes & Cai, 2007). If no relationship is found, then it is assumed that data do not violate the assumption of homoscedasticity. After doing so for models examining each dependent variable, it was determined that the data satisfactorily met the assumption of homoscedasticity.

To determine if there were multivariate outliers, Mahalanobis distances were saved and examined. The critical χ^2 value for 17 df is 40.79, and two cases were excluded from the analyses due to having Mahalanobis distances exceeding this value.

Bivariate relationships

Bivariate Correlations. Bivariate correlations between model variables were examined and results are presented in Tables 4.3-4.6.

Correlations among dependent variables. As presented in Table 4.3 below, substance abuse post-treatment entry is weakly positively correlated with the other two dependent variables, follow-up alcohol ASI composite score ($r = .20, p \leq .001$) and follow-up drug ASI composite score ($r = .24, p \leq .001$). Follow-up alcohol and drug

composite scores were also weakly positively correlated with each other ($r = .22, p \leq .001$).

Table 4.3
Zero-order Correlation Coefficients among Dependent Variables

	SUPTE	FASI-A	FASI-D
SUPTE	1		
FASI-A	.204***	1	
FASI-D	.235***	.222***	1

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$
 SUPTE = substance use post-treatment entry, FASI-A = follow-up alcohol ASI, FASI-D = follow-up drug ASI

Dependent Variables with Independent Variables and Controls. Table 4.4 presents zero-order correlation coefficients for the dependent variables with the independent variables and controls.

Substance use post-treatment entry. Substance use post-treatment entry was weakly negatively correlated with self control ($r = -.28, p \leq .001$) and efficacy ($r = -.19, p \leq .001$), and was weakly positively correlated with perceived stress ($r = .20, p \leq .001$). While this variable was also statistically significantly correlated with age ($r = -.07, p \leq .05$), court referral ($r = -.16, p \leq .001$), baseline alcohol ASI score ($r = .14, p \leq .001$), baseline drug ASI score ($r = .08, p \leq .01$), gender ($r = -.12, p \leq .001$), education ($r = .08, p \leq .01$), employment ($r = .07, p \leq .05$), economic hardship ($r = .09, p \leq .001$), and recovery support ($r = -.13, p \leq .001$), these correlation coefficients were extremely low and thus considered an absence of correlation.

Follow-up ASI- Alcohol. Follow-up alcohol ASI score was moderately positively correlated with baseline alcohol ASI score ($r = .43, p \leq .001$), and weakly negatively correlated with self-control ($r = -.22, p \leq .001$). This variable was also weakly

significantly correlated with age ($r = .13, p \leq .001$), court referral ($r = -.13, p \leq .001$), gender ($r = -.13, p \leq .001$), race ($r = -.09, p \leq .001$), recovery support ($r = .08, p \leq .01$), depression ($r = .06, p \leq .05$), perceived stress ($r = .11, p \leq .001$), and efficacy ($r = -.10, p \leq .001$).

Follow-up ASI- Drug. Follow-up drug ASI score was moderately correlated with self-control ($r = -.45, p \leq .001$). Follow-up drug ASI composite score was weakly correlated with baseline drug ASI composite score ($r = .35, p \leq .001$), and perceived stress ($r = .33, p \leq .001$). Very weak statistically significant correlations were observed between this variable and age ($r = -.12, p \leq .001$), court referral ($r = -.12, p \leq .001$), recovery support ($r = -.07, p \leq .05$), and efficacy ($r = -.11, p \leq .001$), but these did not reach levels of practical significance.

Table 4.4

Zero-order Correlation Coefficients for Dependent Variables with Independent Variables and Controls

	SUPTE	FASI-A	FASI-D
A	-.065*	.133***	-.121***
CR	-.160***	-.134***	-.121***
BASI-A	.142***	.426***	.012
BASI-D	.087**	-.015	.346***
G	-.122***	-.125***	.009
R	-.030	-.090**	-.012
ED	.082**	.044	.050
RS	.026	.080**	.024
EM	.074*	.054	-.058
I	.003	.004	-.066*
CI	-.009	-.062	.038
D	.025	.063*	.047
AN	.045	.013	.034
PS	.198***	.111***	.328***
EH	.088**	-.001	.161***
REC	-.125***	.045	.072*
EF	-.188***	-.096***	-.111***
SC	-.284***	-.223***	-.452***

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

A = age, CR = court referral (yes = 1), BASI-A = baseline alcohol ASI, BASI-D = baseline drug ASI, G = gender (female = 1), R = race (White = 1/non-White = 0), ED = education level, RS = relationship status (cohabitation = 1), EM = employment status (employed = 1), I = income, CI = community inequality, D = depression (yes = 1), AN = anxiety (yes = 1), PS = perceived stress, EH = economic hardship, REC = recovery support, EF = efficacy, SC = self-control, SUPTE = substance use post-treatment entry, FASI-A = follow-up alcohol ASI, FASI-D = follow-up drug ASI

Correlations among Independent Variables. Zero-order correlation

coefficients for independent variables are displayed in Table 4.5. The majority of

statistically significant correlations were so low they were not practically significant.

However, there were significant moderate correlations observed between depression and

anxiety ($r = .61$, $p \leq .001$), perceived stress and economic hardship ($r = .42$, $p \leq .001$),

and between perceived stress and self-control ($r = -.60$, $p \leq .001$). In addition, there were

weak correlations between gender and employment ($r = -.28$, $p \leq .001$), employment and

income ($r = .22, p \leq .001$), employment and self-control ($r = .15, p \leq .001$), employment and perceived stress ($r = -.20, p \leq .001$), depression and perceived stress ($r = .21, p \leq .001$), economic hardship and depression ($r = .14, p \leq .001$), economic hardship and self-control ($r = -.20, p \leq .001$), gender and economic hardship ($r = .17, p \leq .001$), anxiety and perceived stress ($r = .17, p \leq .001$), anxiety and economic hardship ($r = .15, p \leq .001$), and efficacy and self-control ($r = .20, p \leq .001$). No correlations approached levels high enough to be a concern for multicollinearity in the regression models.

Table 4.5*Zero-order Correlation Coefficients among Independent Variables*

	G	R	ED	RS	EM	I	CI	D	AN	PS	EH	REC	EF	SC
G	1													
R	-.067*	1												
ED	.044	.052	1											
RS	.001	-.008	.084**	1										
EM	-.276***	.038	.098***	-.012	1									
I	.121***	.048	.041	-.140***	.220***	1								
CI	.081**	.050	.030	-.008	-.140***	-.004	1							
D	.068*	.043	-.013	-.010	-.059	-.077**	-.067*	1						
AN	.075**	.049	.047	-.022	-.042	-.055	-.025	.609***	1					
PS	.121***	.014	-.040	-.019	-.198***	-.082**	.026	.208***	.173***	1				
EH	.174***	-.026	-.031	-.070*	-.085**	-.110***	-.027	.144***	.150***	.420***	1			
REC	.034	-.095***	.007	-.015	-.058*	-.072*	-.023	-.031	.002	-.065*	-.036	1		
EF	.046	.048	-.035	-.083**	.019	.020	-.025	-.040	-.040	-.122***	-.062*	.029	1	
SC	.043	-.021	-.001	-.067*	.152***	.078**	-.009	-.107***	-.102***	-.599***	-.203***	.029	.195***	1

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

G = gender (female = 1), R = race (White = 1/non-White = 0), ED = education level, RS = relationship status (cohabitation = 1), EM = employment status (employed = 1), I = income, CI = community inequality, D = depression (yes = 1), AN = anxiety (yes = 1), PS = perceived stress, EH = economic hardship, REC = recovery support, EF = efficacy, SC = self-control

Independent Variables with Controls. There were a number of statistically significant correlations between the independent variables and the control variables, but none approached levels of practical significance. The highest correlations were between baseline ASI drug composite score ($r = -.18, p \leq .001$), baseline ASI alcohol composite score ($r = -.14, p \leq .001$), and between court referral and self-control ($r = .15, p \leq .001$). Correlation coefficients for these variables are included in Table 4.6.

Table 4.6
Zero-order Correlation Coefficients for Independent Variables and Controls

	A	CR	BASI-A	BASI-D
G	-.048	.005	-.087**	.122***
R	-.082**	-.014	-.076*	.003
ED	.066*	-.129***	.022	.103***
RS	-.095***	-.041	.069*	.000
EM	-.022	.042	.092**	-.011
I	.059*	.020	-.011	-.046
CI	-.083**	.053	-.141***	.008
D	.047	-.091**	.063*	.064*
AN	.008	-.075*	.010	.103***
PS	.031	-.094**	.046	.127***
EH	.064*	-.012	.038	.061*
REC	-.010	-.036	.059*	.175***
EF	-.006	.034	-.107***	-.100***
SC	.044	.154***	-.107***	-.177***

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$
A = age, CR = court referral (yes = 1), G = gender (female = 1), R = race (White = 1/non-White = 0), ED = education level, RS = relationship status (cohabitation = 1), EM = employment status (employed = 1), I = income, CI = community inequality, D = depression (yes = 1), AN = anxiety (yes = 1), PS = perceived stress, EH = economic hardship, REC = recovery support, EF = efficacy, SC = self-control, BASI-A = baseline alcohol ASI, BASI-D = baseline drug ASI

T-tests

T-tests were run to examine differences in mean baseline and follow-up alcohol and drug ASI composite scores, perceived stress, economic hardship, efficacy, recovery support, and self-control for groups based on the social stress factors of gender, race,

relationship status, employment, and income. Group comparisons between social stress factors and baseline and follow-up addiction severity are noted in Table 4.7, and comparisons between social stress factor groups and economic hardship, perceived stress, and coping factors are noted in Table 4.8.

Addiction severity. For comparisons between social stress factors and addiction severity group means, T-tests demonstrated significant differences in means for baseline alcohol ASI composite score ($t = 2.93, p = .003$), baseline drug ASI composite score ($t = 1.81, p = .000$), and follow-up alcohol ASI composite score ($t = 4.32, p = .000$) by gender. Male participants had higher baseline and follow-up alcohol severity scores (.21 versus .17 and .13 versus .09 respectively), and higher baseline drug severity (.17 versus .14).

There were also significant differences in group means between employed and unemployed participants for baseline alcohol severity ($t = -3.11, p = .002$). Contrary to what would be expected, employed participants had higher baseline alcohol severity ($M = .21$) compared to unemployed participants ($M = .16$).

Baseline and follow-up alcohol severity scores differed significantly by relationships status ($t = -2.37, p = .018$ and $t = -2.96, p = .003$ respectively). Single participants had higher mean alcohol severity scores at both points in time (.20 versus .16 at baseline and .12 versus .09 at follow-up).

Lastly, significant differences in group means were found for the relationship between income and follow-up drug severity score ($t = 2.26, p = .024$). Participants reporting income levels below the median had slightly higher mean drug ASI scores than participants with income levels above the median (.07 versus .06).

Perceived stress. Significant differences between group means were found for gender, employment status, and income level for perceived stress. As expected, females reported higher perceived stress than males (26.05 versus 23.82, $t = -4.07$, $p = .000$), unemployed participants reported higher perceived stress than employed participants (26.87 versus 23.21, $t = 6.75$, $p = .000$), and participants with lower incomes reported higher perceived stress than participants with higher incomes (25.62 versus 24.10, $t = 2.76$, $p = .006$).

Economic hardship. There were significant differences between economic hardship group means and all four social stress factors examined. As expected, female participants reported higher economic hardship than males (2.51 versus 1.81, $t = -5.91$, $p = .000$), unemployed participants reported higher economic hardship than employed participants (2.32 versus 1.98, $t = 2.85$, $p = .004$), single participants reported higher economic hardship than cohabitating participants (2.38 versus 2.06, $t = 2.34$, $p = .020$), and participants with incomes below the median reported higher economic hardship than participants with incomes above the median (2.36 versus 1.92, $t = 3.69$, $p = .000$). Notably, gender was associated with a higher difference in means than income or employment.

Coping factors. There were significant differences between means on recovery support for income level ($t = 2.41$, $p = .016$), with lower income participants reporting higher recovery support than higher income participants (9.56 versus 7.55). Mean scores for efficacy significantly differed based on relationship status ($t = 2.25$, $p = .025$), with single participants reporting lower efficacy than cohabitating participants (4.39 versus 4.52). Self-control significantly differed by employment status ($t = -5.13$, $p = .000$),

relationship status ($t = 2.26, p = .024$), and income level ($t = -2.63, p = .009$). Employed participants reported higher self-control than unemployed participants (46.42 versus 43.90), cohabitating participants reported higher self-control than single participants (46.24 versus 44.96), and participants with higher incomes reported higher self-control than their lower-income counterparts (45.94 versus 44.63).

Table 4.7

Comparison of Group Means between Social Stress Factors and Addiction Severity

	<u>BASI-A</u>		<u>BASI-D</u>		<u>FASI-A</u>		<u>FASI-D</u>	
	M (SD)	t	M (SD)	t	M (SD)	t	M (SD)	t
Gender								
Male	.21	2.93**	1.81 [^]	-4.09***	.13 [^]	4.32***	.07	-.34
Female	.17		2.51 [^]		.09 [^]		.07	
Employment								
Unemployed	.16 [^]	-3.11**	2.32	.35	.10	-1.95	.07 [^]	1.93
Employed	.21 [^]		1.98		.12		.06 [^]	
Relationship Status								
Single	.20	-2.37*	2.38	-.01	.12 [^]	-2.96**	.07	-.79
Cohabiting	.16		2.06		.09 [^]		.07	
Income								
Below Median	.19	.37	2.36	1.55	.11	-.26	.07	2.26*
Above Median	.18		1.92		.11		.06	

[^] = significant Levene's test

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

BASI-A = baseline alcohol ASI, BASI-D = baseline drug ASI, FASI-A = follow-up alcohol ASI, FASI-D = follow-up drug ASI

Table 4.8

Comparison of Group Means between Social Stress Factors and Economic Hardship, Perceived Stress, and Coping Factors

	<u>Economic Hardship</u>		<u>Perceived Stress</u>		<u>Recovery Support</u>		<u>Efficacy</u>		<u>Self-control</u>	
	M (SD)	t	M (SD)	t	M (SD)	t	M (SD)	t	M (SD)	T
Gender										
Male	1.81 [^]	-5.91***	23.82	-4.07***	8.12	-1.12	4.34 [^]	-3.47***	44.95	-1.45
Female	2.51 [^]		26.05		9.06		4.53 [^]		45.67	
Employment										
Unemployed	2.32	2.85**	26.87	6.75***	9.45 [^]	1.94	4.44	.30	43.90 [^]	-5.13***
Employed	1.98		23.21		7.82 [^]		4.42		46.42 [^]	
Relationship Status										
Single	2.38	2.34*	24.76	.64	8.43	.50	4.39 [^]	2.25*	44.96	2.26*
Cohabiting	2.06		25.16		8.91		4.52 [^]		46.24	
Income										
Below Median	2.36 [^]	3.69***	25.62 [^]	2.76**	9.56 [^]	2.41*	4.40	-.79	44.63 [^]	-2.63**
Above Median	1.92 [^]		24.10 [^]		7.55 [^]		4.45		45.94 [^]	

[^] = significant Levene's test

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

Chi-square Analyses. Chi-square analyses were conducted examining bivariate relationships between social stress factors, specifically gender, race, employment status, relationship status, income, and educational level, and depression and anxiety (see Table 4.9). Significant associations between depression and gender ($\chi^2 = 5.24, p = .022, \phi = .07$), employment status ($\chi^2 = 3.92, p = .048, \phi = -.06$), and income level ($\chi^2 = 6.73, p = .009, \phi = -.08$) were found. Significant associations were also found between anxiety and gender ($\chi^2 = 6.23, p = .013, \phi = .08$) and race ($\chi^2 = 13.03, p = .001, V = .11$) were found. Although significant, effect sizes were weak. The strongest association was found between race and anxiety, with Black participants having the lowest proportion of individuals reporting serious anxiety in the 12 months prior to baseline (23.3% reporting anxiety and 76.7% reporting no anxiety), and participants reporting other racial/ethnic groups with the highest proportion of individuals reporting anxiety (58.3% versus 41.7%). Slightly over one-third (37.4%) of White participants reported serious anxiety pre-baseline. However, uneven marginals could have affected the outcome of the chi-square analyses for race.

Table 4.9

Crosstab Table of Social Stress Factors, Depression, and Anxiety

	<u>Depression</u>				<u>Anxiety</u>			
	No	Yes	X ²	ϕ or V	No	Yes	X ²	ϕ or V
Gender								
Male	452	147	5.24*	.07*	400	199	6.23*	.08*
Female	75.5%	24.5%			66.8%	33.2%		
	362	160			311	211		
	69.3%	30.7%			59.6%	40.4%		
Race								
White	715	279	5.61	.07	622	372	13.03***	.11***
Black	71.9%	28.1%			62.6%	37.4%		
Other	84	19			79	24		
	81.6%	18.4%			76.7%	23.3%		
	15	9			10	14		
	62.5%	37.5%			41.7%	58.3%		
Employment								
Unemployed	352	153	3.92*	-.06*	309	196	1.98	-.04
Employed	69.7%	30.3%			61.2%	38.8%		
	462	154			402	214		
	75.0%	25.0%			65.3%	34.7%		
Relationship Status								
Single	610	227	.12	-.01	536	301	.54	-.02
Cohabiting	72.9%	27.1%			64.0%	36.0%		
	204	80			175	109		
	71.8%	28.2%			61.6%	38.4%		
Income								
Below Median	388	173	6.73**	-.08**	341	220	3.38	-.06
Above Median	69.2%	30.8%			60.8%	39.2%		
	426	134			370	190		
	76.1%	23.9%			66.1%	33.9%		
Education Level								
Below H.S.	213	85	.26	.02	193	105	4.32	.06
H.S./GED	71.5%	28.5%			64.8%	35.2%		
Above H. S.	352	130			317	165		
	73.0%	27.0%			65.8%	34.2%		
	249	92			201	140		
	73.0%	27.0%			58.9%	41.1%		

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

As expected, female participants were more likely to report depression and anxiety than males, with 30.7% of women reporting serious depression pre-baseline as opposed to 24.5% of men, and 40.4% of women reporting serious anxiety pre-baseline as opposed to 33.2% of men. Also as expected, unemployed participants were more likely to report depression than employed participants (30.3% versus 25.0%), and lower income individuals were more likely to report depression than their higher-income counterparts (30.8% versus 23.9%).

Summary. Although significant, many bivariate relationships were very weak. Although many bivariate correlations were significant, the highest correlations were

observed between depression and anxiety ($r = .61, p \leq .001$), perceived stress and economic hardship ($r = .42, p \leq .001$), and between perceived stress and self-control ($r = -.60, p \leq .001$). Although many were weak, weak correlations overall could be related to non-normal distribution of several key variables.

T-tests indicated that many of the social stress variables were associated with addiction severity, economic hardship, perceived stress, and coping factors. Almost all relationships were in the direction expected, with participants in groups associated with higher social disadvantage also having higher addiction severity, economic hardship, and perceived stress, and lower coping recovery support, efficacy, and self-control. However, employment was associated with higher alcohol addiction severity at baseline, the opposite of what was expected.

Crosstab tables indicated that several of the social stress factors had significant associations with depression and anxiety. Specifically, gender was associated with both depression and anxiety in the 12 months before baseline, with women reporting higher depression and anxiety than men. Race was associated with anxiety, with Black participants reporting anxiety less than participants identifying as White or other racial/ethnic groups, and other non-White racial/ethnic groups reporting anxiety the most. In addition, unemployed participants report depression more than employed participants, and participants with lower incomes report depression more than participants with higher incomes.

Multivariate Analyses

Logistic regression. After examination of bivariate relationships, simultaneous-entry logistic regression was run in order to save and examine standardized residuals and mahalanobis distances. Since logistic regression is sensitive to outliers, cases were then excluded from the dataset if residuals were larger than ± 3 . This resulted in 6 cases being removed from the analysis. Multicollinearity can also affect logistic regression, but with low bivariate correlations and low tolerance statistics from the earlier preliminary linear regression (lowest tolerance statistic was .516), multicollinearity was not a problem with these data.

Research Question #1

The first research question was:

1. *Will the model significantly predict substance use between baseline and follow-up?*
 - a. *Specifically, how do baseline social stress factors and psychological distress relate to substance use post-treatment entry?*
 - b. *Is the relationship between baseline social stress factors, psychological distress, and substance use after treatment entry mediated by perceived stress and economic hardship?*
 - c. *Do coping factors, such as recovery support, efficacy, and self-control, mediate the relationship between perceived stress, economic hardship, and substance use after treatment entry?*
 - d. *Which of the factors will most strongly predict substance use after treatment entry?*

To answer this set of questions, hierarchical binary logistic regression was conducted to enable the examination of each block of variables on the dependent variable. The dichotomous dependent variable was substance use post-treatment entry. Participants who reported alcohol or illicit drug use at any time between baseline and follow-up were coded 1 and participants who remained abstinent throughout the 12 month period were coded 0.

In the first block, the odds of participants reporting substance use post-treatment entry were regressed on the control variables of age, court referral, baseline alcohol ASI, and baseline drug ASI. Next, the social stress variables gender, education level, relationship status, employment, income, and community inequality were added to the model. In the third block the two variables representing psychological distress, depression, and anxiety, were added. Then, perceived stress and economic hardship were included in the fourth block to determine if they mediated the relationship between social stress factors and psychological distress and the odds of substance use post-treatment entry. Last, the coping factors, recovery support, efficacy, and self-control, were added to the model to determine if they mediated the relationship between perceived stress and economic hardship and the odds of substance use post-treatment entry.

Model fit. Statistics demonstrating model fit were examined before interpreting coefficients (see Table 4.10). The -2 Log Likelihood values were high (initial -2LL = 1383.67, final -2LL = 1163.62), although they lessened as each block of variables was included in the model. The high -2LL indicates the data were a questionable fit with the model, although the Omnibus χ^2 indicates the model significantly predicted odds of using substances post-treatment entry. Omnibus χ^2 for the overall model was significant in

each block, and the χ^2 for each individual block was significant except for the addition of the psychological distress variables in block three. The Hosmer & Lemeshow test was not significant for any block. Both Cox & Snell and Nagelkerke R^2 values increased with each block and show that the final model accounted for a substantial amount of variance in the dependent variable (Cox & Snell = .223 and Nagelkerke = .307).

Table 4.10

Model Fit Statistics for Logistic Regression Examining Odds of Substance Use Post-Treatment Entry

	Block One	Block Two	Block Three	Block Four	Block Five
Block χ^2	61.42***	24.80***	1.80	59.41***	134.06***
Model χ^2	61.42***	86.22***	88.01***	147.42***	281.48***
-2LL	1383.67	1358.88	1357.08	1297.68	1163.62
Cox & Snell R^2	.054	.074	.076	.124	.223
Nagelkerke R^2	.074	.102	.105	.171	.307
Hosmer & Lemeshow	8.38	12.10	5.41	12.60	10.81
% Correctly Classified [^]	65.6	66.4	67.4	68.7	71.8

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$
[^]% correctly classified in Block 0 was 64.8

The hit rate improved with each block of variables entered in the model (see Table 4.11). It increased from 64.8% to 65.6% with the inclusion of the control variables, 66.4% with the social stress factors, 67.4% with psychological distress, 68.7% with perceived stress and economic hardship, and 71.8% with the coping factors included. Notably, the model was better at predicting who used substances post-treatment entry than who did not, and even in the final block only correctly classified 51.8% of participants who did not use substances post-treatment entry as opposed to 82.7% of participants who did use substances after entering treatment.

Table 4.11

Classification Table of Logistic Regression Examining Odds of Substance Use Post-Treatment Entry

	Observed	Predicted		% Correct
		0	1	
Block Zero	0	0	392	0
	1	0	722	100
	Overall %			64.8
Block One	0	46	346	11.7
	1	37	685	94.9
	Overall %			65.6
Block Two	0	87	305	22.2
	1	69	653	90.4
	Overall %			66.4
Block Three	0	98	294	25.0
	1	69	653	90.4
	Overall %			67.4
Block Four	0	138	254	35.2
	1	95	627	86.8
	Overall %			68.7
Block Five	0	203	189	51.8
	1	125	597	82.7
	Overall %			71.8

Summary of model variables. The control variables, age, court referral, and baseline alcohol and drug composite scores, were added in the first block (see Table 4.12). All but baseline drug composite score were significant at $p < .001$. The Exp(B) for age was .97, court referral was .53, and baseline alcohol composite score was 4.24. Cox & Snell R^2 was .054 for this block, and Nagelkerke R^2 was .074.

The social stress variables, gender, education, relationship status, employment, income, and community inequality were added in the second block. Gender was the only variable that significantly improved prediction of the dependent variable (Exp(B) = .57,

Wald $\chi^2 = 16.24$, $p < .001$). This block of variables increased the Cox & Snell R^2 to .074 and Nagelkerke R^2 to .102.

The psychological distress variables, depression and anxiety, were added in block three, but were not significant and only slightly increased Cox & Snell and Nagelkerke R^2 . However, with the inclusion of these variables educational attainment rose to significance (Exp(B) = 1.24, Wald $\chi^2 = 5.83$, $p = .013$).

In block four, perceived stress and economic hardship were added to the model, but only perceived stress was significant (Exp(B) = 40.04, Wald $\chi^2 = 1.06$, $p < .001$). All other variables significant in other blocks retained significance when this block was added. Both measures of R^2 increased considerably with the entry of this block (Cox & Snell R^2 to .124 and Nagelkerke R^2 to .171).

Finally, the coping factors, recovery support, efficacy, and self-control, were added in the last block and all three were highly significant. The Exp(B) for recovery support was .98 (Wald $\chi^2 = 17.46$, $p < .001$), efficacy was .33 (Wald $\chi^2 = 55.38$, $p < .001$), and self-control was .96 (Wald $\chi^2 = 12.37$, $p < .001$). Perceived stress lost significance with the inclusion of the coping factors, indicating that these variables mediated the relationship between perceived stress and substance use post-treatment entry. Measures of R^2 again increase considerably with the entry of coping factors into the model, with Cox & Snell R^2 increasing to .223 and Nagelkerke R^2 to .307.

Table 4.12*Hierarchical Logistic Regression of Factors Predicting Substance Use Post-Treatment Entry (n = 1114)*

	Block One			Block Two			Block Three			Block Four			Block Five		
	Wald	Exp(B)	95% C.I.	Wald	Exp(B)	95% C.I.	Wald	Exp(B)	95% C.I.	Wald	Exp(B)	95% C.I.	Wald	Exp(B)	95% C.I.
A	13.38***	.97	.96-.99	14.67***	.97	.96-.99	14.80***	.97	.96-.99	17.54***	.97	.95-.98	11.17***	.97	.96-.99
CR	17.06***	.53	.39-.72	15.02***	.54	.40-.74	14.78***	.55	.40-.74	14.04***	.55	.40-.75	8.33**	.61	.43-.85
BASI-A	19.07***	4.24	2.22-8.11	16.63***	3.96	2.04-7.68	16.65***	3.97	2.05-7.70	14.86***	3.80	1.93-7.50	11.85***	3.52	1.72-7.20
BASI-D	.32	1.35	.47-3.87	.78	1.62	.55-4.77	.58	1.52	.52-4.50	.02	1.09	.36-3.31	.67	1.65	.50-5.51
G				16.24***	.57	.44-.75	16.76***	.57	.43-.74	23.29***	.50	.37-.66	9.61**	.62	.46-.84
ED				6.18	1.24	1.05-1.48	5.83*	1.24	1.04-1.47	8.45**	1.31	1.09-1.56	5.64*	1.26	1.04-1.53
RS				.10	.95	.71-1.29	.07	.96	.71-1.30	.00	1.00	.73-1.36	.41	.90	.65-1.25
EM				.23	1.07	.81-1.41	.24	1.07	.81-1.41	2.62	1.27	.95-1.169	3.42	1.34	.98-1.82
I				.05	.97	.74-1.27	.03	.98	.75-1.28	.00	1.01	.77-1.33	.12	.95	.71-1.27
CI				.22	1.01	.97-1.05	.26	1.01	.97-1.05	.11	1.01	.97-1.05	.04	1.00	.96-1.04
D							.04	.96	.67-1.40	1.44	.79	.54-1.16	1.12	.80	.53-1.21
AN							1.37	1.23	.87-1.73	.71	1.16	.82-1.66	.61	1.16	.80-1.70
PS										40.04***	1.06	1.04-1.08	1.56	1.01	.99-1.04
EH										1.98	1.06	.98-1.14	1.48	1.01	.99-1.04
REC													17.46***	.98	.97-.99
EF													55.38***	.33	.25-.45
SC													12.37***	.96	.94-.98

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

A = age, CR = court referral (reference category is no), BASI-A = baseline alcohol ASI, BASI-D = baseline drug ASI

G = gender (reference category is male), ED = education level, RS = relationship status (reference category is single), EM = employment status (reference category is not employed), I = income (reference category is below median), CI = community inequality, D = depression (reference category is not depressed), AN = anxiety (reference category is not anxious), PS = perceived stress, EH = economic hardship, REC = recovery support, EF = efficacy, SC = self-control

Trimmed Model. To create the most parsimonious model possible, all non-significant variables were excluded from the model (see Table 4.13). Although each variable in the full model as originally conceptualized did not predict substance use post-treatment entry in this sample, the trimmed model significantly predicted whether participants used alcohol or illicit drugs after entering treatment. The variables included in the model improve the ability to correctly predict substance use post-treatment entry from 64.8% to 72.9% (see Table 4.14). Again, the model was better able to predict participants who used substances post-treatment entry than participants who remained abstinent between baseline and follow-up, correctly classifying only 54.6% of participants who did not use compared to 82.8% of participants who used substances. The final model was significant (Omnibus $\chi^2 = 273.42$, $p < .001$), and accounted for a substantial amount of the variance in the dependent variable (Cox & Snell $R^2 = .218$, Nagelkerke $R^2 = .299$). The final model provides the following answers for the first set of research questions:

1(a). How do baseline social stress factors and psychological distress relate to substance use post-treatment entry?

After testing the model, it was determined that gender and educational level were the only two social stress factors that impacted odds of using substances post-treatment entry. In the final model, women were 40% less likely to use substances than men (Wald $\chi^2 = 17.84$, $p < .001$). In addition, for each educational level, participants were 29% more likely to use substances after treatment entry (Wald $\chi^2 = 16.86$, $p = .009$). Psychological distress was not a predictor of substance use after treatment entry.

1(b). Is the relationship between baseline social stress factors, psychological distress, and substance use after treatment entry mediated by perceived stress and economic hardship?

Perceived stress was a significant variable in the model ($\text{Exp}(B) = 1.06$, Wald $\chi^2 = 51.50$, $p < .001$). However, all other significant variables retained their significance and did not weaken with the inclusion of perceived stress, indicating no statistical mediation occurring. In addition, economic hardship was not significant and did not improve ability to predict substance use post-treatment entry.

1(c). Do coping factors, such as recovery support, efficacy, and self-control, mediate the relationship between perceived stress, economic hardship, and substance use after treatment entry?

Coping factors did appear to potentially mediate the relationship between perceived stress and substance use post-treatment entry. Although perceived stress was significant in the fourth block, it became non-significant with the inclusion of recovery support, efficacy, and self-control. For each additional unit of recovery support, participants were 2% less likely to use substances after treatment entry ($\text{Exp}(B) = .98$, Wald $\chi^2 = 17.31$, $p < .001$). For each increase in self-rated efficacy, participants were 67% less likely to use substances after treatment entry ($\text{Exp}(B) = .33$, Wald $\chi^2 = 56.28$, $p < .001$). Finally, for each increase of 1 on the self control scale, participants were 4% less likely to use substances after treatment entry ($\text{Exp}(B) = .96$, Wald $\chi^2 = 11.09$, $p < .001$). Notably, the addition of coping factors to the model caused the largest change in both R^2 measures compared to other blocks entered in the model.

1(d). Which of the factors will most strongly predict substance use after treatment entry?

Odds ratios can be used as measures of effect size, so variables with the largest odds ratios have the largest effect on the ability to predict the dependent variable. In the final model, baseline alcohol composite score on the ASI was the largest predictor of substance use post-treatment entry. For each increase of one on the composite score, participants were 3.65 times more likely to use substances after treatment entry ($\text{Exp}(B) = 3.65$, Wald $\chi^2 = 13.07$, $p < .001$). Although baseline alcohol ASI score was the largest individual predictor, the three coping factors were the largest group of variables that contributed to the ability of the model to correctly predict the odds of using substances post-treatment entry. The addition of this block of variables had an Omnibus χ^2 value of 132.63 ($p = .000$) and increased the Cox & Snell R^2 from .119 to .218 and the Nagelkerke R^2 from .163 to .299.

Table 4.13

Logistic Regression of Factors Predicting Substance Use Post-Treatment Entry- Trimmed Model

	Block One			Block Two			Block Three			Block Four		
	Wald	Exp(B)	95% C.I.	Wald	Exp(B)	95% C.I.	Wald	Exp(B)	95% C.I.	Wald	Exp(B)	95% C.I.
A	14.79***	.97	.96-.87	17.43***	.97	.96-.98	19.70***	.97	.95-.98	12.49***	.97	.96-.99
CR	21.84***	.51	.39-.68	20.26***	.52	.39-.69	16.23***	.55	.41-.73	11.39***	.58	.42-.80
BASI-A	19.18***	4.25	2.22-8.12	17.10***	3.94	2.06-7.56	15.93***	3.90	2.00-7.60	13.07***	3.65	1.81-7.37
G				17.84***	.57	.44-.74	28.15***	.48	.37-.63	12.17***	.60	.45-.80
ED				6.86***	1.26	1.06-1.45	10.07**	1.33	1.12-1.59	6.95**	1.29	1.07-1.55
PS							51.50***	1.06	1.04-1.08	2.49	1.02	1.00-1.04
REC										17.31***	.98	.97-.99
EF										56.28***	.33	.25-.44
SC										11.09***	.96	.94-.98
Omnibus χ^2												
Block	61.10***			23.79***			55.90***			132.63***		
Model	61.10***			84.89***			140.79***			273.42***		
-2LL	1383.99			1360.20			1304.31			1171.68		
Cox & Snell R²	.053			.073			.119			.218		
Nagelkerke R²	.073			.101			.163			.299		

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

A = age, CR = court referral (reference category is no), BASI-A = baseline alcohol ASI,

G = gender (reference category is male), ED = education level, PS = perceived stress, REC = relationship status, EF = efficacy, SC = self-control

Table 4.14

Classification Table of Logistic Regression of Predicted Substance Use Post-Treatment Entry- Trimmed Model

	Observed	Predicted		% Correct
		0	1	
Block Zero	0	0	392	0
	1	0	722	100
	Overall %			64.8
Block One	0	40	352	10.2
	1	40	682	94.5
	Overall %			64.8
Block Two	0	85	307	21.7
	1	66	656	90.9
	Overall %			66.5
Block Three	0	134	258	34.2
	1	96	626	86.7
	Overall %			68.2
Block Four	0	214	178	54.6
	1	124	598	82.8
	Overall %			72.9

OLS Regression

To answer the second set of research questions, hierarchical OLS regression was conducted in two steps. Alcohol and drug ASI composite scores are separate measures that cannot be combined, so the regression model was run once for alcohol ASI score and a second time for drug ASI score. Similar to the logistic regression analysis conducted to answer the first set of research questions, dependent variables were entered in five blocks for both models. In the first block, the odds of participants reporting substance use post-treatment entry were regressed on the control variables of age, court referral, baseline alcohol ASI, and baseline drug ASI. Next, the social stress variables gender, education level, relationship status, employment, income, and community inequality were added to

the model. In the third block the two variables representing psychological distress, depression, and anxiety, were added. Then, perceived stress and economic hardship were included in the fourth block to determine if they mediated the relationship between social stress factors and psychological distress and the odds of substance use post-treatment entry. Last, the coping factors, recovery support, efficacy, and self-control, were added to the model to determine if they mediated the relationship between perceived stress and economic hardship and the odds of substance use post-treatment entry. The data were checked to ensure it met the assumptions of multivariate normality, linearity, and homoscedasticity. Tolerance statistics were checked to exclude the possibility of multicollinearity. Multivariate outliers were determined using Mahalanobis distances and excluded from the sample, leaving an n for this analysis of 1097.

Although there were a large number of participants scoring 0 on follow-up alcohol and drug ASI composite scores, the following analysis examined the entire sample. Other researchers have found that linear regression yields accurate parameter estimates with highly positively skewed data including a large number of 0's as long as the sample size is adequate and the other assumptions of OLS regression met (Lumley et al., 2002). Additional analyses were conducted examining participants who were not using any substances at follow-up to see if there were significant differences between groups, and these analyses will be discussed after OLS regression results in this section.

Research Question #2

The second set of research questions was:

2. *Will the model significantly predict addiction severity at follow-up?*

- a. *Specifically, how do baseline social stress factors and psychological distress relate to addiction severity at follow-up?*
- b. *Is the relationship between social stress factors, psychological distress, and follow-up addiction severity mediated by perceived stress and economic hardship?*
- c. *Do coping factors, such as recovery support, efficacy, and self-control, mediate the relationship between perceived stress, economic hardship, and addiction severity at follow-up?*
- d. *Which of the factors will most strongly predict follow-up addiction severity?*

Alcohol addiction severity.

Each block entered in the model was statistically significant predicting follow-up alcohol ASI composite score (see Table 4.15). The control variables, age, court referral, baseline alcohol ASI composite score, and baseline drug ASI composite score, were entered in the first block ($F(4, 1096) = 59.63, p < .001$). The R^2 was .179. Age and court referral were not significant predictors, but both baseline alcohol ($\beta = .41, t = 14.11, p < .001$) and drug ($\beta = .09, t = 3.12, p = .002$) composite scores were significant.

Variables representing social stress, including gender, educational level, relationship status, employment, income, and community inequality were entered in the second block. After these variables were included, the model was able to account for 19.3% of the variance in alcohol addiction severity at follow-up, which represented a significant change in R^2 of .014 ($p = .005$). As a whole, this block of variables improved the model's ability to predict follow-up alcohol composite score ($F(10, 1096) = 26.03, p$

< .001), but gender ($\beta = -.09, t = -3.27, p < .001$) and relationship status ($\beta = .06, t = 2.14, p = .033$) were the only significant variables. Contrary to what was expected, when all other variables were held constant, females scored .022 less on the alcohol composite score. Similarly, participants cohabitating with an intimate partner scored .016 higher.

With the addition of the psychological distress variables in the third block, the model was still significant ($F(12, 1096) = 21.84, p < .001$) although neither of the individual variables were significant. R^2 only increased to .195, which was not a significant change. The fourth block was similar, with the model retaining significance ($F(14, 1096) = 19.03, p < .001$), but neither perceived stress or economic hardship significantly contributing to the model. The change in R^2 again was not significant, increasing by .003. Notably, perceived stress approached significance in the model at $p = .056$.

The inclusion of the coping factors in the fifth and final block significantly contributed to the overall model ($F(17, 1096) = 20.97, p < .001$), and each of the three variables were individually significant. R^2 was significantly increased by .051 to .248 ($p = .000$). Efficacy had the largest standardized coefficient ($\beta = -.18, t = -6.11, p < .001$), followed by self-control ($\beta = .11, t = -2.95, p < .001$), and recovery support ($\beta = .10, t = 3.57, p < .001$). When all else was held constant, each additional efficacy rating decreased alcohol composite score by .024 points. Each additional point on the self-control scale decreased alcohol composite score by .002, and unlike what was hypothesized, each additional indicator of recovery support raised alcohol composite score, although only by .001. However, since recovery support was measured on a scale

of 0-31, someone reporting the highest amount of recovery support would have an alcohol composite score increased by .031.

Trimmed Model. Overall, the hypothesized model significantly predicted alcohol addiction severity at follow-up. However, some of the individual predictors were not significant and thus the model was trimmed to create the most parsimonious model possible (see Table 4.16). The overall trimmed model was significant ($F(7, 1096) = 49.20, p < .001$) and accounted for 24% of the variance in the dependent variable. Each block of variables significantly increased the amount of variance in the dependent variable accounted for by the model. The trimmed model was used to answer the second set of research questions below:

2(a). How do baseline social stress factors and psychological distress relate to addiction severity at follow-up?

In the final model for alcohol addiction severity, the only significant social stress variables in the second block were gender ($\beta = -.10, t = -3.63, p < .001$), and relationship status ($\beta = -.06, t = -2.11, p = .035$). The inclusion of these models accounted for 19.1% of the variance in alcohol addiction severity, which significantly raised the R^2 in the second block to .191 from .178 ($p = .000$) when only baseline alcohol and drug ASI composite scores were in the analysis. Before the inclusion of the coping variables (see question 2c below), when all other variables were held constant women scored .023 less on the alcohol ASI composite score than men. Similarly, participants cohabitating with an intimate partner scored .015 higher on the alcohol composite score.

2(b). Is the relationship between social stress factors, psychological distress, and follow-up addiction severity mediated by perceived stress and economic hardship?

Perceived stress and economic hardship were not significant in the model and therefore did not mediate the relationship between social stress and alcohol addiction severity.

2(c). Do coping factors, such as recovery support, efficacy, and self-control, mediate the relationship between perceived stress, economic hardship, and addiction severity at follow-up?

The block for coping factors was significant as a whole ($F(7,1096) = 49.20, p < .001$), and recovery support ($\beta = .10, t = 3.62, p < .001$), efficacy ($\beta = -.18, t = 6.01, p < .001$), and self-control ($\beta = -.07, t = 2.26, p = .024$) were all individually significant when added to the model. The block for coping factors significantly increased the R^2 from .191 to .240 ($p = .000$), showing that the final model accounts for 24% of the variance in alcohol addiction severity. When these three variables were added, the control variables and gender all maintained significance but relationship status became non-significant, suggesting that the coping factors potentially mediated the relationship between relationship status and alcohol addiction severity. Mediation was tested empirically using Baron and Kenny's (1986) four steps and the Sobel statistic, and findings indicated that the three coping factors did not significantly mediate this relationship.

2(d). Which of the factors will most strongly predict follow-up addiction severity?

In the final model predicting alcohol addiction severity, baseline alcohol ASI composite score was the strongest predictor ($\beta = .39, t = 14.39, p < .001$). Efficacy was the second strongest predictor of alcohol addiction severity ($\beta = -.18, t = 6.01, p < .001$), and when all other variables are held constant scores for alcohol addiction severity would decrease .023 for every additional indicator of efficacy. Baseline drug composite score was also one of the stronger predictors of alcohol addiction severity at follow-up ($\beta = -.12, t = -4.43, p < .001$), indicating that both baseline drug and alcohol use significantly affected follow-up addiction severity more than the social stress or psychological distress variables included in the model.

Table 4.15*Factors Predicting Follow-up Alcohol Addiction Severity*

Predictor	Block 1			Block 2			Block 3			Block 4			Block 5		
	B	β	<i>t</i>	B	β	<i>T</i>	B	β	<i>t</i>	B	β	<i>T</i>	B	β	<i>t</i>
A	.000	.02	.72	.000	.03	.92	.000	.03	.88	.000	.03	.92	.001	.05	1.57
CR	-.009	-.04	-1.15	-.007	-.03	-.87	-.006	-.03	-.80	-.005	-.02	-.67	-.003	-.01	-.43
BASIA	.211	.41	14.11***	.203	.39	13.41***	.202	.39	13.32***	.202	.39	13.34***	.189	.37	12.81***
BASID	-.081	-.09	-3.12**	-.068	-.08	-2.59**	-.067	-.08	-2.56**	-.070	-.08	-2.66**	-.104	-.12	-3.96***
G				-.022	-.09	-3.27***	-.022	-.10	-3.32***	-.022	-.09	-3.22***	-.014	-.06	-2.10*
ED				.004	.02	.84	.004	.03	.90	.004	.03	.95	.002	.02	.59
RS				.016	.06	2.14*	.016	.06	2.14*	.016	.06	2.09*	.011	.04	1.53
EM				.003	.01	.49	.004	.02	.53	.006	.03	.82	.008	.03	1.13
I				.002	.01	.30	.002	.01	.36	.002	.01	.28	.004	.02	.57
CI				.000	-.01	-.29	.000	-.01	-.22	.000	-.01	-.27	.000	-.01	-.34
D							.012	.05	1.35	.011	.04	1.19	.015	.06	1.65
AN							-.006	-.02	-.71	-.006	-.03	-.73	-.007	-.03	-.80
PS										.001	.06	1.91	-.001	-.05	-1.27
EH										-.002	-.04	-.18	.002	-.03	-.14
REC													.001	.10	3.57***
EF													-.024	-.18	-6.11***
SC													-.002	-.11	-2.95**
Constant	.067			.064			.059			.045			.245		
F	59.63***			26.03***			21.84***			19.03***			20.97***		
Total R ²	.179			.193			.195			.198			.248		
Change in R ²	--			.014**			.001			.003			.051***		

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

A = age, CR = court referral (reference category is no), BASI-A = baseline alcohol ASI, BASI-D = baseline drug ASI

G = gender (reference category is male), ED = education level, RS = relationship status (reference category is single), EM = employment status (reference category is not employed), I = income (reference category is below median), CI = community inequality, D = depression (reference category is not depressed), AN = anxiety (reference category is not anxious), PS = perceived stress, EH = economic hardship, REC = recovery support, EF = efficacy, SC = self-control

Table 4.16*Factors Predicting Follow-up Alcohol Addiction Severity- Trimmed Model*

Predictor	Block 1			Block 2			Block 3		
	B	β	<i>t</i>	B	β	<i>T</i>	B	β	<i>t</i>
BASIA	.218	.42	15.28***	.211	.41	14.77***	.200	.39	14.39***
BASID	-.073	-.09	-3.11**	-.062	-.07	-2.62**	-.106	-.12	-4.43***
G				-.023	-.10	-3.63***	-.019	-.08	-3.09**
RS				.015	.06	2.11*	.011	.04	1.57
REC							.001	.10	3.62***
EF							-.023	-.18	6.01***
SC							-.001	-.07	2.26*
Constant	.068			.067			.214		
<i>F</i>	118.20***			64.31***			49.20***		
Total R ²	.178			.191			.240		
Change in R ²	--			.013***			.049***		

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

BASI-A = baseline alcohol ASI, BASI-D = baseline drug ASI, G = gender (reference category is male), RS = relationship status (reference category is single), REC = recovery support, EF = efficacy, SC = self-control

Drug severity. The same model used to predict alcohol addiction severity was used to predict drug addiction severity (see Table 4.17). A preliminary regression was run to detect multivariate outliers for this specific model, and cases were eliminated if identified as an outlier. The final *n* for the drug severity section of the analysis was 1104.

The first block of the model contained the control variables, and accounted for 13% of the variability in drug addiction severity ($F(4, 1103) = 40.91, p < .001$). Only age ($\beta = -.12, t = -4.43, p < .001$) and baseline drug ASI composite score ($\beta = -.12, t = -4.43, p < .001$) were significant in this block.

When the social stress variables were added in the second block, while the model was significant as a whole ($F(10, 1103) = 17.39, p < .001$) only gender was individually significant ($\beta = -.06, t = -2.15, p = .032$). With the addition of gender to the model, the overall R² increased from .130 to .137, but this change was not significant. The third block added the psychological distress variables, but neither depression nor anxiety were significant. The previously significant variables from the first two blocks retained significance in this block.

In the fourth block, perceived stress and economic hardship were added. The overall model was significant ($F(14,1103) = 22.71, p < .001$), and both individual predictors were significant. When all other variables were held constant, every increase of 1 unit on the perceived stress scale predicted an additional .002 ($\beta = .28, t = 9.08, p < .001$) on the drug ASI composite score. Since this is a scale with a range of 2-50 someone scoring at the high end of the scale would score .10 higher on the drug ASI. When all other variables were held constant, an increase in economic hardship predicted an increase of .003 ($\beta = .07, t = 2.37, p = .018$) on the dependent variable. Since this was an 8-item scale, participants experiencing the highest possible economic hardship would have a value on the drug ASI composite score .024 higher than someone not experiencing economic hardship. This block as a whole significantly increased the R^2 from .138 to .226 ($p = .000$).

Block five added the coping variables, and this block significantly improved the model's ability to predict drug addiction severity ($F(17,1103) = 39.45, p < .001$). All three coping variables were individually significant. Efficacy had the highest standardized β of $-.31$ ($t = -11.28, p < .001$) and every increase in efficacy was associated with a .026 decrease in drug addiction severity when all other variables were held constant. Each increase in self-control resulted in a .002 decrease in drug addiction severity ($\beta = -.24, t = -7.35, p < .001$). Contrary to expectations, an increase in recovery support of one predicted a .001 increase in drug addiction severity score ($\beta = .12, t = 4.58, p < .001$). With the addition of the coping variables in the model, perceived stress no longer was significant, indicating that the relationship between perceived stress and drug addiction severity was mediated by coping. However, economic hardship gained

significance in the final block ($\beta = .08, t = 2.82, p = .005$) even after inclusion of the coping variables. Notably, the overall model predicted drug addiction severity better than it did alcohol addiction severity, and the final R^2 for drug addiction severity was .382. This represented a significant increase from the previous block ($p = .000$), and with the largest change in R^2 of all the blocks, this was the block of variables that contributed the most to the overall model.

Table 4.17*Factors Predicting Follow-up Drug Addiction Severity*

Predictor	<u>Block 1</u>			<u>Block 2</u>			<u>Block 3</u>			<u>Block 4</u>			<u>Block 5</u>		
	B	β	<i>t</i>	B	β	<i>T</i>	B	β	<i>t</i>	B	β	<i>t</i>	B	β	<i>t</i>
A	-.001	-.07	-2.45*	-.001	-.07	-2.39*	-.001	-.07	-2.42*	-.001	-.09	-3.07**	.000	-.05	-2.11*
CR	-.002	-.01	-.36	-.001	-.01	-.25	-.001	-.01	-.21	.000	.00	.07	.004	.02	.82
BASIA	-.004	-.01	-.37	-.003	-.01	-.34	-.004	-.12	-.39	-.008	-.02	-.80	-.025	-.08	-2.88**
BASID	.192	.34	10.92***	.194	.34	10.90***	.194	.34	10.86***	.176	.31	10.38***	.142	.25	9.01***
G				-.010	-.06	-2.15*	-.010	-.07	-2.18*	-.014	-.09	-3.09**	-.003	-.02	-.66
ED				.003	.03	.88	.003	.03	.93	.004	.04	1.56	.002	.02	.95
RS				.002	.01	.45	.002	.01	.45	.004	.02	.82	-.002	-.01	-.39
EM				-.007	-.05	-1.51	-.007	-.05	-1.49	.000	.00	.02	.003	.02	.62
I				-.006	-.04	-1.42	-.06	-.04	-1.36	-.004	-.03	-.97	-.003	-.02	-.65
CI				.000	.02	.78	.001	.02	.82	.000	.02	.71	.000	.01	.43
D							.006	.03	.95	-.001	-.01	-.20	.002	.01	.40
AN							-.003	-.02	-.44	-.007	-.04	-1.25	-.007	-.04	-1.43
PS										.002	.28	9.08***	.000	.05	.155
EH										.003	.07	2.37*	.003	.08	2.82**
REC													.001	.12	4.58***
EF													-.026	-.31	-11.28***
SC													-.002	-.24	-7.35***
Constant	.056			.037			.035			-.023			.242		
F	40.91***			17.39***			14.56***			22.71***			39.45***		
Total R ²	.130			.137			.138			.226			.382		
Change in R ²	--			.008			.001			.088***			.156***		

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

A = age, CR = court referral (reference category is no), BASI-A = baseline alcohol ASI, BASI-D = baseline drug ASI

G = gender (reference category is male), ED = education level, RS = relationship status (reference category is single), EM = employment status (reference category is not employed), I = income (reference category is below median), CI = community inequality, D = depression (reference category is not depressed),

AN = anxiety (reference category is not anxious), PS = perceived stress, EH = economic hardship, REC = recovery support, EF = efficacy, SC = self-control

Trimmed Model. The hypothesized model significantly predicted drug addiction severity at follow-up, although some of the individual predictors were not significant individually. All non-significant variables were excluded from the final model (see Table 4.18). The overall trimmed model was significant ($F(9, 1103) = 74.23, p < .001$) and accounted for nearly 38% of the variance in the dependent variable ($R^2 = .379$). The trimmed model was used to answer the second set of research questions below:

2(a). How do baseline social stress factors and psychological distress relate to addiction severity at follow-up?

In the final model, gender was the only social stress factor that significantly affected the dependent variable. When the non-significant variables were taken out of the model, gender was not significant upon its initial inclusion in the second block ($\beta = -.04, t = -1.55, p = .121$), but became significant when perceived stress and economic hardship were added in block three ($\beta = -.08, t = -3.04, p = .002$). In the final block, gender lost significance again once the coping variables were added to the model ($\beta = -.02, t = -.74, p = .458$), so it was ultimately not a predictor of drug addiction severity. No other social stress or psychological distress variables significantly predicted drug addiction severity.

2(b). Is the relationship between social stress factors, psychological distress, and follow-up addiction severity mediated by perceived stress and economic hardship?

Perceived stress ($\beta = .27, t = 9.12, p < .001$) and economic hardship ($\beta = .07, t = 2.21, p = .028$) were both significant in the revised model when they were added in the third block. They did not mediate the relationship between any social stress factors, and in fact, gender became significant when these two variables were added. The addition of

the perceived stress and economic hardship significantly improved the model's ability to predict drug addiction severity at follow-up and increased the total R^2 of the model from .131 to .220 ($p = .000$).

2(c). Do coping factors, such as recovery support, efficacy, and self-control, mediate the relationship between perceived stress, economic hardship, and addiction severity at follow-up?

Similar to the linear model for alcohol addiction severity, the block for coping factors was significant as a whole ($F(9,1103) = 74.23, p < .001$), and recovery support ($\beta = .12, t = 4.66, p < .001$), efficacy ($\beta = -.31, t = -11.45, p < .001$), and self-control ($\beta = -.24, t = -7.32, p < .001$) were all individually significant when added to the model. The block for coping factors increased the R^2 from .220 to .379 ($p = .000$), showing that the final model accounts for nearly 40% of the variance in drug addiction severity. This change in R^2 was the largest of any block, indicating that the coping factors affected the ability to predict follow-up drug addiction severity more than any other block of variables in the model. When these three variables were added, the control variables, gender, and economic hardship all maintained significance, and economic hardship even gained in significance. However, perceived stress became non-significant upon the addition of coping factors, demonstrating that coping factors appear to mediate the relationship between perceived stress and drug addiction severity. Mediation was again tested empirically using the four step established by Baron and Kenny (1986), with findings indicating that efficacy and self-control mediated the relationship between gender and drug addiction severity, and that all three coping factors significantly mediated the relationship between perceived stress and drug addiction severity (see Table 4.19).

2(d). Which of the factors will most strongly predict follow-up addiction severity?

The strongest individual predictors in the final model predicting drug addiction severity were efficacy ($\beta = .31, t = -11.45, p < .001$), baseline drug addiction severity ($\beta = .24, t = 9.48, p < .001$), and self-control ($\beta = -.24, t = -7.32, p < .001$). Recovery support ($\beta = .12, t = 4.66, p < .001$), economic hardship ($\beta = .08, t = 2.83, p = .005$), baseline alcohol addiction severity ($\beta = -.08, t = -3.14, p = .002$), and age ($\beta = -.06, t = -2.25, p = .024$) were also significant predictors. As the strongest predictor, each increase of one for efficacy predicted a decrease of .026 for drug severity.

As a group, the coping factors most strongly improved the ability of the model to predict follow-up drug addiction severity. The inclusion of these variables in the model increased the R^2 from .220 to .379 ($p = .000$), the largest increase in R^2 by any block of variables in the model.

Table 4.18*Factors Predicting Follow-up Drug Addiction Severity- Trimmed Model*

Predictor	Block 1			Block 2			Block 3			Block 4		
	B	β	<i>t</i>	B	β	<i>T</i>	B	β	<i>t</i>	B	β	<i>t</i>
A	-.001	-.07	-2.43*	-.001	-.07	-2.43*	-.001	-.09	-3.22***	.000	-.06	-2.25*
BASIA	-.003	-.01	-.30	-.004	-.01	-.45	-.008	-.02	-.82	-.026	-.08	-3.14*
BASID	.194	.34	11.93***	.197	.35	12.04***	.177	.31	11.29***	.137	.24	9.48***
G				-.007	-.04	-1.55	-.013	-.08	-3.04**	-.003	-.02	-.74
PS							.002	.27	9.12***	.000	.05	1.38
EH							.003	.07	2.21*	.003	.08	2.83**
REC										.001	.12	4.66***
EF										-.026	-.31	-11.45***
SC										-.002	-.24	-7.32***
Constant	.054			.057			.007			.259		
<i>F</i>	54.54***			41.56***			51.68***			74.23***		
Total R ²	.129			.131			.220			.379		
Change in R ²	--			.002			.089***			.159***		

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

A = age, BASI-A = baseline alcohol ASI, BASI-D = baseline drug ASI

G = gender (reference category is male), PS = perceived stress, EH = economic hardship, REC = recovery support, EF = efficacy, SC = self-control

Table 4.19*Direct, Indirect, and Total Effects of Gender and Perceived Stress on Drug Addiction Severity*

Predictor	Mediator	Direct Effects	Indirect Effects	Total Effects
Gender	Efficacy	-.02	-.04***	-.09***
	Self-Control	-.02	-.03***	-.09***
Perceived Stress	Recovery Support	.05	-.01***	.28***
	Efficacy	.05	.10***	.28***
	Self-Control	.05	-.14***	.28***

Significance of mediation tested with Sobel test * $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

Additional Analyses. Since the original sample contained participants from a variety of treatment settings throughout the state of Kentucky and contained participants with low baseline ASI alcohol and drug composite scores, the analyses were re-run examining only participants who scored high enough at baseline to be indicative of potential substance dependence according to Rikoon et al.'s (2006) established cutoff scores (alcohol ASI composite score of .17 or greater, and drug ASI composite score of .15 or greater). It is possible that participants using higher levels of substances at baseline were affected differently by social stress, psychological distress, appraised stress, and coping factors than participants using less. A total of 714 participants (64.7% of the sample) had baseline scores high enough on one or both of the scales to meet the cutoff.

Logistic Regression. First, hierarchical binary logistic regression was conducted again examining the model's ability to predict substance use post-treatment entry (see Tables 4.20-4.25). Comparisons between the most parsimonious model for the full sample and participants with baseline ASI scores indicative of potential substance dependence are noted in Table 4.24 below. The model fit the data better for the subsample than it did for the full sample, resulting in a lower -2LL (688.91 for the subsample compared to 1171.68 for the full sample). Omnibus χ^2 for each block was significant in the trimmed model for the subsample (see Table 4.23), and the full model Omnibus χ^2 was significant with every block as well. Notably, in the hierarchical model with the subsample, one of the psychological distress variables, anxiety, was significant at its inclusion in the model in block three (Wald $\chi^2 = 5.04$, Exp(B) = 1.48, $p = .025$) and became non-significant (Wald $\chi^2 = 2.86$, Exp(B) = 1.36, $p = .091$) upon the inclusion of

perceived stress (Wald $\chi^2 = 34.31$, $\text{Exp}(B) = 1.06$, $p < .001$) indicating perceived stress mediated the relationship between anxiety and substance use post-treatment entry. In addition, while baseline alcohol ASI composite score was the strongest predictor of substance use post-treatment entry in the full sample, this variable was not significant in the sample of participants with scores high enough to be potentially indicative of substance dependence. This suggests that once the threshold is crossed to indicate potential substance dependence, the specific severity level of alcohol use no longer matters for predicting a return to substance use after beginning treatment.

Similar to findings for analysis with the full sample, the model was able to predict substance use post-treatment entry better than it was able to predict abstinence. In the final block, the model was able to correctly predict 87.3% of participants who had used substances after beginning treatment but only 38.3% of participants who had not used any substances between baseline and follow-up.

Table 4.20

Model Fit Statistics for Logistic Regression Examining Odds of Substance Use Post-Treatment Entry for Participants with Baseline ASI Scores Indicative of Potential Substance Dependence

	Block One	Block Two	Block Three	Block Four	Block Five
Block χ^2	23.83***	10.27	5.77	43.23***	103.89***
Model χ^2	23.83***	34.11***	39.88***	83.11***	187.00***
-2LL	843.63	833.35	827.58	784.35	680.46
Cox & Snell R ²	.033	.046	.054	.109	.229
Nagelkerke R ²	.046	.066	.077	.156	.327
Hosmer & Lemeshow	5.12	3.69	4.61	8.68	13.02
% Correctly Classified [^]	70.6	70.8	72.2	71.9	74.6

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

[^]% correctly classified in Block 0 was 71.0%

Table 4.21

Classification Table for Logistic Regression of Predicted Substance Use Post-Treatment Entry for Participants with Baseline ASI Scores Indicative of Potential Substance Dependence

	Observed	Predicted		% Correct
		0	1	
Block Zero	0	0	209	0
	1	0	511	100
	Overall %			71.0
Block One	0	1	208	.5
	1	4	507	99.2
	Overall %			70.6
Block Two	0	5	204	2.4
	1	6	505	98.8
	Overall %			70.8
Block Three	0	13	196	6.2
	1	4	507	99.2
	Overall %			72.2
Block Four	0	40	169	19.1
	1	33	478	93.5
	Overall %			71.9
Block Five	0	86	123	41.1
	1	60	451	88.3
	Overall %			74.6

Table 4.22

Hierarchical Logistic Regression of Factors Predicting Substance Use Post-Treatment Entry for Participants with Baseline ASI Scores Indicative of Potential Substance Dependence (n = 720)

	Block One			Block Two			Block Three			Block Four			Block Five		
	Wald	Exp(B)	95% C.I.	Wald	Exp(B)	95% C.I.	Wald	Exp(B)	95% C.I.	Wald	Exp(B)	95% C.I.	Wald	Exp(B)	95% C.I.
A	9.39**	.97	.95-.99	9.98**	.97	.95-.99	10.13***	.97	.95-.99	11.10***	.97	.95-.99	5.32	.98	.96-1.00
CR	10.50***	.55	.39-.79	9.74**	.56	.39-.81	9.95**	.56	.39-.80	9.39**	.55	.38-.81	3.55	.67	.45-1.02
BASI-A	5.00	2.33	1.11-4.87	4.56*	2.27	1.07-4.82	5.06*	2.38	1.11-5.07	3.56	2.11	.97-4.58	2.66	2.00	.87-4.58
BASI-D	.01	.94	.26-3.37	.04	1.14	.31-4.20	.01	1.06	.29-3.95	.32	.68	.17-2.65	.05	1.17	.27-5.17
G				8.94**	.59	.42-.83	9.71**	.57	.40-.81	12.84***	.51	.35-.74	4.71*	.64	.43-.96
ED				1.11	1.23	.90-1.41	.97	1.12	.89-1.40	2.55	1.21	.96-1.53	2.55	1.23	.95-1.59
RS				.43	.88	.59-1.30	.42	.88	.59-1.30	.43	.87	.58-1.31	1.50	.76	.50-1.18
EM				.13	.94	.66-1.34	.16	.93	.65-1.33	.70	1.18	.81-1.72	.54	1.17	.78-1.75
I				.09	.76	.67-1.34	.04	.97	.68-1.36	.00	1.01	.71-1.45	.22	.91	.62-1.35
CI				.01	1.00	.95-1.06	.04	1.01	.96-1.06	.00	1.00	.95-1.05	.44	.98	.93-1.04
D							.70	.81	.50-1.32	2.40	.67	.41-1.11	2.12	.67	.38-1.15
AN							5.01*	1.68	1.07-2.64	4.70*	1.68	1.05-2.69	4.44*	1.74	1.04-2.92
PS										29.59***	1.07	1.04-1.09	.12	1.01	.98-1.04
EH										1.32	1.06	.96-1.17	1.03	1.06	.95-1.17
REC													12.32***	.98	.96-.99
EF													34.59***	.28	.18-.43
SC													13.40***	.94	.91-.97

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

A = age, CR = court referral (reference category is no), BASI-A = baseline alcohol ASI, BASI-D = baseline drug ASI

G = gender (reference category is male), ED = education level, RS = relationship status (reference category is single), EM = employment status (reference

category is not employed), I = income (reference category is below median), CI = community inequality, D = depression (reference category is not depressed),

AN = anxiety (reference category is not anxious), PS = perceived stress, EH = economic hardship, REC = recovery support, EF = efficacy, SC = self-control

Table 4.23

Logistic Regression of Factors Predicting Substance Use Post-Treatment Entry for Participants with Baseline ASI Scores Indicative of Potential Substance Dependence- Trimmed Model

	Block One			Block Two			Block Three			Block Four			Block Five		
	Wald	Exp(B)	95% C.I.	Wald	Exp(B)	95% C.I.	Wald	Exp(B)	95% C.I.	Wald	Exp(B)	95% C.I.	Wald	Exp(B)	95% C.I.
A	9.73**	.97	.96-.99	10.36***	.97	.95-.99	10.36***	.97	.95-.99	9.98**	.97	.95-.99	4.65*	.98	.96-1.00
CR	11.62***	.56	.40-.78	12.13***	.55	.39-.77	11.88***	.55	.39-.77	10.26***	.56	.40-.80	4.91*	.65	.45-.95
BASI-A	5.33*	2.35	1.14-4.83	4.03*	2.10	1.02-4.35	4.36*	2.17	1.05-4.51	3.66	2.08	.98-4.41	2.13	1.81	.82-4.01
G				8.50**	.61	.44-.85	9.50**	.59	.43-.83	14.38***	.51	.36-.72	4.81*	.66	.45-.96
AN							5.04*	1.48	1.05-2.09	2.86	1.36	.95-1.94	3.18	1.41	.97-2.07
PS										34.31***	1.06	1.04-1.09	.09	1.00	.98-1.03
REC													12.68***	.98	.97-.99
EF													34.84***	.28	.19-.43
SC													12.67***	.94	.91-.97

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

A = age, CR = court referral (reference category is no), BASI-A = baseline alcohol ASI, BASI-D = baseline drug ASI

G = gender (reference category is male), ED = education level, RS = relationship status (reference category is single), EM = employment status (reference category is not employed), I = income (reference category is below median), CI = community inequality, D = depression (reference category is not depressed),

AN = anxiety (reference category is not anxious), PS = perceived stress, EH = economic hardship, REC = recovery support, EF = efficacy, SC = self-control

Table 4.24

Classification Table of Logistic Regression Predicting Odds of Substance Use Post-Treatment Entry for Participants with Baseline ASI Scores Indicative of Potential Substance Dependence- Trimmed Model

	Observed	Predicted		% Correct
		0	1	
Block Zero	0	0	209	0
	1	0	511	100.0
	Overall %			71.0
Block One	0	0	209	0
	1	4	507	99.2
	Overall %			70.4
Block Two	0	4	205	1.9
	1	7	504	98.6
	Overall %			70.6
Block Three	0	11	198	5.3
	1	6	505	98.8
	Overall %			71.7
Block Four	0	35	174	16.7
	1	33	478	93.5
	Overall %			71.3
Block Five	0	80	129	38.3
	1	65	446	87.3
				73.1

Table 4.25

Model Fit Statistics for Logistic Regression Examining Odds of Substance Use Post-Treatment Entry for Participants with Baseline ASI Scores Indicative of Potential Substance Dependence- Trimmed Model

	Block One	Block Two	Block Three	Block Four	Block Five
Block χ^2	23.82***	8.57**	5.14*	37.66***	103.37***
Model χ^2	23.82***	32.39***	37.51***	75.17***	178.54***
-2LL	843.64	835.07	829.94	792.29	688.91
Cox & Snell R ²	.033	.044	.051	.099	.220
Nagelkerke R ²	.046	.063	.072	.142	.314
Hosmer & Lemeshow	5.24	3.04	2.40	10.67	15.37
% Correctly Classified [^]	70.4	70.6	71.7	71.3	73.1

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

Table 4.26

Comparison of Significant Odds Ratios and Confidence Intervals for Trimmed Models Examining Logistic Regression of Factors Impacting Substance Use Post-Treatment Entry

	Full Sample		Participants W/ASI Scores Indicative of Potential Sub. Dep.	
	Exp(B)	95% C.I.	Exp(B)	95% C.I.
A	.97	.96-.99	.98	.96-1.00
CR	.58	.42-.80	.65	.45-.95
BASI-A	3.65	1.81-7.37		
G	.60	.45-.80	.66	.45-.96
ED	1.29	1.07-1.55		
REC	.98	.97-.99	.98	.97-.99
EF	.33	.25-.44	.28	.19-.43
SC	.96	.94-.98	.94	.91-.97

*All are significant at $p \leq .05$ or less

A = age, CR = court referral (reference category is no), BASI-A = baseline alcohol ASI, G = gender (reference category is male), ED = education level, REC = relationship status, EF = efficacy, SC = self-control

Linear regression. Linear regression examining the effect of the predictor variables on alcohol and drug addiction severity was conducted next for the subsample with baseline ASI scores indicative of potential substance dependence (see Tables 4.27-4.28 for alcohol addiction severity and 4.29 and 4.30 for drug addiction severity).

Alcohol severity. In the first block of the model examining alcohol addiction severity, both baseline alcohol and drug composite score was significant ($\beta = .39$, $t = 10.73$, $p = .001$ and $\beta = -.10$, $t = -2.68$, $p = .007$ respectively). This block was significant ($F = 40.33$, $p = .000$) and had an R^2 of .188.

The addition of the second block was significant ($F = 18.33$, $p = .001$) and significantly increased the R^2 from .188 to .209 ($p = .005$). In this block, baseline alcohol and drug ASI composite score maintained significance, although baseline drug composite

score slightly weakened in significance ($p = .029$). Gender ($\beta = -.11, t = -3.16, p = .002$) and relationship status ($\beta = .09, t = 2.56, p = .011$) were significant in this block.

The third block brought in the psychological distress variables, but neither depression nor anxiety were significant. While the model maintained significance ($F = 15.55, p = .001$), the change in R^2 from .209 to .213 was not significant.

Perceived stress and economic hardship were added to the model in the fourth block, and only perceived stress was significant ($\beta = .09, t = 2.36, p = .019$). The R^2 increased from .213 to .219, but this change was not significant.

In the fifth and final block, the addition of the coping factors significantly improved the model's ability to predict alcohol addiction severity ($F = 15.59, p = .001, R^2\Delta = .060, p = .000$). Recovery support ($\beta = .10, t = 2.97, p = .003$), efficacy ($\beta = -.19, t = -4.94, p = .000$), and self-control ($\beta = -.15, t = -3.25, p = .001$) all were significant individual predictors of follow-up alcohol addiction severity. Perceived stress was no longer significant after the inclusion of the coping factors.

Trimmed model predicting alcohol addiction severity. After all non-significant variables were excluded from the model, the final block accounted for 27% of the variance in alcohol addiction severity at follow-up. Age, baseline alcohol and drug composite scores, gender, recovery support, efficacy, and self-control were all significant predictors of follow-up alcohol addiction severity. Baseline alcohol ASI composite score was the largest predictor of follow-up alcohol addiction severity ($\beta = .35, t = 10.28, p < .000$)

Drug addiction severity. The model was then examined for predicting follow-up drug addiction severity for participants with baseline ASI scores indicative of potential

substance dependence. The first block was significant ($F = 24.52, p = .000$), and accounted for approximately 12% of the variance in follow-up drug addiction severity ($R^2 = .122$). Both age ($\beta = -.08, t = -2.10, p = .036$) and baseline drug ASI score ($\beta = .32, t = 8.19, p = .000$) were significant predictors in this block.

The addition of the social stress factors in the second block did not significantly change the ability of the model to predict follow-up drug addiction severity, and none of the individual predictors were significant. Similarly, the addition of the psychological distress variables in the third block did not significantly change the overall model's ability to predict drug addiction severity and neither depression nor anxiety were significant.

In block four, both perceived stress ($\beta = .30, t = 7.91, p = .001$) and economic hardship ($\beta = .09, t = 2.29, p = .023$) were significant. The inclusion of both of these variables in the model caused a significant change in R^2 from .128 to .233 ($p = .000$). Although non-significant in previous blocks, gender became significant in this block ($\beta = -.08, t = -2.32, p = .020$).

The addition of the coping factors in the final block caused the biggest change in ability of the model to predict the dependent variable ($R^2\Delta = .173, p = .000$). With the inclusion of recovery support ($\beta = .10, t = 3.22, p = .000$), efficacy ($\beta = -.32, t = -9.28, p < .000$), and self-control ($\beta = -.28, t = -6.78, p = .000$), age and gender no longer were significant. Baseline alcohol ASI composite score became significant in this block ($\beta = -.07, t = -2.06, p = .040$), and baseline drug ASI composite score maintained significance ($\beta = .24, t = 7.04, p = .000$). In addition, while perceived stress no longer was significant in this block, economic hardship maintained significance ($\beta = .08, t = 2.45, p = .014$).

Trimmed model predicting drug addiction severity. All non-significant variables were excluded from the model and the analysis was re-run to create the most parsimonious model examining follow-up drug addiction severity for participants with baseline ASI scores indicative of potential substance dependence. In the final block, baseline alcohol and drug ASI scores were significant ($\beta = -.07, t = -2.24, p = .026$, and $\beta = .23, t = 7.35, p = .000$ respectively), economic hardship ($\beta = .08, t = 2.36, p = .019$), recovery support ($\beta = .10, t = 3.15, p = .002$), efficacy ($\beta = -.32, t = -9.41, p = .000$), and self-control ($\beta = -.27, t = -6.61, p = .000$) were significant predictors of follow-up drug addiction severity. Similar to previous models, the block of variables having the largest impact on the dependent variable was the coping variables ($R^2\Delta = .173, p = .000$).

Table 4.27

Factors Predicting Follow-up Alcohol Addiction Severity in Participants with Baseline ASI Scores Indicative of Potential Substance Dependence (n = 703)

Predictor	<u>Block 1</u>			<u>Block 2</u>			<u>Block 3</u>			<u>Block 4</u>			<u>Block 5</u>		
	B	β	<i>t</i>	B	β	<i>T</i>	B	β	<i>T</i>	B	β	<i>T</i>	B	β	<i>T</i>
A	.000	.03	.94	.001	.04	1.20	.001	.05	1.22	.001	.05	1.31	.001	.07	2.02*
CR	-.009	-.03	-.93	-.007	-.03	-.72	-.006	-.02	-.62	-.005	-.02	-.52	.000	-.00	-.05
BASIA	.200	.39	10.73***	.191	.37	10.15***	.190	.37	10.13***	.189	.367	10.10***	.180	.35	9.92***
BASID	-.090	-.10	-2.68**	-.074	-.08	-2.19*	-.072	-.08	-2.14*	-.078	-.09	-2.29*	-.11	-.12	-3.16**
G				-.029	-.11	-3.16**	-.030	-.12	-3.26***	-.029	-.12	-3.19***	-.019	-.07	-2.10*
ED				.001	.01	.16	.001	.01	.22	.002	.01	.36	.001	.01	.25
RS				.026	.09	2.56*	.026	.09	2.61**	.026	.09	2.58**	.019	.06	1.91
EM				.002	.01	.17	.002	.01	.20	.006	.02	.65	.008	.03	.88
I				.009	.03	.95	.010	.04	1.08	.009	.04	1.02	.010	.04	1.13
CI				.000	.00	.01	.000	.01	.19	.000	.01	.13	.000	-.00	-.12
D							.019	.07	1.54	.017	.06	1.38	.022	.08	1.91
AN							-.004	-.01	-.32	-.004	-.02	-.28	-.005	-.02	-.49
PS										.001	.09	2.36*	-.001	-.05	-1.07
EH										-.002	-.03	-.74	-.002	-.03	-.80
REC													.001	.10	2.97**
EF													-.025	-.19	-4.94***
SC													-.002	-.15	-3.25***
Constant	.066			.047			.029			.001			.258		
F	40.33***			18.33***			15.55***			13.80***			15.59***		
Total R ²	.188			.209			.213			.219			.279		
Change in R ²	.188***			.022**			.003			.006			.060***		

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

A = age, CR = court referral (reference category is no), BASI-A = baseline alcohol ASI, BASI-D = baseline drug ASI

G = gender (reference category is male), ED = education level, RS = relationship status (reference category is single), EM = employment status (reference category is not employed), I = income (reference category is below median), CI = community inequality, D = depression (reference category is not depressed), AN = anxiety (reference category is not anxious), PS = perceived stress, EH = economic hardship, REC = recovery support, EF = efficacy, SC = self-control

Table 4.28

Factors Predicting Follow-up Alcohol Addiction Severity in Participants with Baseline ASI Scores Indicative of Potential Substance Dependence- Trimmed Model

Predictor	Block One			Block Two			Block Three			Block Four		
	B	β	<i>t</i>	B	β	<i>T</i>	B	B	<i>t</i>	B	β	<i>t</i>
A	.001	.04	1.12	.001	.05	1.44	.001	.05	1.43	.001	.07	2.06*
BASIA	.203	.39	11.04***	.193	.37	10.50***	.192	.37	10.48***	.182	.35	10.28***
BASID	-.079	-.09	-2.52*	-.064	-.07	-2.05*	-.071	-.08	-2.27*	-.104	-.12	-3.36***
G				-.030	-.12	-3.44***	.032	-.13	-3.65***	-.022	-.09	-2.57**
RS				.025	.09	2.50*	.025	.09	2.53*	.018	.06	1.82
PS							.001	.08	2.28*	-.001	-.06	-1.38
REC										.001	.09	2.77**
EF										-.024	-.19	-4.94***
SC										-.002	-.14	-3.16**
Constant	.056			.046			.022			.265		
<i>F</i>	53.50***			36.51***			31.47***			28.61***		
Total R ²	.187			.208			.213			.271		
Change in R ²	.187***			.021***			.006*			.058***		

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

A = age, CR = court referral (reference category is no), BASI-A = baseline alcohol ASI, BASI-D = baseline drug ASI

G = gender (reference category is male), ED = education level, RS = relationship status (reference category is single), EM = employment status (reference category is not employed), I = income (reference category is below median), CI = community inequality, D = depression (reference category is not depressed), AN = anxiety (reference category is not anxious), PS = perceived stress, EH = economic hardship, REC = recovery support, EF = efficacy, SC = self-control

Table 4.29

Factors Predicting Follow-up Drug Addiction Severity in Participants with Baseline ASI Scores Indicative of Potential Substance Dependence

Predictor	<u>Block 1</u>			<u>Block 2</u>			<u>Block 3</u>			<u>Block 4</u>			<u>Block 5</u>		
	B	β	<i>t</i>	B	β	<i>T</i>	B	β	<i>t</i>	B	β	<i>t</i>	B	β	<i>t</i>
A	-.001	-.08	-2.10*	-.001	-.08	-2.06*	-.001	-.08	-2.06*	-.001	-.09	-2.49*	.000	-.05	-1.43
CR	-.002	-.01	-.33	-.002	-.01	-.30	-.002	-.01	-.28	.000	-.00	-.06	.005	.03	.95
BASIA	.001	.00	.08	.001	.00	.11	.001	.00	.08	-.007	-.02	-.58	-.022	-.07	-2.06*
BASID	.186	.32	8.19***	.189	.33	8.20***	.190	.33	8.20***	.166	.29	7.61***	.139	.24	7.04***
G				-.010	-.06	-1.67	-.011	-.06	-1.68	-.014	-.08	-2.32*	-.001	-.00	-.09
ED				-.000	.00	-.05	.000	.000	-.01	.003	.03	.85	.002	.02	.70
RS				.003	.01	.37	.003	.01	.38	.003	.02	.52	-.005	-.02	-.77
EM				-.009	-.05	-1.37	-.009	-.05	-1.37	.002	.01	.31	.004	.02	.74
I				.000	.000	.013	.000	.00	.04	.003	.02	.58	.003	.02	.58
CI				.001	.03	.72	.001	.03	.77	.000	.02	.57	.000	.00	.05
D							.005	.03	.65	.000	-.00	-.04	.005	.03	.71
AN							-.004	-.02	-.48	-.008	-.04	-1.03	-.009	-.05	-1.42
PS										.003	.30	7.91***	.000	.03	.72
EH										.004	.09	2.29*	.003	.08	2.45*
REC													.001	.10	3.22***
EF													-.027	-.32	-9.28***
SC													-.003	-.28	-6.78**
Constant	.058			.035			.032			-.036			.279		
F	24.52***			10.26***			8.56***			15.09***			27.90***		
Total R ²	.122			.128			.128			.233			.406		
Change in R ²	.122***			.006			.001			.104***			.173***		

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

A = age, CR = court referral (reference category is no), BASI-A = baseline alcohol ASI, BASI-D = baseline drug ASI

G = gender (reference category is male), ED = education level, RS = relationship status (reference category is single), EM = employment status (reference category is not employed), I = income (reference category is below median), CI = community inequality, D = depression (reference category is not depressed), AN = anxiety (reference category is not anxious), PS = perceived stress, EH = economic hardship, REC = recovery support, EF = efficacy, SC = self-control

Table 4.30

Factors Predicting Follow-up Drug Addiction Severity in Participants with Baseline ASI Scores Indicative of Potential Substance Dependence- Trimmed Model

Predictor	Block 1			Block 2			Block 3			Block 4		
	B	β	<i>t</i>	B	β	<i>T</i>	B	β	<i>t</i>	B	β	<i>t</i>
A	-.001	-.08	-2.08*	-.001	-.08	-2.06*	-.001	-.09	-2.50*	.000	-.05	-1.48
BASIA	.002	.01	.14	.000	.00	.03	-.006	-.02	-.54	-.023	-.07	-2.24*
BASID	.189	.32	8.87***	.193	.33	8.97***	.170	.29	8.37***	.135	.23	7.35***
G				-.008	-.05	-1.34	-.014	-.09	-2.50*	-.002	-.01	-.31
PS							.003	.29	7.96***	.000	.03	.61
EH							.003	.08	2.07*	.003	.08	2.36*
REC										.001	.10	3.15**
EF										-.028	-.32	-9.41***
SC										-.003	-.27	-6.61***
Constant	.056			.059			-.003			.286		
F	32.69***			25.00***			34.77***			52.32***		
Total R ²	.122			.124			.228			.401		
Change in R ²	.122***			.002			.104***			.173***		

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

A = age, BASI-A = baseline alcohol ASI, BASI-D = baseline drug ASI

G = gender (reference category is male), PS = perceived stress, EH = economic hardship, REC = recovery support, EF = efficacy, SC = self-control

Comparing models with and without baseline alcohol and drug composite scores.

Because baseline alcohol and drug addiction severity were such strong individual predictors, and there was a possibility that social stress factors were related to baseline addiction severity, the models were re-run without those two variables to see if findings differed. Logistic regression analyses predicting substance use post-treatment entry results were similar with and without the baseline measures included in the model. Similarly, OLS regression analyses predicting follow-up drug addiction severity results were similar. However, findings differed considerably for the OLS regression model predicting follow-up alcohol addiction severity (see Table 4.31).

When baseline measures for addiction severity were removed from the analyses predicting follow-up alcohol addiction severity, age ($\beta = .14, t = 4.87, p = .000$), court referral ($\beta = -.07, t = -.236, p = .018$), and relationship status ($\beta = .07, t = 2.43, p = .015$) were significant, when these variables were not significant when baseline addiction severity variables were included in the model. In both models, gender ($\beta = -.10, t = -3.57, p = .000$), recovery support ($\beta = .08, t = 2.96, p = .003$), efficacy ($\beta = -.21, t = -6.54, p = .000$), and self-control ($\beta = -.12, t = -3.62, p = .000$) were significant. The overall model was significant ($F = 21.40, p = .000$) even without baseline measures of addiction severity. While the R^2 was lower than in the model including baseline addiction severity measures, the model accounted for a sizeable amount of variance in the dependent variable ($R^2 = .133$).

Table 4.31

Comparison of Final Block of Trimmed Models for Factors Predicting Follow-up Alcohol Addiction Severity With and Without Baseline ASI Scores

Predictor	With Baseline Measures			Without Baseline Measures		
	B	β	<i>t</i>	B	β	<i>t</i>
A				.002	.14	4.87***
CR				-.020	-.07	-2.36*
BASIA	.200	.39	14.39***	N/A		
BASID	-.106	-.12	-4.43***	N/A		
G	-.019	-.08	-3.09**	-.029	-.10	-3.57***
RS				.023	.07	2.43*
REC	.001	.10	3.62***	.001	.08	2.96**
EF	-.023	-.18	6.01***	-.032	-.21	-6.54***
SC	-.001	-.07	2.26*	-.002	-.12	-3.62***
Constant	.214			.270		
<i>F</i>	49.20***			21.40***		
Total <i>R</i> ²	.240			.133		

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

A = age, CR = court referral (reference category is no), BASI-A = baseline alcohol ASI, BASI-D = baseline drug ASI, G = gender (reference category is male), RS = relationship status (reference category is single), REC = recovery support, EF = efficacy, SC = self-control

Summary

The hypothesized model was able to significantly predict both substance use post-treatment entry and alcohol and drug addiction severity at follow-up. For substance use post-treatment entry, the model was better able to predict participants who used after entering treatment than participants who remained abstinent. When comparing the model's ability to predict follow-up alcohol and drug addiction severity, it was best able to predict drug addiction severity as evidenced by the larger R^2 for the analysis examining follow-up drug ASI score. Some variables were not significant in any of the models, such as employment status, income, or community inequality. Although depression and anxiety have been associated with addiction and relapse, the two psychological distress variables were also not significant in most of the multivariate analyses. The exception was the significance of anxiety in predicting substance use post-treatment entry for participants with baseline scores indicative of potential substance

dependence. In all analyses, individual variables that most significantly affected substance use post-treatment entry and follow-up addiction severity were baseline ASI alcohol measures and the three coping measures.

However, while some variables were significant in almost every model, such as baseline ASI alcohol measures and the three coping measures, significance of individual predictors changed depending on the outcome variable of interest. Differences were found in significant predictors of substance use post-treatment entry, follow-up alcohol addiction severity, and follow-up drug addiction severity. For example, when using the model to predict substance use post-treatment entry, age, court referral, and gender were all negatively associated with the dependent variable, indicating that older participants, those referred by the court system, and female participants were less likely to use substances after entering treatment than younger participants, individuals not referred by the court system, and males. All three coping measures were also negatively related to the dependent variable, indicating that participants with more recovery support, higher efficacy, and higher self-control were less likely to use substances after entering treatment. Baseline alcohol ASI score and education were positively related to substance use post-treatment entry, indicating that participants with higher alcohol addiction severity at baseline and higher education levels were more likely to use substances after entering treatment.

When using the model to predict follow-up alcohol addiction severity, baseline alcohol ASI score and recovery support were positively related to alcohol addiction severity. As expected, higher baseline alcohol addiction severity was a predictor of higher follow-up alcohol addiction severity. On the contrary, the finding about recovery

support was surprising; it was expected that higher recovery support would be associated with lower addiction severity at follow-up. Baseline drug addiction severity, gender, efficacy, and self-control were all negatively related to follow-up alcohol addiction severity in the full sample. While higher baseline alcohol addiction severity predicted higher follow-up alcohol addiction severity, higher baseline drug addiction severity predicted lower follow-up alcohol addiction severity scores which makes sense given that most people using specific types of substances upon treatment entry would relapse with those same specific substances. Women had lower alcohol addiction severity at follow-up, contrary to what was hypothesized. When the analysis was re-run examining alcohol addiction severity at follow-up without including baseline alcohol and drug ASI measures in the model, other variables became significant including age, court referral, and relationship status. The opposite of what would be expected, older participants and cohabitating participants had higher alcohol addiction severity at follow-up, while court referred participants had lower follow-up alcohol addiction severity.

When using the model to predict drug addiction severity, age, baseline alcohol ASI score, efficacy, and self-control were negatively associated with drug addiction severity. Similar to the findings on follow-up alcohol addiction severity, participants using more problematic levels of alcohol at baseline used less problematic levels of drugs at follow-up. As would be expected, higher baseline drug addiction severity was associated with higher follow-up drug addiction severity. In addition, the model examining follow-up drug addiction severity was the only one in which economic hardship was significant. Participants reporting higher economic hardship had higher follow-up drug addiction severity scores. Also similar to the model examining alcohol

addiction severity, higher recovery support was associated with higher drug addiction severity at follow-up.

Chapter Six

Discussion

There is a large body of literature examining the relationship between social disadvantage, stress, and psychological distress (Buka, 2002; Laaksonen et al., 2009; Marmot, 2004; Mirowsky & Ross, 1986; Mirowsky & Ross, 2003; Mulia et al., 2008; Pearlin, 1989; Ross, 2000; Wang, Schmitz, & Dewa, 2009; Weich & Lewis, 1998), and between stress, distress, and addiction relapse (Alverson et al., 2000; Brown et al., 1995; Hyman et al., 2009; Mattoo et al., 2009; McMahon, 2001; Sinha et al., 2009; Tate et al., 2008; Tuchman, 2010). However, only one study has examined substance use and relapse from a social stress perspective (Rhodes & Jason, 1990). Thus, the current study sought to address this gap by using a model containing imputed social stress factors, psychological distress, perceived stress and economic hardship, and coping factors to analyze relapse in a large secondary dataset of Kentucky substance abuse treatment participants. To capture the complexity of social stress, gender, educational attainment, relationship status, employment, income, and community inequality were used as imputed social stress factors. The self-reported experiences of significant depression and/or anxiety in the 12 months preceding treatment entry were used as measures of psychological distress. Appraised stress was captured by using Cohen's Perceived Stress Scale (Cohen et al., 1983) and a measure of economic hardship adapted from She and Livermore (2007). Finally, since coping has been found to mediate the stress (Lazarus & Folkman, 1984; Pearlin, 1989) and relapse processes (McMahon, 2001; Tate et al., 2008; Walton et al., 2003), coping factors including recovery support, efficacy, and self-control were included as mediators in the model.

The purpose of this study was to use a social stress theoretical framework as a heuristic for understanding substance use after entering treatment and follow-up addiction severity in a sample of substance abuse treatment participants from across Kentucky. While other studies have examined relapse after treatment, very few have specifically examined addiction severity upon relapse. In addition, the majority of studies on relapse after treatment were conducted with limited, single program treatment samples rather than a broad sample taken from across a variety of treatment programs. Rather than solely examining relapse after residential treatment, outpatient treatment, detox, or other specific types of treatment, this large statewide treatment sample allowed the model to be examined for treatment participants in general.

Overall, the hypothesized model was able to significantly predict substance use after treatment entry and follow-up drug and alcohol addiction severity, although several individual predictors were not significant in any of the analyses. Notably, employment status, income, and community inequality were not significant in any of the multivariate analyses. However, gender, education, relationship status, anxiety, economic hardship, and perceived stress were significant in at least one of the analyses. As a group, coping factors had the largest impact on substance use post-treatment entry and follow-up addiction severity. As would be expected, baseline alcohol and drug ASI scores also had a large effect on the dependent variables in most of the analyses.

Social Stress Factors

As a whole, social stress factors did not perform in the analyses as hypothesized. Gender was a significant predictor in all three models, however, contrary to the hypothesized relationship women were less likely to use substances post-treatment entry

and had lower drug and alcohol addiction severity at follow-up than men. Since women often have higher social disadvantage and higher psychological distress (Aneshensel, 1992; Mirowsky & Ross, 2003; Moksnes et al., 2010; Olff et al., 2007; Pearlin et al., 1989; Vrijmoet-Wiersema et al., 2008), this finding was somewhat unexpected.

However, previous research indicates that women often use alcohol and illicit drugs less frequently than men (OAS, 2009), although they use more prescription medications (Poole & Dell, 2005). The current study did not examine prescription drug use after treatment entry, only alcohol and illicit drug use, so it is possible that women in the sample obtained more prescription medications than did men. In addition, despite the fact that gender was not a significant predictor of addiction severity in the current models, it is possible that stress and distress may impact relapse processes in different ways for female and male participants. Future research should further examine the effects of stress and distress on relapse for women when compared to men.

Education and relationship status were the two other imputed social stress factors significantly associated with addiction severity in at least one of the analyses. In previous studies, lower educational attainment is associated with drug use and higher substance abuse and dependence (OAS, 2009; SAMHSA, 2010), and higher educational attainment is associated with alcohol use (OAS, 2009). Opposite of what was expected in the current study, higher education was a predictor of using substances after entering treatment and education level was not associated with addiction severity in either of the models. So, while participants with higher educational levels might be more likely to use substances after beginning treatment, their use was not necessarily more problematic than for participants with lower levels of education.

Relationship status was only significant when examining follow-up alcohol addiction severity when baseline ASI measures were removed from the model. However, while it was hypothesized that single participants would experience more stress as described in extant literature (Brown, Bulanda, & Lee, 2005; Horwitz & White, 1998; Mirowsky & Ross, 2003), cohabitating participants actually predicted higher alcohol severity scores at follow-up in this analysis. The relationship status measure only asked whether participants were living with an intimate partner and did not capture satisfaction with the relationship or quality of the relationship. When in satisfying, close intimate relationships, people are often protected from some of the harmful effects of stress (Pearlin et al., 1981). However, people unhappy in their relationships experience higher distress than single people (Mirowsky & Ross, 2003). Often, substance users are in relationships with other substance users (Hughes, 2007), which could increase strains experienced after substance abuse treatment if one partner is attempting to remain abstinent and the other is not. In addition, intimate partner violence frequently co-occurs with substance abuse and nearly half of all women entering treatment for substance abuse report being victimized by an intimate partner, as do 10% of all men (Schneider, Burnette, Ilgen, & Timko, 2009). Relationships in which intimate partner violence occurs would certainly not protect from harmful effects of stress. Dissatisfaction with current relationships, experiences of abuse in relationships, or living with partners who are still using substances could have been responsible for higher alcohol addiction severity in cohabitating participants in this study.

Income, employment, and community inequality were not significant in any of the multivariate analyses. This finding for income was not surprising, since it was

hypothesized that income would not be individually related to substance use after treatment entry or to addiction severity. Although low SES status is associated with higher distress (Everson et al., 2002; Marmot, 2004; Mirowsky & Ross, 2003), income alone is often not a significant predictor (Gavin et al., 2010). However, since both employment (OAS, 2004; SAMHSA, 2010; Vaillant, 1988; Watkins et al., 2004) and inequality (Lantz et al., 2005; Marmot, 2004) have been associated with distress and addiction in previous studies, it was expected that both of these social stress factors would predict substance use after entering treatment and follow-up addiction severity in the current sample. In the current study, employment was divided into only two groups, those who were employed at least part-time and those who were unemployed. These two groups may not have captured stress and distress associated with un/underemployment, and participants who were underemployed and captured in the employed group may have experienced similar stress and distress as participants in the unemployed group. Also, the fact that the majority of this sample reported very low wages indicated that many participants, even those working full-time, still were not working in high-status jobs. Stress is reduced by more than just the mere presence of a job; jobs associated with increased status, control, and creativity are associated with lower distress (Mirowsky & Ross, 2003). For the most part, working participants in this sample were probably not employed in these types of jobs. In addition, while inequality has been associated with increased distress (Buka, 2002; Marmot, 2004; Wilkinson & Marmot, 2003; Wilkinson & Pickett, 2009), it was not significant in any of the analyses. The dataset used in this study only contained information about the county in which participants went to treatment; although it was likely they lived in or near the county in which they participated in

treatment, some participants could have been in that county for residential treatment and not lived there outside of the treatment program. In addition, it is unknown how long participants lived in that county, and effects of community inequality might vary depending on length of time spent in the unequal county. It is also possible that community inequality affects outcomes for the general population, but not in a sample of substance users. Because of stress experiences, stigma, and shame often shared by persons using substances regularly, there may be no unique effect of community inequality.

Although many of the social stress variables in the current study were not significant predictors of substance use after treatment entry or addiction severity at follow-up, there could be a number of explanations for this lack of significant findings. One potential reason for this finding is that social stress theory does not hold promise for understanding the relationship between social disadvantage and relapse. Given the consistency of findings linking stress to substance use, this explanation seems unlikely. However, a more probable explanation for these findings is that the measures included in the dataset are not adequately capturing “social stress”. One of the criticisms some stress theorists aim at research examining stressful life events is that measuring occurrence of the event alone does not capture the individual person’s appraisal of the event (Lazarus & Folkman, 1984). For example, one person’s divorce might be a devastating occurrence that causes major life readjustment, yet another’s divorce might be a cause for celebration. Lazarus has argued that it is important to measure appraisal of the event as stressful rather than simply measuring the occurrence of the event (Lazarus, 1999; Lazarus & Folkman, 1984). However, because of limitations in the use of secondary

data, the current study has in some ways mimicked previously-criticized research on life events. Simply counting whether participants are female, low income or members of minority racial groups does not capture the amount of distress the participants may feel about being in that group. Supporting this notion was the finding that perceived stress was often a significant predictor of substance use post-treatment entry and addiction severity (before coping factors were added in the model), but did not mediate the relationship between social stress factors and the dependent variables. While the role of stress was important, this variable was capturing something separate from the imputed social stress factors. If in fact the demographic variables had captured social stress, then perceived stress should have accounted for some of the variance in the dependent variable originally attributed to the social stress factors. Notably, the current measures do not adequately capture the experience of being in a group of social disadvantage, preventing the construct of social stress from fully being tested. If other measures were used the results might be different, thus further research should be conducted in this area using different measures.

In addition, one of the primary factors contributing to the stress experience is race (Mirowsky & Ross, 2003; Ong et al., 2009; Utsey et al., 2008), yet race was unable to be included in the multivariate model due to distribution problems in this sample. Bivariate relationships indicated that White participants were more likely to report serious depression and anxiety than Black participants, although participants in other non-White racial/ethnic groups were more likely to report both measures of psychological distress than either White or Black participants. However, highly unequal groups make these findings suspect. In the future, more research needs to examine impact of race on

substance use after treatment entry and addiction severity to determine if it is significant in ways unmeasured by the current study.

Even if measures better captured the experience of social stress and economic hardship, it is also possible that these types of stress do not have a unique effect on relapse or addiction severity. Addiction alone is stressful, considering the amount of time and energy put into finding and obtaining the substance of addiction and recovering from use afterward, problems caused in relationships secondary to substance use, physical effects of use such as tolerance and withdrawal, and other characteristics of use necessary to meet diagnostic criteria for substance dependence (APA, 2000). The strains addiction places on relationships, careers/employment, and maintaining activities of daily living are substantial. Heavy use of any substance places a heavy load on the body, mind, and spirit of the addict/alcoholic, and chronic substance use increases allostatic load over time (Cleck & Blendy, 2008; Sinha, 2008). Addiction is characterized by lack of control, and lack of control has been implicated as a primary cause of stress and distress (Mirowsky & Ross, 2003). Overcoming an addiction and attempting to recover from addiction can be even more stressful since typical coping mechanisms are no longer a viable option, old social support systems have to be changed, and activities that have become normal parts of the individuals' lives have to be altered (Laudet & White, 2008; Walton et al., 2002). Considering all of the chronic stress and strain inherent in addiction and recovery, there may be no unique contribution of social stress or economic hardship on the addiction and recovery process above and beyond chronic stress most likely experienced by the majority of people attempting to recovery from a substance use disorder. To examine this in future research, it would be important to ask questions examining addiction-related

stress, recovery-related stress, and general social stress to attempt to distinguish the effect of one from another. Measures would have to be developed and empirically tested for this process, but addiction-related questions could potentially focus on experiences of lack of control over use, strains on social relationships secondary to substance use, or physical symptoms of illness, fatigue, or pain from chronic use. Recovery-related questions could possibly focus on development of new social relationships or strains on existing pre-recovery relationships, experiences of cravings, and how persons cope with triggers and stress without using substances. Social stress measures would need to focus on the experience of being in a group associated with social disadvantage, including perceptions of disadvantage or discrimination and chronic strains experienced directly due to membership in those groups. To test the specific effects of each type of stress, valid and reliable measures of each type of stress would need to be developed and used in the analyses.

Psychological Distress

Although depression and anxiety have been associated with addiction and relapse (Ahmadi & Ahmadi, 2005; Buckner et al., 2008; Brown et al., 1998; Cornelius et al., 2004; Greenfield et al., 1998; Hasin et al., 2002; Scorzelli & Chaudhry, 2005; Tate et al., 2004; Tate et al., 2008; Tuchman, 2010; Wakins et al., 2004), the two psychological distress variables were also not significant in most of the multivariate analyses with the exception of the significance of anxiety predicting substance use post-treatment entry for participants with baseline scores indicative of potential substance dependence. Much literature exists detailing associations between depression, anxiety, stress, and relapse (Ahmadi & Ahmadi, 2005; Buckner et al., 2008; Brown et al., 1998; Cornelius et al.,

2004; Greenfield et al., 1998; Hasin et al., 2002; Scorzelli & Chaudhry, 2005; Tate et al., 2004; Tate et al., 2008; Tuchman, 2010; Wakins et al., 2004), so the absence of significant relationships between these factors in much of the current study is curious and unexpected.

Although possible that depression and anxiety are not predictors of substance use post-treatment entry or addiction severity at follow-up, these findings are most likely due to measurement error of psychological distress. Similar to the problem with examining social stress using this secondary dataset, psychological distress was not captured adequately with the data at hand. The lack of significant findings between the measures for psychological distress, stress, coping, and the dependent variables does not negate the possibility that there is a relationship between these factors. Simply asking single dichotomous questions about experiences of serious depression or anxiety in the previous 12 months does not adequately capture psychological distress (Flett et al., 1997). Accurately measuring distress entails capturing the entire range of physical and psychological symptoms of depression and anxiety, including type and severity, instead of treating depression and anxiety as discrete entities (Mirowsky & Ross, 2003). Further research should be conducted using different measures of psychological distress to capture the range of type and severity of distress experienced in this population. It is quite possible that different measures for these variables would behave differently in similar analyses.

There could be another aspect of the current psychological distress variables that is problematic. While there is a difference between mental disorder and psychological distress, the single questions asked in the dataset did not capture this difference.

Although psychological distress accompanies mental disorder, it does not alone equate mental disorder (Horwitz & Wakefield, 2007; Mirowsky & Ross, 2003). Both depression and anxiety are diagnoses as well as symptoms; without further explanation of this question, some participants might be considering whether they had been diagnosed with depression or anxiety in the previous 12 months rather than capturing symptoms. In addition, depression, anxiety, and other psychological diagnoses are terms some people attempt to avoid due to a stigma against mental health problems. Even if experiencing high amounts of distress some might not be willing to call their symptoms by the name of depression or anxiety. This also supports the notion that inquiring about objective symptoms might therefore be a better measure of quality and quantity of distress (Mirowsky & Ross, 2003). In addition, context needs to be included in measures of distress; if distress exists without an adequate cause or out of proportion with the cause it could signify disorder rather than distress (Horwitz & Wakefield, 2007). On the contrary, if individuals experience high amounts of distress and have numerous causes of the distress that should be captured as psychological distress rather than being labeled as psychiatric disorder. Future research examining mental health and addiction needs to take care not to further pathologize people studied.

Economic Hardship

Even though income alone is often not a significant predictor of psychological distress (Gavin et al., 2010), financial strain associated with low income is often associated with higher psychological distress (Mirowsky & Ross, 2003; Weich & Lewis, 1998). Because of the relationship between financial strain and distress, economic hardship was expected to be a predictor of negative substance abuse outcomes in the

current study. Surprisingly, economic hardship was only significant in the analyses examining follow-up drug addiction severity and did not predict substance use post-treatment entry in general or follow-up alcohol addiction severity. Of course, since drugs are more expensive than alcohol to obtain, the association between economic hardship and drug addiction severity could be related to the high cost of maintaining higher levels of drug use rather than a cause of higher levels of drug use. Further research needs to examine the time order of economic hardship and drug addiction severity to determine which one might cause the other.

Additional Observations

The findings between economic hardship and drug addiction severity highlight the fact that the overall model acted differently given specific outcome variables of interest. Baseline alcohol and drug addiction severity were significant in almost all models examined, but age was significant in only substance use post-treatment entry and drug addiction severity. However, once baseline addiction severity measures were removed from the models, age was also a significant predictor of follow-up alcohol addiction severity. While older participants were less likely to use substances after entering treatment and had lower drug addiction severity at follow-up, as would be expected given other research reporting that older participants are less likely to relapse (Walker et al., 2011) and to remain abstinent longer than younger participants (Smyth et al., 2010), interestingly older participants had higher follow-up alcohol addiction severity once baseline measures were removed from the model. Thus, while less likely to use after beginning treatment, older participants had more problematic patterns of alcohol use but not drug use if they did relapse. This finding is most likely due to the progressive nature

of addiction and the development of tolerance after chronic use; physiological adaptations require chronic users to increase amount of substances used over time (Cleck & Blendy, 2008).

For substance use post-treatment entry, the model was better able to predict participants who used after entering treatment than participants who remained abstinent. So, there is something substantive not being captured by the present model that helps explain why some individuals are able to remain drug and alcohol free after beginning substance abuse treatment when others are not. These could be motivational factors, since other research on relapse and recovery indicates that persons with higher motivation for recovery have a higher likelihood of remaining abstinent (McKay, 1999). In the current research, participants' stage of change (DiClemente et al., 2004) and motivation level is unknown. Future research should focus on determining specific protective factors for preventing relapse in the face of stress. Additionally, psychological coping factors were not captured in the current dataset and might be important for understanding why some participants were able to remain abstinent. Although recovery support, efficacy, and self-control were captured as measures of coping in the current model, individual coping ability and resilience have also been indicated as mediators in the stress process (Lazarus, 1999; Lazarus & Folkman, 1984; Pearlin, 1989). Also of potential importance is the type and length of treatment received; participants in this study participated in a number of treatment programs and specific treatment factors would be important to understand for predicting maintained abstinence from substance use after treatment entry. Some participants were in outpatient programs and still living in the community, increasing opportunities for use, while others were in more restrictive

intensive outpatient or inpatient programs that would correspond with reduced opportunities for use as well as increased support not captured by the current recovery support variable. Treatment variables would be important to include in future research; while the current dataset included some information about number of individual services received (such as therapy, group counseling, or psychiatric services), it did not include this information for all participants and included no measure of length or “dose” of treatment. This is important to include in future research, particularly since other research has found longer length of treatment is associated with reduction in relapse (Greenfield et al., 2007; Hser, Huang, Teruya, & Anglin, 2003; Satre, Mertens, Areans, & Weisner, 2003).

When using the model to predict addiction severity at follow-up, the included variables accounted for more of the variance in drug addiction severity than alcohol addiction severity. Since alcohol use is legal and more socially accepted than most drugs of abuse, a broader range of factors most likely impact alcohol use rather than those conceptualized using a social stress theoretical framework. On the contrary, drug use may be more closely related to experiences of stress and availability of coping resources, specifically since certain drugs of abuse are actually prescribed for symptoms of anxiety and the specific features of some drugs naturally mimic the body’s stress response (Cleck & Blendy, 2008). Since previous research has found an association between specific type of substance used and specific symptoms experienced (Ahmadi & Ahmadi, 2005; Bonn-Miller & Moos, 2009; Blume et al., 2000; Khantzian, 1985; Robinson et al., 2011), future research should examine whether a model such as the current one predicts specific types of drug use after treatment rather than general drug use. In the current sample, it was not

possible to examine the model's ability to predict addiction severity for specific drugs of abuse since the number of participants using each type of substance at follow-up was too small for the multivariate model.

While most significant findings were in the direction expected, several surprising relationships were identified in the current sample. For instance, although increased recovery support was associated with less likelihood of using substances post-treatment entry, it was associated with greater drug and alcohol addiction severity at follow-up. So, while participants reporting greater recovery support group participation were less likely to use at all, if they did use they were more likely to have more problematic levels of use. This finding could be due to the mixed nature of the sample; participants with low problem severity at baseline might be less likely to participate in recovery support groups if they did not feel it was needed. Individuals choosing to participate in high levels of recovery support groups, whether AA, NA, or faith-based programs, would most likely be people who are struggling to remain abstinent on their own. Thus, while increased recovery support might not be a *cause* of higher problem severity at follow-up, and future research should examine the nature of this relationship further, it might be an association found simply because persons most likely to relapse are the very same persons most likely to feel they need high levels of support group participation. People having no trouble remaining abstinent would most likely not feel a need to participate in recovery support groups unless required to do so by the court system or treatment program. Even then, they probably would attend the least amount of meetings necessary to meet requirements.

Notably, addiction severity at follow-up might not be indicative of recovery status although it was conceptualized as such for the current study. There were participants who remained abstinent between baseline and follow-up, participants who used but did not reach levels associated with potential dependence, and participants who were using at levels at follow-up that were indicative of potential substance dependence. While every participant was included in the dataset because of substance use, not all participants had a problem with addiction. Some participants might have had legal consequences such as DUI arrests or drug trafficking charges that resulted in referral to treatment without actually meeting diagnostic criteria for substance dependence. Inherent differences in these groups and their expected use patterns could be confounding the results of this study and should be examined further.

Overall, this is a sample of participants who are referred to treatment for SUDs, and while some may not think they have a problem and may not have attempted to abstinent, others may be working diligently to remain abstinent from drugs and alcohol. Thus, the group that is fully abstinent between baseline and follow-up are most likely those participants who have a SUD and are attempting to recover, placing them in a unique position for experiencing stress. For many individuals new in recovery, stress levels and distress increase since they often have to change their entire lifestyle, including social support systems and activities, and can no longer use substances to cope (Brandon et al., 2007; Laudet & White, 2008; Walton et al., 2002). In addition, individuals who may have engaged in illegal activities to support their addiction may find themselves struggling to make ends meet when new in recovery. This potentially increases both stress and economic hardship. On the contrary, many participants who continued to use

between baseline and follow-up but were not using at high levels or experiencing consequences of use measured by the ASI could be people who are not experiencing addiction. This group may be able to use at more manageable levels that normally do not cause problems for them and would not experience the same level of stress and distress as someone with a SUD. Future research needs to examine experiences of stress in relation to substance use for groups based on diagnosis and presence of an SUD.

Limitations

There are a number of limitations to this research that affect the generalizability of the findings. First, as already discussed, a number of the measures used in this secondary data analysis are potentially problematic and may not necessarily adequately capture the constructs of interest. Future research needs to use measures designed to capture the stress and distress associated with social disadvantage and economic hardship in order to discover its relationship with relapse and addiction severity after treatment.

Second, these data are self-reported. However, it should be noted that the follow-up survey was conducted by an outside researcher over the phone which increases the probability that participants will honestly disclose use since it is anonymous, their responses will not be relayed to their treatment provider or family members, and they do not know the person asking them the questions and thus feel the need to give answers deemed positive in order not to disappoint the interviewer. In addition, previous research examining self-reported data from substance users has found that it is generally reliable and valid (DelBoca & Noll, 2000; Shannon, Mathias, Marsh, Dougherty, & Liguori, 2007).

Third, this study only followed participants for one year from baseline. As already mentioned, “dose” of treatment was not captured, so it was not possible to see how differences in hours of treatment, length of treatment, method of treatment, skill or training of the provider, or any other specific treatment variable might have impacted outcomes for participants. In addition, given statistics about addiction and relapse, some participants still abstinent at the 12 month point will relapse in the future. If followed for a longer period of time patterns in relapse could be better understood.

Time is a limitation of this study in other ways as well. While data existed about whether or not participants had used between baseline and follow-up, there was no measure of the specific time from baseline until substance use. If a time variable existed it would have been possible to use survival analysis to understand whether stress impacted time between baseline and use. Social stress and economic hardship could have been associated with shorter or longer times until relapse even if there were no differences in the total amount of people who relapsed during the follow-up period.

In addition, this was a nonprobability sample and participants volunteered to participate in the follow-up component of the study. Not all baseline participants consented to follow-up contact, and not all participants contacted for follow-up responded and participated in the survey. Thus, participants who took both surveys could have been somewhat different than the total sample in ways that might have affected data for relapse and addiction severity. Although it might be helpful to compare baseline data for participants who completed the follow-up survey to those who did not to determine if there were systematic differences apparent at baseline, this information was not in the dataset provided to this author. Even if there are no differences at treatment entry,

participants who relapse or are using heavily at follow-up may be the individuals least likely to respond to survey attempts at time of follow-up.

Finally, there were a number of outliers who had to be excluded from the analysis, and these outliers might have painted a different picture of the impact of social stress, psychological distress, economic hardship, and substance abuse if able to be included in the analysis. Particularly participants with extremely high alcohol or drug ASI scores at follow-up might have something additional to teach us about the impact of stress on addiction if able to be included in the multivariate analyses. Future research should explore these participants further to better understand how stress might impact addiction severity.

Implications for Future Research

Demographics are frequently used as control variables in research, and the central focus is often on other key variables. However, many studies examining stress, addiction, mental health, and other social problems consistently find that demographics are significant predictors of outcomes; specifically, most studies find that categories associated with social disadvantage are predictors of *negative* outcomes. Future research needs to consider the reasons behind these findings. Treating these variables as controls allows us to continue to ignore the theoretical implications of *why* membership in these groups matters. As in the current study, I would argue that demographics need to be treated as key variables rather than simply as controls. However, rather than simply including these variables as predictors, new measures need to be developed that capture the *experience* of being in one of these demographic groups. We are not capturing the reasons for their sociological importance with measures asking only about membership in

these groups; there is something about the experience of being in these social categories that is central to the development and maintenance of many social ills.

As already discussed, the relationships between social stress, economic hardship, psychological distress, and addiction relapse need to be further studied using measures that better capture the complexity of the constructs of interest. This longitudinal research needs to be collected over a longer period of time to capture the effects of stress on addiction and the recovery process.

Notably, the neuroscience literature on stress and addiction indicates that medications are being developed to increase a recovering person's ability to cope effectively with stress and decrease likelihood of relapse (Cleck & Blendy, 2008; Sinha, 2008). However, the people experiencing the greatest amount of stress and thus most in need of pharmacological interventions are often the very same people who cannot afford these much needed medications. If medications are developed, they need to be accessible to all persons, including those living in low SES brackets. In addition, other ways to reduce stress for populations of social disadvantage and to increase coping ability and resources should continue to be the focus of research.

Implications for Practice

Social work practitioners come into contact with people actively addicted or recovering from addictions on a regular basis. Findings from this study support the current relapse prevention technique of teaching coping skills, encouraging development of recovery-supporting social networks, and trying to build efficacy. However, social work functions at the crossroads of sociological and psychological "worlds", and the results of this study in combination with the extant literature on the association between

social characteristics and individual outcomes further emphasize a need to pay attention to both worlds and not ignore one for the other. It is important to consider the whole person and the systems in which they function when providing treatment; different individuals are affected in different ways by the world around them and the meaning they ascribe to it. The meaning of race, gender, poverty, disability, or any other characteristics associated with social disadvantage should be explored with the individual treatment participant to determine how those characteristics might impact that specific individual. As a profession, we cannot become so enveloped by psychological theory and methods that we forget about sociological theory.

In addition, social work practitioners need to take care not to pathologize people when they are experiencing natural consequences of social disadvantage. People are labeled as having depression or anxiety, often conceptualized as psychiatric disorders, when in fact these may simply be symptoms experienced as a result of chronic stress. Our field needs to take care not to diagnose with disorder when disorder is not necessarily present. Similarly, social work practitioners should always ask about context when assessing for psychiatric disorder; normal distress in the face of chronic stress and strain is different than distress without any specific cause or distress that is out of proportion with the cause.

Perhaps most importantly, the field of social work needs to continue its fight against social injustice. The systems that perpetuate strata of social advantage and disadvantage similarly perpetuate social ills. As a profession, we have to continue working toward equal power and rights for women and minorities, and a living wage, educational opportunities, and job training programs for persons of low SES groups. All

people should have their “basic needs” met and should not have to worry where they will find their next meal, where they will find a roof over their head, or how they will pay for their medication or doctor’s appointment.

Interventions for substance use disorders need to incorporate housing, employment, and education programs when possible to ensure participants new in recovery are returned to the community in a better economic position than when they entered. Previous studies examining treatment programs with added case management components and assistance with environmental and social needs such as housing, medical care, and parenting classes, show better outcomes for low-income participants who receive these additional services (McLellan et al., 1998; McLellan et al., 1999). In addition, coping skills already taught in treatment programs (Brandon et al., 2007) should continue to be taught; findings from this study support the importance of efficacy, recovery support, and self-control in reducing substance use and addiction severity after treatment.

Conclusion

Almost two decades ago, Rhodes and Jason (1990) criticized research on substance abuse and relapse as ignoring sociological factors impacting individual outcomes, stating that ignoring the social world in which people live places undue blame on the individual for factors often out of their control. Despite their critique, and despite the large body of research finding significant relationships between sociological factors such as gender, race, and SES, very little research has examined the exact nature of these relationships and exactly *why* sociological factors are associated with negative mental health and addiction outcomes.

The current study examined sociological factors hypothesized to affect outcomes for substance use and addiction severity. Despite the non-significant findings for income, education, employment, and economic hardship in most of the current analyses, more research needs to be conducted to further examine the impact of these variables on relapse and addiction severity since some null findings may be due to measurement error. The results of this study should not be ignored, but further analyses should be conducted to determine if results are replicated with different measures or if social stress factors become significant predictors when measured differently. In addition, research should focus on distinguishing between types of stress experienced to determine if social stress has a unique effect on relapse and addiction severity when measuring other types of stress.

Despite lack of significant findings for many factors in the current project, so many previous studies have established a strong association between SES, psychological distress, and addiction that these factors cannot be ignored when providing services to substance abuse treatment participants. Particularly for participants with severe SUDs who may participate in residential programs and return home after completing treatment, poverty limits options and control over personal environment. Treatment providers would do well to include components aimed at improving employment outlook in their programs, as well as assisting with finding permanent safe and stable housing after treatment completion so participants do not have to live with individuals in their social circles who might still use alcohol and illicit drugs.

In summary, the current study contributed to the body of literature by using a social stress theoretical framework as a heuristic for understanding substance use post-

treatment entry and follow-up alcohol and drug addiction severity in a large statewide sample of Kentucky substance abuse treatment participants. In doing so, although the imputed social stress factors did not appear to capture social stress as conceptualized, it was found that perceived stress was often a predictor of substance use after treatment entry and follow-up addiction severity, and that coping factors significantly mediated the relationship between perceived stress and the substance use outcome variables. This study lays the foundation for future work in this area, since further research should be conducted examining social stress factors and their impact on distress and relapse in persons who participate in substance abuse treatment. This study also supports the continued emphasis on increasing coping ability for participants of substance abuse treatment programs, since coping factors had the largest effect on post-treatment substance use and addiction severity.

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Elizabeth A. Wahler, MSW, CSW
Place of Birth: Lexington, KY
Date of Birth: 4/12/1977

Vita

Education

- 2005 Master of Social Work
University of Kentucky, Lexington, KY
Specialization: Clinical Social Work
- 1998 Bachelor of Science
University of Evansville, Evansville, IN
Major: Psychology
Minor: Sociology

Teaching Experience

- 1/10-5/12- Teaching Assistant in the College of Social Work Graduate Program

Peer-Reviewed Publications

- Wahler, E. A.** (accepted pending revisions). Retribution or rehabilitation? Conflicting goals of U. S. policies pertaining to drug felonies and their impact on women. *Journal of Women, Politics, & Policy*.
- Wahler, E. A.** (forthcoming). Identifying and challenging social work students' biases. *Social Work Education*.
- Staton-Tindall, M. **Wahler, E. A.**, Webster, J. M., Leukefeld, C. G., & Freeman, R. (forthcoming). Telemedicine-based alcohol services for rural problem drinkers. *Psychological Services*.

Invited Book Chapters

- Wahler, E. A.** (forthcoming). Promoting the emotional health and growth of adolescents with mental illness and learning disabilities. In T. Gulotta and M. Bloom (Eds.), *Encyclopedia of Primary Prevention and Health Promotion (2nd Ed.)*.
- Wahler, E. A.** (forthcoming). Practice Suggestions. In T. Palmer, T. Nugent, & C. Leukefeld (Eds.), *RESPECT: A promising intervention for welfare-to-work practitioners*.

Technical and Research Reports

- Staton-Tindall, M. Webster, J. M., **Wahler, E. A.**, Leukefeld, C. G., & Freeman, R. (2011). Alcohol use among rural offenders on community supervision. *Offender Programs Report, 15*(2).
- Carlton, E. L., **Wahler, E.**, Delaney, M., Staton-Tindall, M., & Leukefeld, C. (2011). *Targeted Assessment Program (TAP) brief report series No. 9: Learning problems*. Frankfort, KY: Cabinet for Health and Family Services
- Wahler, E. A.** (2006). Losing the right to vote: Perceptions of permanent disenfranchisement and the civil rights restoration application process in the state of Kentucky. http://www.sentencingproject.org/doc/publications/fd_kylosingtherighttovote.pdf

Refereed Presentations

- Wahler, E. A.** (2011, October). Preparing Future Social Workers for Ethical Practice: Identifying and Challenging Students' Biases. Paper presentation accepted for the October 2011 annual program meeting of the Council on Social Work Education, Atlanta, GA.
- Wahler, E. A.**, Staton-Tindall, M., Webster, J. M., Freeman, R., & Leukefeld, C. G. (2011, April). An exploration of rural offenders' recidivism risk factors by severity level of alcohol use. Poster session presented at the annual conference of the Center for Clinical and Translational Science, Lexington, KY.
- Wahler, E. A.**, Otis, M., Leukefeld, C., Carlton, E., & Ramlow, B. (2011, January). Learning problems, social stress, and depressive symptomology in low-income women. Poster session presented at the annual conference of the Society for Social Work and Research, Tampa, FL.

Invited Guest Lectures

- 2012 Provided invited guest lecture entitled “Overview of substance use, abuse, and dependence: Exploring opportunities for social work intervention” for a BSW introductory social work course at Eastern Kentucky University
- 2011 Provided invited guest lecture entitled “Overview of substance use, abuse, and dependence: Exploring opportunities for social work intervention” for a BSW introductory social work course at Eastern Kentucky University
- 2009 Provided invited guest lecture entitled “Micro, mezzo, and macro social work practice: Applying micro principles to macro-level work” for a BSW introductory social work course at the University of Kentucky
- 2007 Provided invited guest lecture entitled “Connecting the dots between the substance abuse and child welfare fields” for a BSW child welfare course at the University of Kentucky
- 2007 Provided invited guest lecture entitled “Understanding individual and systemic barriers to self-sufficiency for TANF recipients” for a BSW social welfare policy course at the University of Kentucky
- 2006 Provided invited guest lecture entitled “Connecting the dots between the substance abuse and child welfare fields” for a BSW child welfare course at the University of Kentucky
- 2006 Provided invited guest lecture entitled “Understanding individual and systemic barriers to self-sufficiency for TANF recipients” for a BSW social welfare policy course at the University of Kentucky

Invited State and Regional Workshops/Presentations

- 2010 Planned and facilitated training entitled “Recognizing and working with individuals with substance abuse problems” for the Kentucky Community and Technical College System (KCTCS) Ready-to-Work and Work-and Learn annual statewide staff meeting in Cadiz, KY
- 2006-2007 Facilitated six regional trainings across Kentucky for Department for Community Based Services (DCBS) Division of Protection and Permanency/Child Protective Service staff entitled “Recognizing and intervening with parents with substance abuse problems”

- 2006 Planned and conducted four participatory trainings on mental health, substance abuse, and intimate partner violence for members of an at-risk community in Lexington, KY
- 2005 Collaborated with an interdisciplinary team to plan and conduct a community training in Lexington, KY entitled “Identification and service provision with individuals with learning problems: Practical, ethical, and legal considerations”
- 2002 Created and facilitated job club for KTAP recipients in Lexington, KY

Funding/Awards

- 2012 Received “Best Student Research Paper Award” by UK College of Social Work Research Committee- \$500
- 2011 Doctoral Student Research Award- \$2000 research stipend by the UK College of Social Work Research Committee
- 2005 Awarded \$2500 research stipend by The Sentencing Project

Employment Experience

**University of Kentucky, Center on Drug and Alcohol Research, Targeted Assessment Program, 12/07-Present
Community Based Services Manager/Program Coordinator**

**University of Kentucky, Center on Drug and Alcohol Research, Targeted Assessment Program, 1/04-12/07
Targeted Assessment Specialist**

**University of Kentucky College of Social Work, 4/06-12/07
Program Assistant (part-time) for Chris Flaherty, PhD**

**Ronald McDonald House Charities of the Bluegrass, 4/03-1/04
House Manager**

**Skill Enhancement & Employment Center, 1/02-3/03
Employment Consultant**

**Chrysalis House, 10/98-1/02
Program Coordinator/Counselor**

Service

To the University

- 2011- 2012 UK Teaching Assistant Development Advisory Board- Student Representative
- 2010-2011 UK College of Social Work PhD Program Review Committee- Student Representative

To the Community

- 2011 Served as judge for the Bluegrass Alliance for Women Legacy Award
- 2006-2007 Fayette County Race, Community, and Child Welfare Committee
- 2004-2007 Fayette County Domestic Violence Prevention Board
- 2004-2007 People Advocating Recovery
- 2001-2007 Take Back the Night Planning Committee Member

Professional Memberships

- 2010-Present Society for Social Work and Research