UNIVERSITY OF CINCINNATI

Date: October 7, 2005

I, Fatin T. Mangold,

hereby submit this work as part of the requirements for the degree of:

Doctorate of Philosophy (Ph.D.)

in:

Nursing

It is entitled:

Harmful Drinking, Depression, and Conduct Disorder among Women Involved in an Alcohol-Related Motor Vahicle Crash: A Secondary Analysis

This work and its defense approved by:

Chair: Marilyn Sommers, Phd, RN, FAAN

Liliana Guyler, PhD

Janet Wray, PhD, RN

Harmful Drinking, Depression, and Conduct Disorder among Women Involved in an Alcohol-Related Motor Vehicle Crash: A Secondary Analysis

A dissertation submitted to the

Division of Graduate Studies and Investigation

Of the University of Cincinnati

In partial fulfillment for the degree of

Doctor of Philosophy

In the College of Nursing

2005

by

Fatin Theresa Mangold

B.S.N., Jordan University of Science and Technology, 1991

M.S.P.H., Jordan University of Science and Technology, 1994

M.S.N., Catholic University of America, 1998

Committee Chair: Associate Dean for Research, Marilyn S. Sommers

Abstract

The purpose of this study was to analyze the relationships among alcohol consumption and two psychological variables (depression and conduct disorder) in women who are harmful drinkers who had been involved in an alcohol-related motor vehicle crash (ARMVC). Wilsnack's theoretical model of causes and consequences of problem drinking among women was used to guide the analyses. The sample included 43 participants, 18 to 45 years old, with a mean age of 28.84 years (*SD* = 7.10). The sample was derived from a brief intervention study that was conducted to test the effect of brief intervention to reduce alcohol consumption. Data were collected using a Health Screening Survey, which included instruments to assess for conduct disorder before and after age 15 and depression both in the previous year and over a life time. Alcohol consumption was calculated using the Timeline FollowBack method (TLFB). Multiple regression analyses were conducted to assess the relationship among the psychological factors of interest and the average number of drinks per drinking day. Initial regression equations were conducted using five predictive variables (conduct disorder before and after 15, depression both in the last year and life time depression and age) and three outcome variables (average drinks per drinking day, binge drinking, and total number of drinks). Results showed that the combination of conduct disorder before and after age 15, depression over a life time and in the last year, and age significantly predicted almost 26% of the variance in the average number of drinks per drinking day, (F [5, 37] = 2.65, p < .05). Subsequent regression analyses included three predictive variables at a

time to find the best regression model. Results indicated that the best fit regression model that significantly explained approximately 25% of the variance in the average number of drinks per drinking day included depression over a life time, conduct disorder after age 15, and age. Depression over a life time significantly contributed the most to the variance of the average number of drinks per drinking day (37%) followed by age and conduct disorder after age 15. Younger women with a history of conduct disorder and depression consumed more alcohol than their older counterparts. Although more work is needed to understand the relationships among the variables, when young women screen positive for depression or conduct disorder, alcohol screening is also important.

Acknowledgments

I would like to extend my deepest gratitude for my mentor and committee Chair Associate Dean for Research, Marilyn S. Sommers for her vision and guidance through this journey. Dr. Sommers provided me with support both academically and emotionally through the ups and downs in my advancement in the program and especially during this work. For that and more I will always be deeply thankful and grateful to her both on the personal and the academic levels.

I would like to also thank my committee members Dr. Janet Wray of the school of nursing and Dr. Liliana Guyler from the department of health promotion for their appreciated and valuable contribution to this work. Their knowledge and vision added more depth and meaning to this work. I thank them for their time and their patience throughout this work.

I would like to thank the academic community at the College of Nursing, University of Cincinnati. Thanks to all of the teachers and scientists especially those with whom I had the opportunity to work with and benefit from their academic knowledge and expertise. I cannot ignore the guidance and the leadership of Dr. Andrea Lindell, the Dean of the College of Nursing. Dr. Lindell's vision and continuous support for the PhD. Program, the PhD students, and international students in particular, is invaluable.

Thanks to Mr. Glenn Kent for his contribution especially in the statistical analyses of the data. His expertise and knowledge guided the analyses and his comments were very valuable to this work.

I would like to acknowledge the anonymous forty three female participants who agreed to participate in the original study, for without them this work would have not been possible.

Last but not least, I can not give enough credit for one person who has been the greatest partner in life and provided more than I can ever describe. My husband Robert Mangold has been, still is, and continues to be the most incredible and most supportive, loving and caring husband any woman could ask for. I like to thank him for all the hours he spent caring for our daughter, while I was busy studying, all the nights he gave her baths, sang songs for her, read her books until she fell asleep while I was on the computer every night working on this dissertation.

My life and my academic journey has been guided by my faith in God who blessed me with a fantastic family, wonderful friends and most of all a sense of humanity and eagerness to help others. I hope that this work will be a contribution to the scientific community and add to our knowledge and ability to help those who are in need. My greatest and most thanks is to my God for making everything in my life just the way it is.

Dedication

I dedicate this work to my soul mate, my husband and life partner Robert and to the joy of my life my daughter Gloria. I also dedicate this work to my parents for teaching me the values of life, keeping faith a part of my childhood, and for supporting me during my academic journey.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE

This chapter includes an introduction to the problem of the current investigation, a brief description of the current research related to harmful drinking, and an explanation of the epidemiology of alcohol use in women. It also explores gender differences in drinking, alcohol use and co-morbid disorders (depression, and conduct disorder), and statement of the specific aims and the research questions.

Alcohol-related morbidity and mortality are considered significant problems in the United States (United States Department of Health and Human Services [USDHHS], 1997). Harmful drinking is a pattern of alcohol use that causes damage to mental or physical health, and can lead to psychosocial problems, injury, depressive disorders, financial difficulties, and problems with the law (Savada, 1990; USDHHS, 1997; World Health Organization [WHO], 2003). Sommers defined harmful drinking as a pattern of alcohol use that is currently resulting in alcohol-problems (Sommers, in press).

On average in the United States, 45,000 people die annually in traffic crashes, and 43.6% of these deaths involve alcohol. The most recent data from the National Highway Traffic Safety Administration (NHTSA) indicated that there were 17,013 alcohol-related fatalities in 2003, which were 40% of the total traffic fatalities for the year. There is one alcohol-related death in the Unites States every 31 minutes (NHTSA, 2004).

Alcohol consumption and harmful drinking are known to have a wide variety of consequences specific to the female population. According to the

National Institute on Alcohol Abuse and Alcoholism (NIAAA) reports, alcohol consumption among women causes a variety of biological and psychosocial consequences such as death (including suicide), cognitive dysfunction and brain pathology, affective disorders, psychological changes, (including sleep dis-regulation), and risks for alcohol dependence in children of women who are alcohol dependents (NIAAA, 1999a).

Harmful Drinking and the Epidemiology of Alcohol Use in Women

A wide variety of terms are used to describe alcohol consumption: alcoholism, dependence, alcohol use, alcohol abuse, harmful drinking, hazardous drinking, alcohol misuse, binge drinking, and problem drinking. The population of interest for this study was women who were problem drinkers, and even more specifically, harmful drinkers, as defined according to the International Classification of Disease (ICD-10) criteria of the WHO (2003). Problem drinking is composed of two categories; hazardous drinking and harmful drinking. Persons who are hazardous drinkers are those who have not experienced alcohol-related problems, but consume alcohol in a pattern that increases the risk for developing alcohol-related problems. Persons who are harmful drinkers are those who have experienced harm (physical and psychological) due to their drinking but are not alcohol dependents (Dyehouse & Sommers, 1998).

Unfortunately, the epidemiological studies on alcohol consumption reflect mainly the prevalence of alcohol dependence or alcohol abuse, rather than harmful and hazardous drinking. Alcohol dependence means that a person continues to drink despite experiencing significant alcohol-related problems, as

well as cognitive, behavioral, and physiologic symptoms such as physical withdrawal or the need to drink increasingly large amounts. Alcohol abuse is characterized by continued drinking despite adverse effects on family or work, trauma, or negative health consequences (USDHHS, 2000). No specific national data can be found on harmful drinking. However, it is useful to report on the prevalence of alcohol dependence because it provides some information about the size of the problem for women who are hazardous and harmful drinkers.

According to NIAAA's (2005a) most recent reports nationwide, alcohol dependence is declining in both men and women, while alcohol abuse is increasing (using definitions of that Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) (American Psychiatric Association [APA], 1994). In the United States and over the last ten years alcohol abuse among females in the general population has increased from 1.51% in 1991 to 2.55% in 2002, and was highest with 4.57% among women ages 18-29 years old (NIAAA, 2005b). On the other hand, data showed that the prevalence of alcohol dependence has slightly declined from 2.58% in 1991 to 2.32% in 2002 (NIAAA, 2005c). Data showed similar trends for men, but the prevalence is higher for men than women in both categories. No specific statistics are provided for problem drinkers, because they are usually counted with the prevalence statistics for alcohol abuse (Grant et al., 2004).

For years the primary focus on alcohol problems has been on alcohol dependence. More recently scientists have realized that alcohol abuse and not dependence has a much higher prevalence in the general population and leads

to a significant amount of illness and injury. Far more alcohol-related motor vehicle crashes (ARMVC) result from those abusing alcohol rather than dependent on alcohol, and strategies are needed to reduce the health-related adverse events that occur from abuse. In an analysis of levels of blood alcohol concentration (BAC) of convicted drivers involved in fatal injuries, those with BACs of 0.15 percent or higher were categorized as problem drinkers (NIAAA, 2003a).

Historically, investigators have shown that the prevalence of alcohol abuse among women is increasing, as are the number of alcohol-related problems, and that women might be surpassing men in problem drinking (Liban & Smart, 1980). Results of epidemiological investigations over a period of twenty years conducted by a group of investigators showed otherwise. Wilsnack, Wilsnack, and Klassen (1984) interviewed a sample from the general population that included 500 females who were moderate to heavy drinkers, 379 light drinkers or abstainers, 39 who were self-reported former problem drinkers and a group of 396 men for comparison. Moderate to heavy drinking was defined as four or more drinks per week. Investigators compared the prevalence of problem consumption with those from eight previous surveys. Results indicated that there has been no major increase in the prevalence of drinking among women. Results showed that women drinkers remain predominantly light drinkers, and abstinence is increasing among women after age 50. However, the results also revealed a significant upward linear increase in the percentage of middle-aged women (ages 35-64) who drink. The investigators emphasized the following findings: 1) there is

no dramatic increase in levels of women's drinking; 2) although drinking has not increased, concerns about women's drinking should remain an important area of investigation because women's drinking problems have long been neglected.

Gender Differences in Drinking

There are many reasons to focus health sciences research on women and their alcohol consumption. Women are at higher risk than men for developing problems from alcohol consumption (USDHHS, 1997). There are physical differences between the two genders that lead to different blood alcohol levels even after consuming the same amount of alcohol. Women have less body water, and less lean body fat; therefore alcohol has a stronger effect on body tissues in women as compared to men. In addition women are known to have lower activity of the enzyme, alcohol dehydrogenase (ADH), which is an important factor for alcohol metabolism. Furthermore, women are considered at higher risk for alcohol-related problems than men because they are less likely to seek help for drinking-related problems, and less likely to report these problems because of the social stigma attached to female drinking (USDHHS, 1997; Wilsnack & Wilsnack, 2002).

Importantly, according to the 2003 National Survey on Drug Use and Health, the rates of alcohol use among men and women are comparable; 74.5 million (61%) females aged 12 or older and 80.0 million (70%) males aged 12 or older used alcohol during the past year. Males 12 years or older were twice as likely to be dependent on or abuse alcohol or an illicit drug (12%) in the past year as females aged 12 years or older (6%) (Office of Applied Studies, 2004a).

Almost without exception, early studies on alcohol were based on the white, male population (Wilsnack, Wilsnack, & Klassen, 1984). Since the 1970s, investigations about women's drinking have increased, but many questions remain unanswered like the characteristics, etiology, and factors leading to alcohol use, and treatment available for women with alcohol problems. Most of the confusion and conflicting information about women's drinking is due to the fact that limited work has been done about harmful drinking and problem drinking, and in particular little is known about these patterns in women.

Alcohol Use and Co-morbid Disorders (Depression, and Conduct Disorder)

Alcohol co-morbidity refers to a situation when an individual has any of the alcohol use disorders in addition to psychiatric disorders. Clark and Bukstein (1998) propose that the co-existence between psychopathology and alcohol use disorders starts among adolescents and may continue beyond. Both conduct disorders and depression seem to be involved with drinking in some way. The presence of a history of conduct disorder and depression increases the risk for problem drinking in the female population. Heavy drinking patterns tend to begin after not before, problems with depression (Wilsnack, Klassen, & Wilsnack, 1986).

Alcohol and Depression

Several studies have found that the association between depression and alcohol disorders is higher in women than men. As the nature of the association between depression and alcohol use in women is still unclear, investigators

found that in women depression tends to come before alcohol problems and could increase the likelihood of subsequent heavy alcohol use (Helzer & Pryzbeck, 1988; Wilsnack, Klassen, Schur, & Wilsnack, 1991)

Sullivan, Fiellin, and O'Conner (2005) reviewed 35 studies that reported on the prevalence and effects of alcohol problems in depression. They found that the median prevalence of current alcohol problems with depression was 16%, and the median prevalence of lifetime alcohol problems with depression was 30% in psychiatric patients, with a higher prevalence than that found in the general population. The majority of the studies evaluated alcohol abuse and dependence, and about 71% were conducted in the psychiatric inpatient setting, with the majority of the participants being women. The authors concluded that most of the literature on depression and alcohol focused on dependence and alcohol abuse and ignored other alcohol use disorders like hazardous and harmful drinking.

Alcohol and Conduct Disorder

Conduct disorder is marked by a variety of behavioral problems at home or in school that begin before the age of 15 (Barry, Fleming, Manwell, & Copeland, 1997). Behavioral problems that continue into adulthood usually progress into antisocial personality disorder (DSM-IV-TR). Conduct disorder is believed to be one of the factors that is associated with problem drinking in women (Clark, Vanyukov, & Cornelius, 2002). Although Reiger and Robins (1991) reported that the prevalence of antisocial personality is higher in men than women (6-7% and 1-2% respectively), recent data from the National Survey on

Drug Use and Health indicate that the percentage of girls involved in risky behaviors like fights has increased from 16.2% in 2002 to 20% in 2003 (Office of Applied Studies, 2004b)

Kessler et al. (1997) analyzed data from the National Co-Morbidity Study to investigate lifetime co-occurrence of alcohol abuse and dependence with psychiatric disorders. Results of the analyses showed that the prevalence of conduct disorder among alcohol abusers was 13.5% among females and 25.3% among males, while higher prevalence was found among alcohol dependents, with a prevalence of 22.8% among females and 41.6% among males.

Thus, the literature shows that there is a relationship between conduct disorder/antisocial personality and alcohol abuse and dependence. However, it is not clear if the same relationship exists among female harmful drinkers. If an association is established through this investigation, clinicians and health care workers in non-clinical settings can identify possible future harmful drinkers earlier and customize proper interventions to prevent future harmful drinking.

Specific Aims and the Investigation Question

Alcohol use in women is associated with multiple factors, including depression and conduct disorder. There is not enough information about how these two factors affect harmful drinking among women in the U.S. Therefore, there is a need to investigate the relationship between depression, conduct disorder and harmful drinking among women. In order to assess the relationships of interest, the investigator used Wilsnack's theoretical framework of women's drinking behaviors and drinking consequences (Wilsnack, Wilsnack, et al., 1986).

The framework is one of the few theoretical works that are specific for women and describes how multiple factors affect and lead to problem drinking. Among these factors are depression and conduct disorder.

The specific aim of this study is to explore the association of harmful drinking in women and the presence of conduct disorder and depression. To begin to understand the phenomenon of harmful drinking in women and the factors associated with it, preliminary work with a pre-existing data base of women injured in ARMVC was used. The study population was chosen for two reasons. First, a sample of female harmful drinkers was readily available. Second, the ARMVC serves as a consequence of drinking that may help to explain the association between drinking variables and psychological variables.

The current investigation was used to answer the following question:

What is the relationship between harmful drinking and selected psychological variables among women who have been involved in an alcohol-related motor vehicle crash (ARMVC)?

By understanding the relationship among these variables, the ultimate goal is for nurse scientists to develop interventions to reduce harmful drinking in women, and eventually to reduce the risk for injury within the female population.

CHAPTER TWO

This chapter includes a detailed review of the related literature, the limitations of the literature, a description of the conceptual model that was used to guide the analyses, and a description of the significance of the current investigation.

Review of the Related Literature

The following review of the literature is designed to clarify the current state of knowledge development concerning harmful drinking in the female population in the U. S. In addition the review of the literature will clarify the definition of harmful drinking, gender differences, related epidemiological data, and the association between harmful drinking in women and co-morbid conduct disorder and depression. However, because the literature about harmful drinking is limited, the investigator also reviewed literature about problem drinking, alcohol abuse, and alcohol dependence within the female population. Furthermore, this section contains a discussion of the conceptual model that was used to guide the investigation and the significance of the investigation.

Commonly Defined Patterns of Drinking

Harmful drinking is defined differently from alcohol abuse and dependence. There are several definitions of harmful drinking available in the literature. Most investigators use or adapt the definition reported by Edward, Arif, and Hudgson (1981) of the World Health Organization. According to the ICD-10 (International Classification of Disease-10) definition, harmful drinking is a pattern of alcohol use that causes damage to health (the definitions offered by Edward et

al. is the same as ICD-10). The damage may be physical, or mental (e.g. depressive episodes secondary to heavy alcohol intake). Harmful drinking commonly is associated with adverse social consequences such as job or marital problems; social consequences in themselves, however, are not sufficient to justify a diagnosis of harmful drinking (WHO, 1992, 2005).

Alcohol Abuse and Dependence

According to the Ninth Special Report on Alcohol and Health (USDHHS, 1997), there are two major systems used to diagnose alcohol abuse (problem drinking) and alcoholism (alcohol dependence): the Diagnostic and Statistical Manual for Mental Disorders, Fourth Edition (DSM-IV), and the International Classification of Diseases, Tenth Revision: Clinical Descriptions and Diagnostic Guidelines (ICD-10). According to the DSM-IV (American Psychiatric Association [APA], 1994) alcohol dependence is a cluster of cognitive, behavioral and physiologic symptoms that indicate continued drinking despite significant alcohol-related problems. Alcohol abuse generally is characterized by repetitive patterns of drinking resulting in harmful situations with adverse consequences including impaired ability to fulfill responsibilities or negative effects on social and interpersonal functioning as well as health. The ICD-10 definition (published by the WHO) uses the category harmful use, rather than alcohol abuse, which emphasizes consequences that may be either physical or psychological in nature. In the Tenth Special Report on Alcohol and Health (USDHHS, 2000), alcohol abuse and alcohol dependence are used and defined in a similar fashion as in the Ninth Special Report, but no definitions of problem drinking are

included. Alcohol-related consequences refer not to a specific diagnostic category but to a wide range of alcohol-related problems including difficulties with family and friends, work problems, legal troubles, injuries and casualties, and health consequences. The definitions (mentioned earlier) that are adopted by NIAAA underwent multiple refinement processes, and as recently as the year 2000, the American Psychological Association (APA) published the final DSM-IV-TR criteria that provided a greater distinction between alcoholism and alcohol abuse, including the addition of physiologic indicators to the definition of dependence (APA, 2000).

Problems with Overlapping Definitions

A review of the earlier literature on alcohol disorders and patterns of drinking revealed a confusion among these definitions (alcohol-related consequences, alcoholism, problem drinking) among investigators. Some investigators mix the concept of problem drinking with the consequences of alcoholism, or alcohol-related problems. For example, Dahlgren (1978) investigated the development and pattern of problem drinking among a group of 200 male and female in-patients. Although the investigator explicitly explained that the purpose of the study was to compare problem drinking between the male and female in patient populations, the study groups were composed of those who met the criterion for alcohol dependence, thereby confusing problem drinking with alcohol dependence. There is a need to differentiate between problem drinkers as participants who experience problems from alcohol but are not dependent and alcohol-related problems that occur as a consequence from

drinking alcohol among those who are alcohol dependent. Wilsnack, Wilsnack, et al. (1986) noticed the confusion of terms and explicitly recommended that the terms problem drinking and alcohol-related problems be used interchangeably. Thus, as the confusion of terms remains, investigators must explicitly identify the definition of the terms used.

Even more recently, the literature continues to reflect some confusion and lack of consistency about the definitions describing the patterns of drinking. For example, an article entitled “Harmful Alcohol Use” Gmel and Rehm (2003) started by describing alcohol misuse and its harmful effects on society and individuals, and noted that these effects resemble the consequences of alcohol abuse given by the DSM-IV criteria. The authors suggested that harmful use, alcohol abuse, and alcohol misuse, are all different definitions of the same phenomenon. Some investigators suggest classifying alcohol use into three main categories: harmful use, (which would include harmful drinking, alcohol abuse, problem drinking and dependence) meaning the presence of alcohol-related problems; hazardous use, meaning the risk for alcohol-related problems is likely; and non-hazardous use, meaning no known risks for alcohol-related problems (Fink et al., 2002).

Variations in definitions can affect the results of epidemiological investigations, consequently leading to differences in reported rates and prevalence of alcohol use and abuse, and affecting conclusions and recommendations for future treatment and prevention plans. Administrators, investigators, and health care workers who use results of epidemiological

investigations need to identify which definitions are being used before applying the results of such investigations.

Gender Differences in Drinking and Alcohol Metabolism

About a third of the women in the U. S. drink alcohol, and one out of ten averages two or more drinks a day (NIAAA, 2003b). The Dietary Guidelines for Americans (United States Department of Agriculture [USDA], 2005) recommends no more than one drink a day for women, and no more than two drinks a day for men. This recommendation reflects the fact that the standards are different between women and men as far as the amount of alcohol required to result in similar alcohol-related effects for men and women. Obviously women need less alcohol then men to get the same effects.

Results from current and past investigations indicate that there are gender differences in drinking patterns, the quantity of alcohol consumed, and the risks and consequences of alcohol consumption. Women are at a higher risk for problem drinking and alcohol abuse because of many factors. For instance, when women drink as compared to men, the alcohol in the bloodstream reaches a higher level more quickly even when drinking the same amount (NIAAA, 1997, 2004a). Because women have proportionally less body water than men, and less lean body fat than men, there is less fluid to dilute alcohol. Higher blood alcohol concentration occurs, thus making women's brain and organs exposed to more alcohol than would occur in men.

In addition there are differences in alcohol metabolism between women and men. Alcohol is absorbed from the stomach and intestines into the blood,

and then is metabolized in the liver by enzymes including alcohol dehydrogenase (ADH), which mediates the conversion of alcohol to acetaldehyde. The latter is rapidly converted to acetate by other enzymes and is eventually metabolized to carbon dioxide and water. Not all the alcohol consumed is metabolized through the liver; a small quantity that remains un-metabolized causes alcohol concentration to be measured in breath and urine. Alcohol is detoxified and removed from the blood through a metabolic process called oxidation, thus preventing alcohol from accumulating and destroying various organ cells. Until all the alcohol consumed has been metabolized, it is distributed throughout the body, affecting the brain and other tissues. Women have lower activity of the alcohol metabolizing enzyme ADH in the stomach than men, causing a larger proportion of the ingested alcohol to reach the blood before it is metabolized (NIAAA, 1997). Thus, although women are known to drink less than men, they are more susceptible to organ damage at lower levels of consumption over shorter periods of time (NIAAA, 2000).

There is a plethora of studies on men's drinking, but not nearly as many about women's drinking. Only in the last thirty years have scientists included women as participants in studies about alcohol. There are conflicting reports about gender differences in problem drinking as to whether 1) women have more or less drinking-related problems than men and 2) women are more or less likely than men to seek help for drinking-related problems. For example, one opinion is that men experience more drinking related problems because they drink more than women (Dixit & Crum, 2000; NIAAA, 1990). Another opinion is that although

women drink less than men, they are at higher risk for alcohol-related problems (NIAAA, 2004a). The reason for this increase in risk is that women are less likely to seek help for alcohol-related problems and they tend to hide their drinking and any alcohol-related problems (Liban & Smart, 1980), putting them at high risk for injury to self and others.

Alcohol and Co-morbidity

The causes for problem drinking in women are most likely to be multi-factorial. Two of these factors may be depression and conduct disorder (Clark et al., 2002). When investigating the presence of both an alcohol and another mental disorder, the term co-morbidity is appropriately used to describe the co-occurrence of two (or more) diseases, disorders, illnesses, or health problems (NIAAA, 2004b). The term alcohol co-morbidity refers to a situation in which a participant has an alcohol use disorder (abuse or dependence) as defined in DSM-IV-TR, in addition to another psychiatric disorder such as depression, or conduct disorder/antisocial personality (as defined in DSM-IV-TR). According to the most recent Surgeon General's report, one in five Americans has experienced psychiatric problems (NIAAA, 2005d). Individuals with one type of psychiatric disorder are at higher risk for having another type of psychiatric disorders.

According to Reiger et al. (1990) 37% of individuals who have alcohol dependence or abuse also experience a co-existing mental disorder. Results of the National Co-morbidity Survey (Kessler et al., 1997) show a considerable lifetime co-occurrence of psychiatric disorders with alcohol abuse and

dependence. Among men who have alcohol dependence, there are 35% with anxiety disorder (panic, phobia), 28.1% with mood disorder (major depression, dysthymia, mania), and 16.9% with antisocial personality disorder. The relationship among alcohol dependence, anxiety disorders and mood disorders was stronger among women with alcohol dependence (60.7% anxiety disorder, 53.5% mood disorder), while antisocial personality disorders were not as frequently observed (7.8%).

Ross and Shirley (1997) noticed the dearth of literature about psychiatric co-morbidity problems among female problem drinkers. The investigators explored the relationship of mental disorders to drinking and problem drinking in women in the community, to determine whether the lifetime occurrence of one or more mental disorders is significantly associated with alcohol consumption. The study sample used for analysis was 4,285 women aged 15-64 years, using the University of Michigan Composite International Diagnostic Interview (UM-CIDI), to produce the DSM-III-R diagnosis. Participants were asked in any one year period of their life, if they had at least 12 drinks of any kind, and then were asked the 21 questions related to the DSM-III-R diagnosis criteria for alcohol abuse or dependence. Problem drinking was defined as the presence of one or more of the 21 UM-CIDI alcohol symptoms, which contributed to a DSM-III-R diagnosis of either abuse or dependence. The sample was divided into groups: the first two groups contained no problem drinkers (healthy group, no history of problem drinking or psychiatric disorders) and the psychiatric group (no history of psychiatric problem but met the criteria for non-drug-related mental disorders).

The other two groups included the problem drinkers (who reported one or more alcohol symptoms and no co-morbidity, and the co-morbid problem drinker (history of one or more mental health). The co-morbid group had 79% anxiety disorders and 55% mood disorders, while the psychiatric group reported 84% anxiety disorders and 38% mood disorders.

The two problem drinker groups consumed more alcohol than the non-problem groups. Results showed that problem-drinking women with and without co-morbidity were significantly younger than the healthy and psychiatric groups. Problem drinkers without psychiatric problems were better educated than the co-morbid problem drinkers. Co-morbid problem-drinkers tended to be less educated, had an earlier age of the first alcohol-related problem and were more likely to seek treatment for mental health reasons.

Depression and Alcohol Use

Across all the literature about depression and alcohol disorders, the majority of investigators focused on populations with alcohol dependence, also described as alcoholism. Few studies were found that examined depression and problem drinking, or alcohol-related problems. There were no studies about depression and harmful drinking. Thus, this review will first explore what is known about depression and other alcohol use disorders, and then examine selective studies that investigated the relationship between depression and problem-drinkers (among both male and female populations).

Nature of the relationship

There is a consensus among scientists that there is a relationship between depression and alcohol use disorders, but the temporal relationship is still undefined (Brown et al., 1998; Crum, Brown, Liang, & Eaton, 2001; Nurnberger, Foroud, Flury, Meyer, & Wiegand, 2002). Depression may be both a risk factor for alcohol abuse (meaning that a women with depression might use alcohol to relieve that depression and eventually become an alcohol abuser), and a consequence of alcohol abuse in women (meaning that a women who abuse alcohol might develop depressive symptoms) as suggested by longitudinal analysis (Helzer & Pryzbeck, 1988).

An important issue with the occurrence of an alcohol use disorder and depression is how to categorize them; i.e., as a primary or secondary diagnoses. Depression and alcohol use disorders are usually categorized into primary or secondary when they coincide in clinical cases. Some drinkers may use alcohol as a relief for feelings of depression, and therefore in this case depression is a primary diagnosis and the alcohol use disorder is secondary. On the other hand depression may develop as a result of alcoholism, and in that case alcoholism is primary and depression is secondary (Nurnberger et al., 2002; Schuckit, 1986).

Epidemiology of Depression and Alcohol Consumption

Clinical samples have shown a co-occurrence between depression and alcohol use (abuse and dependence) (Brown et al., 1998; Davidson, 1995). Brown et al. found that among a group of 73 patients (alcohol and cocaine abusers in treatment), 43.8% met the criteria for current major depressive disorder, and 50.7% met the criteria for lifetime major depressive disorder. More

patients among those who were currently depressed in the study were females (37.5%) than in the non-depressed group (17.1%). However, clinical studies investigating depression sometimes produce hyper-inflated rates because study participants may have multiple disorders at higher rates than in the general population (Grant & Harford, 1995).

Population based samples have also shown a high occurrence of alcohol abuse or dependence among those with depression as compared to those without depression. Grant et al. (2004) presented results on the prevalence and association of substance use disorders and independent mood and anxiety disorders (depression was among the mood disorders). Results showed that among all respondents, the prevalence of major depression was 7.17%. The prevalence was higher among those with a 12-month substance use disorder (15.15%) as compared to those without (6.35%).

As stated earlier, the literature does not offer enough information about depression and other alcohol use disorders like harmful drinking among women. Depression is among the most common co-morbid disorders occurring in women with alcohol use disorders. Several studies found that the association between depression and alcohol disorders is higher among women than men (Grant & Harford, 1995; Helzer & Pryzbeck, 1988; Kessler et al., 1997). The National Co-Morbidity Study (NCS) is one of the first studies to use a structured psychiatric interview with a national representative sample (adults aged 18-55 years). Results showed a 17.1% prevalence of a major depressive episode overall, with a 21.3% prevalence for women and a 12.7% for men (Kessler et al., 1994).

Secondary analysis of the data by Kessler et al. (1997) demonstrated that the rate of depression and alcohol abuse and dependence differed between men and women; among those diagnosed with alcohol abuse, the prevalence of depression was 9% for males and 30.1% for females, and among those with alcohol dependence, prevalence of depression was 24.3% for males and 48.5% for females.

Review of Related Studies

Alcohol problems (Dixit & Crum, 2000; Wang & Patten, 2002), including alcohol abuse and dependence (Brown et al., 1998; Davidson, 1995) often coincide with depression. Large community-based studies have shown that the rate of co-morbid depression and alcohol disorders is higher than the expected rate in the general population (Dixit & Crum, 2000). Further, studies have shown that the association between depression and alcohol disorders is higher in women than men (Grant & Harford, 1995; Helzer & Pryzbeck, 1988; Kessler et al., 1997). Although the temporal relationship between alcohol disorders and depression is not clear, it is believed that in women depression tends to come before problem drinking. According to Wilsnack, Wilsnack, et al. (1986) heavy drinking tends to begin over time and begins after, not before, problems with depression. Dixit and Crum (2000) supported the existence of a relationship between depression and the risk of heavy alcohol use in women. The authors emphasized that depression must be included in the assessment of vulnerability for heavy alcohol use among women. These findings have been emphasized by other investigators.

Dixit and Crum (2000) investigated whether depression is associated with a greater risk of heavy alcohol consumption in women. The study was based on a 1-year follow up of a Baltimore cohort of the NIMH Epidemiologic Catchment Area (ECA) project. The sample contained 1,383 females at risk for heavy alcohol use. The Diagnostic Interview Schedule (DIS) was used to assess mental disorders according to the DSM-III definition. History of depression, frequency of lifetime-experienced depressive symptoms, antisocial personality, cognitive impairment and other variables were assessed at baseline, and incidents of heavy drinking were identified a year later. Results showed that 6.4% of women reported a history of major depression; those women tended to be younger; more likely to be divorced, separated or never married; and more likely to report a history of other psychiatric disorders than those without a history of major depression. Initial analyses revealed the relative risk of heavy drinking at follow up was 2.6% percent among those diagnosed with major depression. A higher number of lifetime-experienced depressive symptoms were associated with heavy alcohol use. The final regression model for best fit included depression, age, history of antisocial personality, and father's history of heavy drinking as independent variables that predicted heavy drinking. The authors concluded that depression must be considered in assessment for vulnerability to alcohol use in women.

The study was limited by the small number of heavy drinking cases (*N* = 56), and the small number of women with antisocial personality disorder *(N* = 8). The findings should be interpreted with caution, therefore. However, the

statistical significance obtained in the study is similar to previous studies. The investigators recommended the inclusion of a higher number of participants with antisocial personality disorder and depression and the need to measure alcohol use for a longer period than the previous six months.

Crum et al. (2001) assessed the relationship between depression and problem drinking for specific levels of alcohol use among problem drinkers in a community-based sample. The study included 334 problem drinkers; 216 men and 118 women. The investigators hypothesized that there would be an increased risk of greater alcohol consumption among depressed problem-drinkers than those without depression in the prior year and that the strength of this association would be stronger for women. Levels of alcohol consumption were divided between high consumption (drinking at least daily) and low consumption (drinking less than daily).

Initial regression analysis showed that the strongest predictor of higher level drinking was the level of consumption in the prior year (Parameter Estimate = 6.79; *CI* = 6.32-7.25; $p < .001$). To further explain the relationship, investigators assessed the association of depression in the prior year with transition to higher level drinking for each level of alcohol consumption. The odds for transition to higher level drinking among depressed men relative to those without prior depression was generally greater than one (*OR* = 3.15) and indicated a bimodal association. A similar pattern was found among women, but with a reduced strength of association. The odds ratios were less than one signifying that relative to non-depressed women, prior year depression was associated with

decreased odds of transition to higher level drinking. The findings did not, therefore, support the study hypothesis.

The study was limited because the investigators did not assess the quantity of alcohol consumed; rather, they used a classification of levels as high or low, and assessed depression only for the last year. The investigators did not assess if any treatment was received between the baseline and intervening years. The investigators suggested further exploration of the relationship between drinking and depression.

Schutte, Heart, and Moos (1997) examined the relationship between depressive symptoms and drinking behavior among a sample of 207 women and 207 men seeking detoxification or referral services for their drinking problems. Initial analysis showed significant differences in the covariance between depressive symptoms and alcohol consumption, and depressive symptoms and problem drinking among men and women. Women reported a significantly more depressed mood, depressive features and dependence symptoms at baseline, and more depressive features at one year follow-up, while men reported significantly higher alcohol consumption (quantity and frequency) at both follow-ups. Further analyses with structural equation modeling showed: 1) having more initial depressive symptoms predicted less alcohol consumption one year later; 2) in the three year follow up, having more depressive symptoms predicted heavier alcohol consumption; and 3) having heavier baseline alcohol consumption predicted more depressive symptoms at one year, but no significant relation was found at three years.

The investigators did not assess the presence of any other mental disorder among participants. The results can not be generalized to those who have been in previous treatment programs (participants were a first time treatment group), and also because of the short stay period of the participants in the treatment center, it was not possible to obtain reliable information about those participants who refused to participate in the study.

In summary, most of the literature reveals that there is a connection between depression and alcohol consumption disorders among women. Thus, it is expected that the investigator will find a similar correlation between depression and alcohol consumption in the current investigation. Furthermore, the investigator expects to find a strong correlation, and to find high levels of depression, because the investigator used a high risk population (women who were already experiencing problems caused by drinking alcohol) among which levels of depression tend to be higher than the general population.

Alcohol and Conduct Disorder/Antisocial Personality

Conduct disorder is a term that covers a subset of out-of-control behaviors (Hill & Mauhgan, 2001). This revision will offer the definitions available in the literature like the DSM-III-R, the DSM-IV, and the ICD-10 for purpose of clarification. However, the Definitions available in the literature such as the DSM-III-R, the DSM-IV, and the ICD-10 will be offered for purpose of clarification. However, the definitions that will be used for the current investigation are the ones that are offered by the DSM-III-R; those definitions were the basis for the definitions adopted in the original study. The DSM-III-R definition of conduct

disorder is a disturbance of conduct lasting at least six months, during which at least three symptoms out of thirteen have been present. Among the list of symptoms are stealing, running away from home, lying, setting fires, being truant, being physically cruel to animals or people, forcing someone into sexual activity, using weapons, initiating physical fights, destroying others' properties, breaking into someone's house, and stealing with confrontation.

The DSM-IV-TR definition of conduct disorder is "a repetitive and persistent pattern of behavior of which the basic rights of others or major age-appropriate societal norms are violated" (American Psychiatric Association [APA], 2000, p. 99). In the DSM-IV-TR symptoms were reduced to eight, and four have to be present for a diagnosis. The DSM-IV definition is similar to the ICD-10 definition (WHO, 1992). According to ICD-10, conduct disorders are defined as disorders characterized by a repetitive and persistent pattern of dissocial, aggressive, or defiant conduct. Examples of the behaviors upon which the diagnosis is based include excessive levels of fighting or bullying, cruelty to other people or animals, severe destructiveness to property, fire-setting, stealing, repeated lying, truancy from school and running away from home, unusually frequent and severe temper tantrums, and disobedience. According to some researchers, it is best to use the DSM-IV-TR criteria, as they have been demonstrated by investigators that DSM-IV-TR as better in diagnosing CD (more discussion is included in the methods chapter).

Epidemiology and Measurement Issues

Clark, et al. (2002) stressed that childhood antisocial behaviors are factors that lead to adolescent alcohol use or dependence. The prevalence of antisocial personality is 6-7% for men and 1-2% in women (Kessler et al., 1994; Regier & Robins, 1991). According to more recent data from the National Survey on Drug Use and Health (Office of Applied Studies, 2004b), in 2003 about 2.4 million girls aged 12 to 17 reported taking part in one or more serious fights at school or work during the past year, an increase from 16.2% in 2002 to 20% in 2003. A similar increase was reported in the percentage of girls who participated in group-against-group fights in the past year (from 13.5% to 16.8%). In addition, past year substance use was the most prevalent delinquent behavior among girls aged 12 to 17, with 36.5% (4.5 million) females reporting past year alcohol use (Office of Applied Studies, 2004b).

One of the major problems in measuring conduct disorders among girls is that the definitions used by both the DSM and ICD are more likely to describe the behaviors of boys compared to girls, which might be one of the explanations for lower rates of conduct disorders among females. Thus, using a different definition that includes girls' activities might increase the current statistics (Hill & Maughan, 2001; Zoccolillo, 1993). Further support for this perspective came from Zoccolillo, Tremblay, and Viatro (1996), who found that the DSM-III-R criteria for conduct disorder failed to identify a group of girls with early onset of pervasively antisocial behavior.

Relationship of Antisocial Behavior and Alcohol Consumption

Based on the findings from several studies (Clark, Klirisci, & Moss, 1998; Capsi, Moffitt, Newman, & Silva, 1996; Rydelius, 1981; Mannuzza, Klein, Bessler, Malloy, & LaPadula, 1998), investigators affirmed that childhood antisocial behaviors precede and predict adolescent alcohol use. Antisocial behavior is also believed to be related to adult use of alcohol (Liskow, Powell, Nickel, & Penick, 1991).

Conduct disorder is believed to advance with age into antisocial personality disorder (ASP). ASP disorders are chronic behavioral and relationship patterns that interfere with a person's life over many years. To receive a diagnosis of antisocial personality disorder, a person must first have had behavior that qualifies for a diagnosis of conduct disorder during childhood. Genetic factors and child abuse are believed to contribute to the development of this condition. ASP affects more men than women, and individuals with antisocial and alcoholic parents are at higher risk for ASP than those without those parental characteristics (National Institute of Health [NIH], 2003).

According to Myers, Stewart, and Brown (1998) antisocial behavior is predictive of both adolescent and adult involvement in substance abuse. Conduct disorder is considered a strong prognostic indicator of both psychoactive substance use disorders and antisocial personality disorders in adulthood (Robins & Price, 1991). A relationship between antisocial behaviors and alcoholism is already established throughout the literature, but more studies are

needed to explore the same relationship among harmful drinking/problem-drinking women if effective interventions are to be developed and tested.

Myers et al. (1998) investigated the progression from conduct disorder to ASP disorder following treatment among a sample of 1,137 adolescents (39% females) who were recruited from two inpatient substance abuse treatment programs. Participants had only a DSM-III-R conduct disorder diagnosis. The investigators used a chart review, and conducted a 90-minute interview with participants, and another interview with a resource person to provide collateral information. Four years after treatment, 60% of the participants met the criteria for ASP diagnosis, with a higher number of males represented (71%). Results indicated that when the onset of deviant behavior began at or before age 10, a greater diversity of deviant behavior occurred, and more extensive pretreatment drug use occurred; these factors were the best predictors of progression to ASP disorder. Participants with ASP were more involved with alcohol and drugs and had poorer function across the life domain than those without ASP. Thus investigators concluded that evaluation of conduct disorders at the time of treatment of substance use might be valuable for planning and intervention.

Barry et al. (1997) examined the relationships among conduct disorder, antisocial personality disorder, and substance use, substance abuse problems, depression, and demographic factors in primary care settings. The sample included 708 male, and 1,217 female participants, with an average age of 41 years and who were 85% Caucasian. The DIS-B was used to measure conduct disorder and antisocial personality disorder. Results showed that men were more

likely to meet the criteria for both disorders (8% antisocial personality and 13.4% conduct disorder) than women (3.1% antisocial personality and 4% childhood conduct disorder). In relation to alcohol consumption, data showed that a history of conduct disorder diagnosis and antisocial personality disorder significantly increased alcohol consumption. Also binge drinking was more prevalent among those with ASP disorder or conduct disorder. In addition those with histories of CD and ASP were more likely to report having drinking problems. Those relationships were similar in both men and women. However, when multiple regression was conducted, ASP was significantly predicted by binge drinking, while conduct disorder was not.

In the previous study Investigators used a sample of primary care patients, and thus the results can be generalized only to such populations. The data were collected retrospectively using a cross-sectional design, which might not have provided a definitive diagnosis of antisocial personality disorder or conduct disorder. The instrument to measure conduct disorder was modified from the DSM-III-R criteria (by deleting the sensitive questions from the criteria) which might have underestimated the prevalence of conduct disorder in the study, as suggested by the investigators. However, the study is very relevant to the current investigation. Results supported the importance of investigating ASP and conduct disorder among problem drinking females.

Women, Drinking and Driving

Traffic-related crashes are the leading cause of death in the United States for people ages 2 to 33 years (NHTSA, 2004). Approximately 40% of all traffic

fatalities are associated with alcohol. An alcohol-related motor vehicle crash (ARMVC) is defined as a driver or non-occupant with a blood alcohol concentration (BAC) of at least 10 gram per deciliter (mg/dl) (0.01g/dl) (NHTSA, 2004). In general, those who are involved in ARMVCs are men, young in age, and white. Although a higher percentage of men are involved in ARMVCs than women, women are more prone to alcohol-related problems than are males at the same levels of drinking. Due to physical differences (previously discussed) females reach a given BAC faster than males. According to Zador (1991), women have a higher relative risk of driver fatality than men at a similar BAC. Furthermore, statistics have shown that although the alcohol-related crashes and fatalities have dropped, the proportion of women involved has increased. In 1998 women comprised 27% of drivers involved in alcohol-related fatal crashes, a 5% increased compared to 1988 (NHTSA, 2001a). In addition laboratory studies on the effects of alcohol on responding to visual cues and other tasks suggest that there may be gender differences in the way alcohol affects the performance of driving tasks (Waller & Blow, 1995). Less information is known about the effects of alcohol on women's driving performance because most of the studies have been conducted on men. Popkins, Rudisill, Walker, and Geissinger (1988) reported that women are more prone to ARMVCs than men at similar BACs. At a BAC > 0.08% the risk of a crash doubled for men and increased about 4.5 times for women.

Statistics have shown that in the year 2002, men (78%) are more likely to be involved in alcohol-related fatal crash than women (NHTSA, 2003a). Out of all

the alcohol-related fatal crashes, 49% were between the ages 21 and 45, a range matching the participants' ages in the current investigation. Risky-driving is higher among young drivers presumably because risk-taking is a developmental part of the teen-age and younger adult years (Committee on Injury and Poison Prevention and Committee on Adolescence, 1996). In addition, heavy drinking is known to affect an individual's perception of risk and thus causes poor judgment about driving under the influence. The presence of mental disorders such as conduct disorder and depression may increase the probability even further for getting involved in risky behaviors.

It is possible that women's lower tendency toward risk taking is one of the reasons for lower rates of drinking and driving among women when compared to men (NIAAA, 1999b). Women are also less likely to view drinking and driving as an acceptable behavior. Nevertheless, according to Wilsnack, Wilsnack, et al. (1986) the most frequently acknowledged alcohol-related problems among women drinkers was driving while intoxicated; 17% of women who drank reported that they have driven while impaired, and 66% of those who drank more than 2 ounces a day reported driving while drunk or high.

Investigators used data from North Carolina including driving while intoxicated (DWI) arrests, crashes, driver licensing data, and fatalities from the mid 70s to the mid 80s in order to examine trends in driving and drinking among women (Popkins, Rudisill, Waller, & Geissinger, 1988). Results indicated that more women are driving and thus more are exposed to dangers of drinking and driving. Data showed that between the years 1976 and 1984 the percentage of

women arrested for DWI increased from 6.5% to 11.5%, while on the other hand the percentage of men arrested for DWI decreased. There was a decrease in the rate of female crash involvement from 51% in 1976 to 48% in 1985, a minimal decrease as compared to the decrease in the rates of male crash involvement.

The literature does not contain many articles that examine the relationship between conduct disorder, drinking and driving among women. Only one article was available that examined the components of antisocial personality among a group of women who were convicted for drunken driving. Lex, Golberg, Mendelson, Lawler, and Bower (1994) used a sample of 33 women who were residents of a treatment center for male and female alcoholics with driving under the influence (DUI) related offenses. Investigators collected data about personality disorders, and substance use history. The majority of participants were alcohol dependents and only two were alcohol abusers. Results showed that the most common behavior out of the criteria for conduct disorder were stealing, truancy, running away from home, lying, and fighting. One woman only met the criteria for DSM-III-R for conduct disorder when excluding the behaviors that occurred while drunk. When including the behaviors that occurred while intoxicated in the criteria for Antisocial Personality Disorder (ASPD) 18.2% met the criteria for adult ASP by having a history of childhood disorders and characteristics of ASPD as an adult. Upon examination of the age when drinking started and when conduct disorder symptoms appeared, investigators concluded that behaviors of ASPD were largely a consequence of substance abuse, and childhood behaviors were limited predictors of ASPD.

There is not enough information about the effects of having conduct disorder, depression, and problem drinking among women and the relationship to ARMVCs. However, in this study, by examining the relationship between conduct disorder and depression and measures of alcohol consumption among a group of women who are harmful drinkers and have been involved in ARMVCs, investigators can begin to understand this relationship.

Summary of the Literature and Conclusions

In conclusion, it is clear that the literature offers evidence that conduct disorder, depression and alcohol consumption are associated; the presence of depression and conduct disorder are associated with the likelihood of developing alcohol use disorders like alcohol abuse and dependence in female populations. Based on that conclusion, it is expected that the investigator will find a similar relationship among women who are harmful alcohol drinkers.

For that reason this investigation was conducted to examine the relationship between the two variables of interest and harmful drinking among women who have been involved in an alcohol-related motor vehicle crash.

Conceptual Model

Wilsnack's conceptual model of women's drinking behavior and drinking consequences is one of the few models designed specifically to investigate women's drinking behaviors (Wilsnack, Wilsnack, et al., 1986). The works of Jessor and Jessor were used to build the model (Jessor, Grave, Hanson, & Jessor, 1968). In addition, the authors of the model used sociological and

psychological theories and theories on gender-related factors that influence drinking behaviors (Wilsnack & Cheloha, 1987).

In the 1986 study, the team used data to examine the relationships between the variables and to develop the model further. The investigators used data from the National Survey of Women's Drinking in 1981. Data included multiple factors such as current alcohol consumption, history of alcohol use, drinking context, problem consequences, symptoms of dependence, attitudes and beliefs about drinking, drinking related problems, demographic variables, measures of socialization and personality characteristics, perceived social environment, and life experiences. This investigation was one of the first studies that the investigator used to clarify the concepts of the model and the relationships among them. Depression and antisocial behaviors were included in the life experiences variables. Depression was measured using the Diagnostic Interview Schedule (DIS) criteria of the NIMH. Criteria for a depressive episode included a period of depressed mood lasting two or more weeks, accompanied by three or more depressive symptoms including sleep and appetite disturbances, fatigue, psychomotor retardation or agitation, loss of sexual interest, feelings of worthlessness, cognitive changes, and suicidal thoughts or behavior. The investigators used a path analysis approach to understand the drinking behavior among female drinkers. The analysis included 100 variables, which were used in the analysis over ten stages, followed by a procedure called winnowing out the variables. The initial regression was conducted for seven

drinking variables, and then was reduced to four major drinking variables, and then path analysis was performed.

Of importance to this current investigation are the results pertaining to depression and antisocial behavior. Results of the bivariate analyses showed that depressive symptoms and depressive episodes were more closely related to chronic or modal drinking (modal drinking was not defined in the study) than to episodes of exceptionally heavy drinking. Among heavier-drinking women (1 ounce or more of ethanol per day) 61% reported having had at least one period of depressed mood lasting two weeks or more compared to 38% of depressed mood abstainers. Among the heavier drinkers, 19% had had at least three depressive episodes compared with three percent of long term abstainers.

Results of the path analysis revealed the effect of depression on problem consequences and on alcohol dependence symptoms. Women were more likely to drink more heavily, which increased the risks for problem consequences if they felt that drinking helped them relax. A woman was more likely to say that drinking gave her self-assurance if she had ever been severely depressed. A history of depression directly increased the risks that women drinkers would develop symptoms of alcohol dependence. Past experience with depression and with antisocial behavior also made women drinkers more likely to associate at present drinking with other drinkers, indirectly increasing women's risks of becoming alcohol dependents by influencing them to drink more heavily. Analysis showed also that younger women drinkers had the greatest risk for becoming alcohol dependent and developing alcohol dependence symptoms and were more likely

to have experienced the depression and anxiety that increase the reliance on alcohol.

Upon examination of the definitions of the variables of interest in Wilsnack's work, it was noticed that there were similarities in the way the variables were defined and the way they were defined in the current investigation, thus supporting the appropriateness of the use of this conceptual model to examine the relationships among the variables of interest in the current study. Table 1 shows the definitions of selective variables as defined by Wilsnack (S.-C. Wilsnack, personal communication, March, 2004).

Table 1

Definition of Variables of Interest According to the Conceptual Model

Variable	Definition
Lifetime depression	Lifetime depressive symptoms and depressive episodes (three levels: no depression, felt depressed two weeks or more, one or more depressive episodes. Classification was made according to the NIMH Interview Schedule Criteria
Antisocial behavior	Number of types of antisocial behavior the respondent ever engaged in, from the following: received four or more traffic tickets in one year for things other than parking; taken something from a store without paying for it; hit a spouse, companion, or friend; thrown something at someone; threatened to hurt a spouse, companion or friend; struck a child harder than intended
Problem consequence	Number of drinking-related problems experienced in the past 12 months like: drove a car when high or drunk; drinking led to an accident in home; drinking had harmful effect on housework or chores; drinking hurt job or career opportunities; started a fight or argument with someone outside family when drinking; partner indicated respondent needed to cut down on drinking; started a fight or argument with partner when drinking; drinking caused problems between respondent and respondents' children.

As Figure 1 shows, women's drinking patterns and adverse drinking consequences result from the direct and indirect effects of six sets of influences: (1) origins and upbringing (including parental drinking behavior, parental warmth or rejection, early separation from parents, childhood sexual abuse); (2) adult life experiences (including divorce/separation, lifetime depressive episodes, adult sexual assault); (3) current roles and relationships (employment, marital status, and family); (4) current personality characteristics (including negative affectivity, gender-role characteristics, attitudes and moral judgments); (5) the quality of current roles and relationships (considered a particularly important and proximal predictor); and (6) expectancies about the effects of alcohol. The six sets of predictors influence drinking contexts, drinking levels, and drinking consequences.

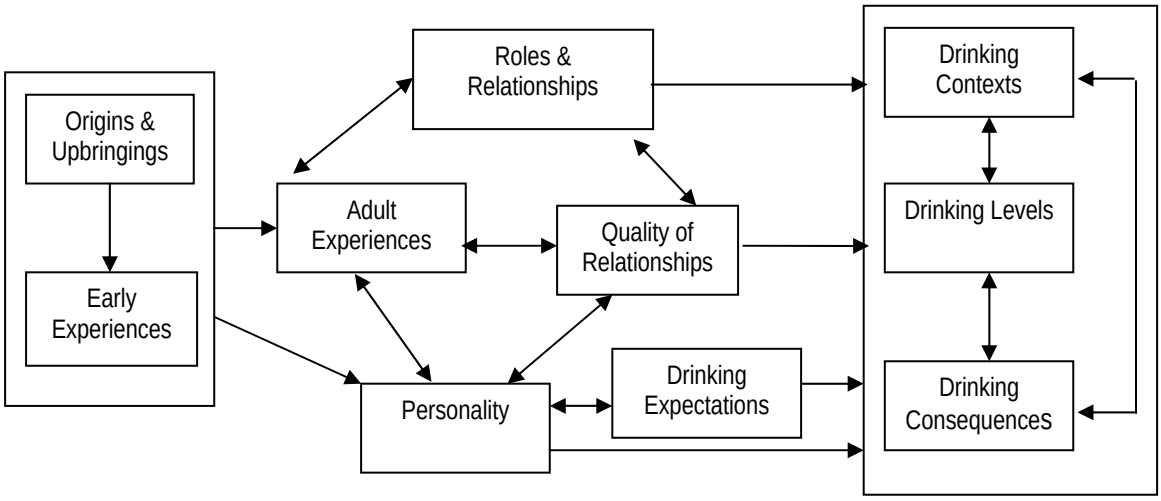

Figure 1. Wilsnack's conceptual model of women's drinking behaviors and drinking consequences.

The conceptual model includes an extensive number of factors that cannot be included in one investigation. To test the entire model prospectively an investigator would need a large sample size and a well-funded study. S. C. Wilsnack (personal communication, March 25, 2004) suggested the use of parts of the model in studies when a large sample is not possible. Based on several analyses performed by the authors over the years, a variety of relationships have emerged among the concepts of the model. Results of an analysis (Wilsnack, Wilsnack, & Klassen, 1986) suggested that there is a relationship between antisocial behavior, depression and problem drinking among women.

For the purpose of this study, a portion of Wilsnack's model will be used to guide a secondary analysis of available data to identify the relationship between levels of drinking among females aged 18 to 45 years who have been involved in an alcohol-related motor vehicle crash and the presence of a history of conduct disorder and/or depression. According to the model conduct disorder would be a part of the early experiences, and depression would be a part of the adult experiences.

Significance

Little is known about the association of psychological factors such as depression and conduct disorder with harmful drinking and the consequences of problem drinking such as motor vehicle crashes. If women who are harmful drinkers with a history of conduct disorder and depression are more likely to be involved in high risk behaviors that lead to motor vehicle crashes, then preventive measures are important to reduce the potential for injury. Preventive measures

would be limited to the use of alcohol, and also to screen for conduct disorder and depression and manage these disorders early if present.

The study population in this investigation was women who have been involved in an alcohol-related motor vehicle crash. According to the theoretical framework guiding this investigation, the study participants were experiencing harmful consequences of drinking (as evidenced by their positive blood alcohol level coupled with the occurrence of a crash). Thus, these women serve as an appropriate population to investigate the relationship between depression, conduct disorder and levels of drinking. It is essential to investigate this relationship in order to prevent risky behaviors, specifically alcohol-related motor vehicle crashes.

Results of this investigation will have implications at the primary prevention and the intervention levels. Screening young females for conduct disorder early in life, (possibly around the age of ten years) is important for identifying those who are at risk for developing or who already exhibit risky behaviors. Early identification of young women with conduct disorder is essential for the management of those diagnosed with the disorder, and serves to prevent further development of conduct disorder into antisocial personality disorder, which usually develops after age 15. Once those with conduct disorder are identified, they can be referred to other health care professional for proper treatment. In addition, it is important to spread awareness among parents, teachers, school nurses and counselors about the signs and symptoms of conduct disorder and the importance of identifying it in its early stages in order to

prevent further consequences of becoming a problem drinker in adolescence and adulthood.

Results of the current investigation also have implications in primary care settings. Physicians and nurse practitioners need to assess for problem drinking with all of their patients, but in particular if any of their female patients show any symptoms of depression or antisocial personality, and vice versa. Based on an investigation of conduct disorder and antisocial personality in adult primary care patients, Barry et al. (1997) declared that physicians and other health care workers are in an important position for screening and intervening in cases with co-morbid conditions like personality disorders, risky drinking patterns, and depression.

Vogeltanz and Wilsnack (1997) confirmed that evidence suggests that physicians and other health care professionals in non-alcoholic-specific treatment settings may serve as a front line for identifying female problem-drinkers and that more efforts to screen for problem drinking in women should occur in these settings. For example, school nurses, school psychologists, and counselors working in schools, have access to the at-risk populations for developing problem-drinking. Early indications like conduct disorder and antisocial behaviors can be identified through screening early on, and proper interventions like counseling can be recommended. The Institute of Medicine declared that people who are alcohol dependent are not the cause of the majority of alcohol problems, but those with maladaptive problem drinking behaviors are (Vogeltanz &

Wilsnack, 1997). Therefore this study focused on an important target population, those with alcohol-related problems not alcohol dependence.

While the study is highly significant because of the lack of information on harmful drinking females at high risk for injury, an efficient way to determine the association among the variables was to complete a secondary analysis of pre-existing data. Should the hypotheses demonstrate statistical significance, then prospective work that has the potential to show causation among the variables will be an important and significant next step.

CHAPTER THREE

This chapter describes the methods used by the investigators of the original study and the current study. The methods section includes a description of the purpose of the study, the protocol of the study, the procedures used, the measurement strategies including the definition of variables, the measurement strategies, the instruments, and their psychometric properties. The chapter also includes the data management procedures and the statistical analyses used in the current study, and finally a section on the strategies to insure protection of human rights of the participants included in the study.

Methods

The investigator used pre-existing data collected as part of a brief intervention trial that occurred from 1994 through 1999. The purpose of the original study was to determine if, 12 months following an alcohol-related vehicular injury, brief intervention strategies were effective in reducing alcohol intake and adverse events in non-alcohol dependent, hospitalized young adults. Brief intervention is a simple, quick, and clinically effective strategy that can be used to motivate patients to evaluate the consequence of alcohol use behavior and to change drinking behavior (Dyehouse & Sommers, 1998).

The purpose of the current investigation was to examine the relationship between harmful drinking and selected psychological variables among women who have been involved in an ARMVC. The investigator performed an analysis of the baseline data collected during the original study at the time of participants'

enrollment. Selected psychological factors included depression over a lifetime and in the last year and conduct disorder before and after age 15.

Protocol

In the original study the investigators used an experimental design with a Control group (C) and two experimental groups: Simple Advice (SA) and Brief Counseling (BC). The C group received a health interview but no intervention. The SA group received a health interview and an additional 5 minutes of advice about the importance of sensible drinking or abstinence. The BC group received the health interview, 5 minutes of advice, and an additional 15 minutes of counseling on personal problem solving strategies. All participants were interviewed by telephone at 3, 6, and 12 months after study entry (Sommers et al., in press). Study hypotheses were:

(1) A significantly greater decrease in alcohol consumption will occur for: 1) the BC group compared to the SA group and 2) the SA group compared to the C group over the 12-months following an ARMVC.

(2) A significantly greater decrease in adverse events (adverse driving events, health status changes) in the 12 months following the ARMVC as compared to the 12 months prior to the ARMVC for: 1) the BC group compared to the SA group and 2) the SA group compared to the C group.

In the current investigation there was no need to develop any protocols for data collection. The investigator used the existing data only for the women participants only. The relevant variables were extracted from the original data and were analyzed to answer the study question.

Study Population

The original study included drivers and passengers who were assigned a Diagnosis-Related Group (DRG) and cost code indicating a traumatic injury from an ARMVC. These participants required hospital admission to either of two Level I Trauma Centers in southwestern Ohio and had a positive blood alcohol level upon admission (Sommers et al., 2005).

The target population for the original study was young adults between the ages of 18 and 45 years of age who were hospitalized with an injury following an ARMVC. Additional inclusion criteria included: hospital admission within 24 hours of the injury; blood alcohol level (BAC) $\geq$ 10 mg/dL; English-speaking; intact cognition as judged by nurse clinicians upon physical assessment and chart review; and potential for discharge from hospital to home within 4 weeks after entry into the study. Participants were excluded from the study if they had a positive screen for alcohol dependence based on the Alcohol Use Disorders Identification Test (AUDIT) (Babor & Grant, 1989; Reinert & Allen, 2002), had attended an alcohol treatment program in the past year, had evidence of symptoms of alcohol withdrawal, received advice from their health care provider in the past 3 months to change their alcohol use, or drank more than 150 grams of alcohol (12 standard drinks) per day. The current study will include a sub-sample of 43 females from the original study population, which is the only inclusion criteria used; thus men were excluded.

Procedures

In the original study the investigators used the AUDIT as an initial screen for alcohol dependence. Participants with a positive AUDIT screen were referred for further evaluation. Blood specimens were obtained to determine BAC for all subjects. Once alcohol free, a specially trained nurse clinician obtained informed consent and explained the concept of a standard drink (Dyehouse & Sommers, 1998). A standard drink contains about 14 grams of pure alcohol. Standard drink equivalents include: One 12-ounce bottle of beer, one 12-ounce bottle of light beer, one 8.5-ounce bottle of malt liquor, one 5-ounce glass of table wine, one 3.5-ounce of fortified or desert wine, one 12 ounce wine cooler, one 2.5-ounce of cordial, liqueur, or aperitif, one 1.5-ounce of 80-proof distilled spirits (such as gin, vodka, whiskey), one 1-ounce of brandy (Sommers, in press).

Participants were randomly assigned to the Control (C), Simple Advice (SA), or Brief Counseling (BC) group. The nurse clinician then used a Health Interview Schedule (HIS) adapted from the Fleming's Trial for Early Alcohol Treatment (TrEAT) protocol (Fleming, Barry, Manwell, Johnson, & London, 1997) that was conducted in the primary care population, and then delivered the intervention to SA and BC participants. The health interview schedule contained embedded questions on pre-injury alcohol consumption as well as health-related effects of drinking and a health history including scales to measure depression over a lifetime and in the last year, and conduct disorder before and after age 15.

Measurement Strategies

The following includes a description of the measurement instruments used in the original study and description of their psychometric qualities. There were three measurement instruments used including the Alcohol Use Disorders Identification Test (AUDIT), the Health Interview Schedule (HIS), and the Timeline Followback Method(TLFB).

AUDIT

The AUDIT was developed by the World Health Organization collaborative project to identify problem drinkers (people who meet the criteria of harmful drinking, alcohol abuse, or alcohol dependence) in primary care settings (Cherpitel, 1997). The investigators of the collaborative project used a sample of 2000 patients of whom 64% were classified as current drinkers. The investigators reviewed a number of procedures such as self-reported drinking and laboratory and clinical procedures used to identify persons with early alcohol problems. Then they conducted a comparative, cross-national study to select the most suitable features of the various approaches for screening. The investigators selected items that best distinguished between light and harmful drinkers. The AUDIT is a ten-item questionnaire, including three questions on the quantity and frequency of drinking, three questions on alcohol dependence, and four questions on problems caused by alcohol. The AUDIT responses are scored from zero to four for a maximum score of 40 (scores of eight or more considered diagnostic for an alcohol-use disorder; Saunders, Aasland, Babor, de la Fuenta, & Grant, 1993). The purpose of using the AUDIT was to identify those whose

alcohol consumption has become harmful or hazardous to their health. The AUDIT is suitable for use with adults in a variety of settings.

Psychometrics of the AUDIT.

The AUDIT demonstrates a high sensitivity to identify hazardous drinkers (consumption which confers risk of physical or psychological harm) as well as harmful drinkers (consumption which has caused damage to health) (McCusker, Basquille, Khawaja, & Murray-Lyon, 2002). In a review of the AUDIT's performance, Allen, Litten, Fertig, and Babor (1997) found that the test's sensitivity ranges from 38% to 94% and its specificity ranges from 66% to 90%.

The Health Interview Schedule

The Health Interview Schedule (HIS) used in the original study was adapted from the Health Screening Survey (HSS) used in Fleming's TrEAT protocol, which contained embedded questions on pre-injury alcohol consumption, health-related effects of drinking, and health history (Fleming & Barry, 1991; Fleming et al., 1997). Fleming adopted the Health Screening Survey (HSS), originally developed by Wallace, Culter, and Haines (1988) and modified by Fleming and Barry (1991), for use in brief alcohol intervention studies to reduce the intervention effect of alcohol use questions. The extended version (HSS-B) contains additional questions to measure depression, conduct disorders, drug use and problems, and family history of other mental health or substance abuse problems (Barry et al., 1997).

In addition, Barry et al. (1997) used the Diagnostic Interview Schedule (DIS-R) to assess for conduct disorder and antisocial personality disorders. The

DIS-R was originally based on the third revised DSM criteria (DSM-III-R). The DSM-III-R criterion for conduct disorder contains 12 items. A probable conduct disorder is defined by a positive response to three or more out of 12 items of the criteria, and can be used to identify conduct disorder before or after the age of 15 years old (Barry et al., 1997). Criteria for depression contains eight symptoms of which the participant has to have at least four or more of the symptoms groups that have lasted for two weeks or more in order to have a positive diagnosis of depression.

Validity and reliability of the HIS.

Fleming and Barry (1991) investigated the validity and reliability of the data resulting from the Health Screening Survey (HSS) in a three-sample masked test. The three samples included patients from two substance abuse treatment centers and three primary care clinics. Overall results demonstrated evidence of the construct validity and reliability of the HSS. The HSS demonstrated high sensitivity in a known population of alcoholics, correctly identifying more than 95% of alcoholic patients, and 78% of participants in the community primary care sample. The revised edition (removing the accident/trauma subscale) improved the specificity without a significant decrease in the sensitivity of the instrument. Positive Predictive Values was also satisfactory across the samples and ranged from 0.94 to 0.53.

Timeline Follow-Back

The Timeline Follow-Back (TLFB) was the instrument used in the original study to measure alcohol consumption. The TLFB method, developed by Sobell

and Sobell (Sobell, Maisto, Sobell, & Cooper, 1979; Sobell, Sobell, Leo, & Cancilla, 1988), is widely used to measure alcohol consumption. It is a structured interview wherein the participants receive a calendar-based memory cue to help them report their alcohol use in chronological order. The TLFB provides a detailed picture of the person's drinking over a specified period of time ranging up to 12 months. The TLFB was designed for use with alcohol abusers, but it has also been used in clinical settings, and can be used to measure drug and cigarette use as well (Sobell & Sobell, 1995, 2000). The pencil and paper format of the tool is available on line and can be used in research free of charge.

The TLFB is the instrument of choice when drinking is a variable (problem or binge drinking), or when accurate estimates of drinking are required. The instrument can provide variables to portray patterns, variability, and level of drinking, which can be generated using variables such as percentage of days drinking at different levels or the pattern of weekend/weekday drinking. In addition the TLFB can be used in treatment as an advice-feedback tool (Sobell, Brown, Leo, & Sobell, 1996).

A limitation to the retrospective diary method is that it is a time consuming method of data collection. Prolonging the interview increases participant burden and therefore participants' participation and retention may be negatively affected. When mailed out it may increase the burden on respondents, causing an increase in attrition rates (Cunningham, Ansara, Wild, Toneatto, & Koski-Jannes, 1999; Sobell & Sobell, 1995). In this study however, the instrument was completed using a face to face interview.

Psychometrics of the TLFB.

Sobell and Sobell (1992) reported on the psychometrics of the TLFB tool: test-retest reliability, comparison of participants and collaterals' reports of the participants drinking, and comparison of participants' TLFB reports of incarcerations compared to official record data and concurrent validity. Several investigators have reported the test retest reliability using a variety of populations (normal drinkers, college students, and alcoholics) investigating several levels of drinking (days abstinent, days of drinking 1-6 drinks, days drinking more than 6 drinks). Results of these investigations show overall high test-retest reliability across multiple populations of drinkers. For example, correlation coefficients ranged from 0.86 for days drinking more than 6 drinks to 0.96 for abstinent days (Sobell et al., 1988). Concurrent validity was assessed by comparing TLFB data with two established measured of alcohol-related disabilities: Alcohol Dependence Scale (ADS), and Short Michigan Alcohol Screening Test (SMAST). Sobell, Sobell, Klanjer, Pavan, and Baisian (1986) reported a 0.62 correlation between the ADS and TFLB data on heavy consumption days; Selzer, Vinokur, and Rooijen (1975) reported a correlation of 0.51 between the SMAST and TFLB data on heavy-consumption days. Finally, participant-collateral comparisons "correlation of self-reported drinking from both participants and collaterals (significant others who provide independent data on participants' drinking)" ranged from 0.60 to 0.90 (Sobell & Sobell, 1992).

Definition of Variables

In the original study, investigators used the HSS based on Fleming's work which was based on the DSM-III-R. Thus the investigator of the current study used definitions of conduct disorder and depression based on the DSM-III-R because the definitions can't be changes after the data had been collected. The same applies for the alcohol consumption variables; the definitions were based on how they were defined in the original study.

Depression

Depression was defined as the presence of four or more depressive episodes that lasted for two weeks or more. Depression was measured in two ways: the number of depressive episodes and a diagnosis of depression. Depression was measured in the original study using the HIS (based in the DIS criteria) which contained a scale to measure depression (Appendix A). Major depressive episode was defined as a period of at least 2 weeks during which there was either depressed mood or the loss of interest or pleasure in nearly all activities. The individual must also have experienced at least four or more symptoms out of seven symptoms groups. Group one included major changes in appetite or weight, group two included sleep, and psychomotor activity; decreased energy; feelings of worthlessness or guilt; difficulty thinking, concentrating, or making decisions; or recurrent thoughts of death or suicidal ideation, plans, or attempts. Participants were diagnosed as having depression if they had an episode of depression of four or more of the depressive symptoms in the criteria that lasted for more than two weeks.

Conduct Disorder

Conduct disorder was defined as disorders characterized by a repetitive and persistent pattern of dissocial, aggressive, or defiant conduct. Participants were identified as having a positive history of conduct disorder if they met three or more of the eight items criteria that persisted for six months or more. The original study contained scale for measuring conduct disorder before and after age 15 (Appendix A).

Alcohol Consumption Variables

In order to use the TLFB, the concepts of standard drink and heavy, episodic drinking (binges) needed to be defined. Measures of alcohol consumption for the current investigation were: the total number of standard drinks per month, the number of binges per month, and the average number of drinks per drinking day as measured with the TLFB.

Total drinks per month.

Total drinks per month were defined as the total number of standard drinks a woman had consumed during the last month before the crash. It was calculated by adding all the standard drinks in the month prior to the crash as reported in the TLFB tool

Binge drinking.

Binge drinking was defined as the number of drinking days on which a female participant consumed ≥ 4 standard drinks for the previous month before the crash.

Average drinks per drinking day.

The average number of drinks per drinking day was calculated by dividing the total number of drinks for the previous month by the number of days, in which the participant had drunk, included in the TLFB tool.

Alcohol-Related Motor Vehicle Crash

ARMVC were defined as all those crashes involving a driver or non-occupant who had a blood alcohol level (BAC) at or above 10 mg/dl (NHTSA, 2001b)

Data Management and Analysis

Data management was carried during the original study and in the current investigation. In the original study, a graduate assistant responsible for data management reviewed all completed instruments. Data were entered into separate data sets for cleaning purposes prior to being merged to be used as one data set (Sommers et al., 2005). For the current investigation data management procedures included screening of the data for missing values, and outliers. Missing values were visually inspected, and outliers were examined by evaluating the distribution of the box plots for each variable. Outliers were identified as cases that fell between 1.5 and 3 box lengths. The investigator also examined the assumptions of regression including normality, linearity, and homoscedasticity of the variables (Mertler & Vannatta, 2002).

Upon examination of the normal distribution histogram, all three outcome variables showed a deviation from normal distribution, with all variables positively skewed, which was interpreted as a violation of the normality assumption.

Violation of the normality assumption is considered serious and can distort the relationships and significance tests. Also all the outcome variables had outliers as evidence by the box plots distribution.

Examination of the residual and predicted values plot of the variables also showed a violation of the assumption of linearity and a violation of homoscedasticity. Violation of these assumptions is also considered severe. Violation of linearity is very severe, since it causes an increase in Type II error. Violation of homoscedasticity can lead to serious distortion of findings and if heteroscedasticity is marked it can lead to an increase in Type I error. Variables that did not meet the assumptions of the regression were transformed using proper techniques. The average number of drinks per drinking day and the total number of drinks were positively skewed and did not contain zero value thus they were transformed using the natural logarithm (log variable); and the number of binges was positively skewed and has some Zero values, thus it was transformed using the logarithm of the variable plus 1 (log [variable+1]).

Variables were re-evaluated for the presence of outliers and for satisfying the regression assumptions. Assumption of normality was assessed by examining the normal distribution of the variables, and was judged whether data resembled a bell shaped distribution. Assumption of linearity was examined by evaluating the matrix correlation scatter plot. In addition, the assumptions of linearity and homoscedasticity were examined by evaluating the residual plots (plots of the standardized residuals as a function of standardized predicted

values). The shape of the plot should resemble a rectangle and the scores should be evenly distributed around in the center and around the zero line.

Statistical Analyses

In order to examine the relationship between alcohol consumption, history of depression, and a history of conduct disorder, the investigator used multiple regression analyses using the SPSS (SPSS, Inc, 2005) for Windows. Descriptive data, correlations test and multiple regression analyses were carried out. Descriptive data included frequency and percentage of categorical variables (marital status, level of education and race) in order to evaluate the homogeneity of the sample. Also, means and standard deviation were calculated for the continuous variables such as age, number of depressive episodes, number of conduct disorder symptoms, number of drinks and number of binges.

Correlations tests were also performed using all of the predictive and outcome variables in order to examine how the variables correlate with each other by examining the correlation matrix. Correlations were based on examination of the correlation coefficient which usually ranges from +1 to -1. The investigator then applied multiple regression analyses. Given the type of data available (secondary data, continuous variables, a small sample size, and data collected retrospectively), the investigator could not apply another kind of analyses. For example, it was not appropriate to use Analysis of Variance (ANOVA) because it was not possible to identify a dependent and dependent variables. The kind of data available did not allow the investigator to assume that depression and conduct disorder are caused by alcohol consumption, or visa

versa. In multiple regressions, the investigator was able to use the terms, predictive variables and outcome variables, which denotes correlation but not causality.

Analyses included the outcome variables of harmful drinking indicators: the average number of drinks per drinking day in the previous month prior to crash, the total number of drinks for the month previous to crash, and the average number of binges per month in the previous month before the crash. Predictive variables included: diagnosis of depression over a life time and in the past year before the crash, a diagnosis of conduct disorder before and after the age of 15 years old, and age at the time of the crash. First, the investigator performed three regression analyses including each of the outcome variables (total number of drinks, number of binges, average number of drinks per drinking day) and all of the five predictive variables (conduct disorder before and after 15, depression in a lifetime and in the last year, and age).

Next, the investigator performed a series of separate linear regression equations using each of the outcome variables and a combination of three of the outcome variables at a time to find out which model best explained the variance in the outcome variable. The reason for that is the small sample size (43 participants), does not allow for any of the other methods of regression like stepwise or forward methods. Larger sample sizes would have been needed for such methods. Regressions were evaluated based on the significance of the regression equations and by evaluating the levels of the squared regression

coefficient. Partial correlations were also examined to identify how each variable individually contributed to the regression equation.

Protection of Participants' Human Rights

The secondary analysis of data for the dissertation was approved by the Institutional Review Board (IRB). The original study received approval from the IRB at the University of Cincinnati and had been closed for further subject enrollment. For the purpose of the secondary analysis, a new IRB approval was received. The investigator did not contact the participants for any further data collection. All data were de-identified with names and social security numbers deleted from all data handled by the investigator. Analysis only included the data related to the variables of concern to the current study: alcohol consumption, depression, conduct-disorder and description of the sample. Descriptive statistics for blood alcohol concentration and occupant status (driver versus passenger) were provided by the dissertation Chair. The current investigation carried no harm or side effects to the participants involved because the investigator only examined the data available; again no contact with subjects was established and the confidentiality of the de-identified data was maintained at all times.

CHAPTER FOUR

This chapter contains a detailed description of the results of the analyses performed. Results include a description of the results of the transformation of the outcome variables including presence of outliers and the regression assumptions, descriptive data of the participants, results of the correlations between variables and results of the regression equations evaluated.

Results

Analysis included a sub-sample of 43 female participants who were involved in ARMVC, and were participants of a brief intervention study aimed to reduce drinking levels. The current investigation included analyses of three predictive variable (depression last year and depression over a lifetime) a history of conduct disorder (before and after age 15) and three outcome variables (total drinks in the previous month, average drinks per drinking day and average number of binges in the last month).

Results showed that after transformation, the variables met the three assumptions of statistical regression and there were no outliers identified. Visual examination of the box plot showed that no values fell within the 1.5 box length indicating no outliers. Also, Cook's distance was examined for the presence of outliers. Statisticians recommend a value of Cook's distance of more than 1 as a red flag (Stevens, 2002). In the current analysis, Cook's distance ranged from a minimum of 0 to .137, indicating no outliers. Assumption of normality was examined using the values of skewness and kurtosis. Table (2) shows the values of skewness and kurtosis. Using the criteria that a variable is reasonably close to

normal if its skewness and kurtosis have values between -1.0 and +1.0, the investigator determined that the three outcome variables were normally distributed. Also, the test of normality was non -significant at with Shapiro-Wilk >.05 that indicated that the variables were not violating the normality assumption.

Table 2

Values of Skewness and Kurtosis for the Outcome Variables After transformation

Variable	Skewness	Kurtosis	Shapiro-Wilk Sig.
Total number of drinks per month	-.023	-.420	.643
Average number of drinks per drinking day	-.062	-.536	.697
Total number of binges in a month	.350	-.301	.064

Note: Sig. (Significance).

Assumption of linearity means that there is a straight linear relationship between two variables. The assumption of homoscedasticity means that the variability in scores for one continuous variable is roughly the same at all values of another continuous variable. Both assumptions can be examined using a method that compares standardized residuals to the predicted values of the outcome variable; a decision can then be made by examining the scatterplot produced which should create a rectangular distribution with a concentration of scores along the center. When assumptions are not met, residuals may be clustered on the top or bottom indicating non-normality, clustered on the right or

the left indicating hetroscedasticity, or may be curved indicating non-linearity. The investigator examined three scatterplots (using three outcome variables and the predictive variables each time), and the distribution, and although it did not show a clear rectangle (due to the small sample size), it did not follow any of the other distribution and was clustered more around the center. This finding led the investigator to the conclusion that the assumptions of linearity and homoscedasticity were met. Further description of the assumption of the regression will be presented later in the results.

Sample Demographics

The sample consisted of 43 women who were all included in the analyses. As shown in Table 3, the majority of the participants were white (39, 90.7%); with four nonwhite participants of which three were black (7.0%) and one was other (2.3%). The majority of the participants were not married at the time of the interview, and all had some education ranging from the highest percentage with high school (32.6%) to the lowest percentage of postgraduate degree (2.3%).

Table 3

Frequencies and Percentages of Marital Status, Level of Education and Race

Variable		Frequency	Percentage
Marital Status	Single	19	44.18
	Married	9	20.93
	Common Law Marriage	1	2.33
	Divorced	9	20.93
	Widowed	1	2.33
	Separated	4	9.30
Highest Level of Education	5-11 years	11	25.58
	High School	14	32.56
	Technical School	2	4.65
	Some College	12	27.90
	College Graduate	3	6.98
	Postgraduate	1	2.33
Race	White	39	90.7
	Black	3	7.0
	Other	1	2.3

Participants' ages ranged from 19 to 44 years, with mean age of 28.8. The rate of depression was higher in the last year before the crash as compared to the rate of depression in a life time. There were 15 participants (34.9%) who had experienced four or more depressive symptoms over a lifetime, and 24

participants (46.5%) who experienced four or more depressive symptoms in the last year. As for conduct disorder, on the other hand, there was no difference in the rate of conduct disorder among participants before and after age 15; there were nine participants (20.9%) with three or more symptoms of conduct disorders before and after age 15 (Table 4).

Table 4

Summary of Descriptive Statistics (N=43)

Variable	Minimum	Maximum	Mean	Std. Deviation
Age	19	44	28.84	7.10
CDB15	0	6	1.44	1.82
CDA15	0	6	1.44	1.47
DLT	0	11	3.02	4.06
DLY	0	11	4.80	3.04
Mean Drinks/ Drinking Day	1.25	13.65	4.98	2.90
Total Drinks/Month	2	179	39	43.35
Binges/Month	0	30	4.63	6.02
BAC	26	268	161.51	61.34

Note: CDB15 (conduct disorder before age 15, CDA15 (conduct disorder after age 15), DLT (depression over a lifetime), DLY (depression last year), BAC (blood alcohol concentration).Std. Deviation (standard deviation)

Blood Alcohol Concentration

Blood Alcohol Concentration (BACs) data showed that the average BAC was a 161.51 mg/dl, with a maximum of 268 mg/dl and minimum of 26 mg/dl. With 100mg/dl considered as the legal intoxication at the time of data collection, most of the participants were considered legally intoxicated. When categorized

by driver passenger status at the time of the ARMVC, there were 15 women who were passengers (8.5%) and 24 who were drivers (13.6%). The mean of BAC was higher among those who were drivers with 176.50 mg/dL (*SD* = 67.96) as compared to the passenger women with a BAC mean of 130 mg/dL (*SD* = 42.11).

Levels of Alcohol Consumption

Measures of alcohol consumption included the number of binges in the last month, total number of drinks per month, and average number of drinks per drinking day for the last month. The number of binges ranged from zero to 30, with an average of 4.6 binges per month. The average number of drinks per drinking day was 4.98. The total number of drinks in the last month ranged from a minimum of two drinks to a maximum of 179 drinks, with an average of 39 drinks. Table 4 includes descriptive data for participants in the current study.

Correlations

The predictive variables: conduct disorder before age 15, conduct disorder after age 15, depression over a life time, depression in the last year, age and the outcome variables: total drinks in the previous month, average number of drinks per drinking day, and the total number of binges in the previous month were entered into the correlation matrix to look for significant correlations between the variables. Table 5 summarizes the results of Pearson Correlations (2-tailed) test and the level of significance. The correlation matrix showed a significant positive correlation between: the number of binges and depression last year (r = .346, p = .02), the number of binges and conduct disorder before age 15 (r = .371, p = .01)

the number of average drinks per day and depression over a life time (r = .341, p = .03). Thus, a female with depression in the last year, and a history of conduct disorder had a higher number of binges compared to a female without these variables. In addition there were some significant correlations among the predictive variables; conduct disorder before age 15 was positively correlated with conduct disorder after age 15 (r = .371, p = .01), and negatively associated with depression in a life time (r =-.372, p = .04). Those females who experience conduct disorder before 15 years old, were likely to have conduct disorder after age 15, as compared to females who did not have conduct disorder before age 15. Finally depression over a life time was positively associated with depression in the last year (r = .372, p = .04).

Table 5

Summary of Correlation Matrix Between the Outcome and the Predictive Variables

	Binges	Average Drinks	Total Drinks	AGE	CDB15	CDA15	DLT	DLY
Binges	____							
Average Drinks	.522**	____						
Total Drinks	.913**	.405**	____					
AGE	.088	-.243	.139	____				
CDB15.	.371*	-.057	-.152	-.053	____			
CDA15	.115	.248	.020	-.057	.371*	____		
DLT	.240	.341*	.149	.130	-.314*	.114	____	
DLY	.346*	.166	.283	.214	-.233	.000	.372*	____

Note: CDB15 (conduct disorder before age 15), CDA15 (conduct disorder after age 15), DLT (depression over a lifetime), DLY (depression last year). Average drinks (average drinks per drinking day)
*. Correlation is significant at the .05 level (2-tailed)
**. Correlation is significant at the .01 level (2-tailed)

However, when bivariate correlations are conducted, there is always a risk of making type I error. In order to control for inflation in α levels, a Bonferroni's approach was applied. The value of α was divided by the number of correlations computed (.05/28=.001). Only the correlation between the number of binges and: the average number of drinks per drinking day and the total number of drinks was significant at $p<.003$. In order to further examine the relationship among predictive and outcome variables, a regression was performed to reveal how much all or any of the variables add to the value of the predictive ability of the regression equation. The forced entry method was used because of the small sample size and the limited number of predictive variables

Regression

Three initial regressions were performed to find the best regression equation that predicted the variance in the three outcome variables (total number of drinks, average number of drinks per drinking day, and the total number of binges) using the predictive variables of interest (depression variables, conduct disorder variables and age). Table 6 shows that the combination of conduct disorder before and after age 15, depression over a life time and in the last year, and age were significantly related to the average number of drinks per drinking day, $F\ (5, 37) = 2.65$, $p < .05$. The sample multiple correlation coefficient was .51, indicating that approximately 26% of the variance in the average number of drinks per drinking day can be accounted for by the linear combination of age, depression and conduct disorder.

Table 6

Summary of the Initial Multiple Regression Using all the Predictive Variables

Outcome variables	R^2(Adjusted R)	F Value	Significance
Average Drinks/drinking day	.263(.164)	2.65	.038.*
Total Drinks per month	.098(-.024)	.80	.55
Average Number of Binges/month	.15(.03)	1.27	.29

Note: Predictive variables include CDB15 (conduct disorder before age 15), CDA15 (conduct disorder after age 15), DLT (depression over a life time), DLY (depression last year). R^2 (the squared multiple correlation coefficient), F(test statistic used to decide whether the model as a whole has statistically significant

The prediction linear regression equations for the standardized variables are as follows:

$Z_{\text{predicted average drinks/drinking day}}$ = .776 - .01 (AGE) + .02 (DLT) + .01 (DLY) -.01 (CDB15) + .04 (CDA15)*

$Z_{\text{predicted average number of d binges/month}}$ = .327 + .001 (AGE) +.009 (LTD) + .036 (DLY) - .012 (CDB15) + .032 (CDA15)

$Z_{\text{predicted number of total drinks/ month}}$ = 1.033 + .006 (AGE) + .001 (LTD) + .036 (DLY) - .03 (CDB15) + .021 (CDA15)

When examining the partial correlations for the significant regression equation (The partial correlations showed positive correlations between depression over a life time and the average number of drinks per drinking day (*r* = .29); the more depressive symptoms a women might have experienced over a life time the higher was the number of drinks per day. Similar but smaller positive

correlation existed between conduct disorder after age 15 and the average number of drinks per drinking day (r = .28); women with conduct disorder were more likely to have higher number of average drinks per drinking day. On the other hand age had a strong negative partial correlation with average drinks (r = -.314), which was an expected correlation showing that younger women drink more, and older women drink less.

However, due to a small sample size, regression analyses performed did not have enough power of prediction. According to Tabachnick and Fidell (2001) the minimum sample size of 95 participants would be needed to perform a multiple regression assuming a medium size relationship between the predictive and outcome variables, at α = .05 and β = .20. Therefore, a series of regression equations were performed using combinations of less predictive variables instead of one regression using all of the predictive variables in order to increase the power of the analyses. Table 7 shows a list of the regression equations, with only four of the equations being significant.

Table 7

Series of Independent Multiple Regressions Using Three Predictive Variables

Regression Equation	F	P	R^2 (Adjusted R)
Binges = DLT + CDA15 + Age	.86	.47	.06(-.01)
Average drinks = DLT + CDB15 + Age*	3.4	.03	.20(.14)
Total drinks = DLT + CDB 15 + Age	.66	.58	.05(-.03)
Binges = DLY + CDA15 + Age	2.0	.13	.13(.07)
Average drinks = DLY + CDA15 + Age*	2.9	.04	.18(.12)
Total drinks = DLY + CDA15 + Age	1.2	.30	.09(.02)
Binges = DLY + CDB 15 + Age	1.8	.16	.12(.05)
Average drinks = DLY + CDB 15 + Age	1.6	.20	.11(.04)
Total drinks = DLY + CDB 15 + Age	1.4	.27	.09(.03)
Binges = DLT + CDA15 + Age	.96	.41	.07(-.00)
Average = DLT + CDA15 + Age*	4.4	.01	.25(.19)
Total drinks = DLT + CDA15 + Age	.49	.68	.04(-.03)
Average drinks = CDB 15 + CDA15 + Age	2.6	.06	.17(.10)
Average drinks = DLT + DLY + Age*	3.4	.02	.21(.15)
Total drinks = CDB 15 + CDA15 + Age	.65	.58	.05(-.03)
Total drinks = DLT + DLY + Age	1.3	.30	.09(.02)
Binges = CDB 15 + CDA15 + age	.65	.58	.05(-.03)
Binges = DLT + DLY + age	2.0	.12	.13(.07)

Note: DLT (depression over a lifetime), DLY (depression last year), CDA15(conduct disorder after age 15), CDB15(conduct disorder after age 15)
F(test statistic used to decide whether the model as a whole has statistically significant predictive capability), P (the observed significance levels of the statistical analysis), R^2 (the squared multiple correlation coefficient)
* Significance at $p < .05$.

There were four significant regression equations:

1) Average drinks/drinking day = depression over a lifetime + conduct disorder before 15 + age*

$Z_{\text{predicted average drinks/drinking day}} = .84 + .024\ (LTD) + .007\ (CDB15) - .01\ (AGE)$

2) Average drinks/drinking day = depression last year + conduct disorder after 15 + age*

$Z_{\text{predicted average drinks/drinking day}} = .754 + .018\ (DLY) + .046\ (CDA15) - .010\ (AGE)$

3) Average drinks/drinking day = depression over a lifetime + conduct disorder after 15 + age*

$Z_{\text{predicted average drinks/drinking day}} = .787 + .022\ (LTD) + .039\ (CDA15) - .01\ (AGE)$

4) Average drinks/drinking day = depression over a life time + depression last year + age*

$Z_{\text{predicted average drinks/drinking day}} = .383 + .021(LTD) + .009\ (DLY) - .011(AGE)$

Examination of the R^2 values shows that the best fit model, which included depression over a life time, conduct disorder after 15 and age explained 25% of the variance in the average number of drinks per drinking day, a slight decrease from the original regression (all predictive variables explaining about 26% of the variance), followed by a combination of depression over a lifetime and in the last year, and age, explaining 21% of the variance, followed by depression over a lifetime, conduct disorder before 15 and age predicting 20% of the variance, and finally depression last year, conduct disorder after 15 and age explaining about 18% of the variance.

In order to understand the relationship between each individual predictive variable among the four regressions, partial correlations were examined for each of the regressions. Table 8 shows the values of partial correlation between the

predictive variables and the average number of drinks per drinking day. When examining the partial correlations in the best fit model (model number 3 in table 8) results show that depression over a lifetime had the highest positive correlation (.37) followed by age which was negatively associated (-.30) and conduct disorder after 15 (.25).

Table 8

Partial Correlations Between Predictive Variables and the Average Number of Drinks Per Drinking Day for the Significant Regression Equations

Model	Variables	Partial Correlations
1	DLT	.39
	CDB15	.06
	AGE	-.31
2	DLY	.39
	CDA15	.06
	AGE	-.31
3	CDA15	.25
	DLT	.37
	AGE	-.30
4	DLY	.11
	DLT	.36
	AGE	-.32

Note: DLT (depression over a lifetime), DLY (depression last year), CDA15(conduct disorder after age 15), CDB15(conduct disorder after age 15*)*

Regression Assumptions

All the predictive variables were examined for regression assumptions; however this section only describes the average drinks per drinking day variables because it was the only variable significantly predicted by the regression equations.

The assumptions of regression were checked by examining the normal distribution and the residuals plot. The assumption of normality was examined by drawing the distribution of the regression-standardized residuals of the average number of drinks per drinking day and was found to be almost bell-shaped (Figure 2).

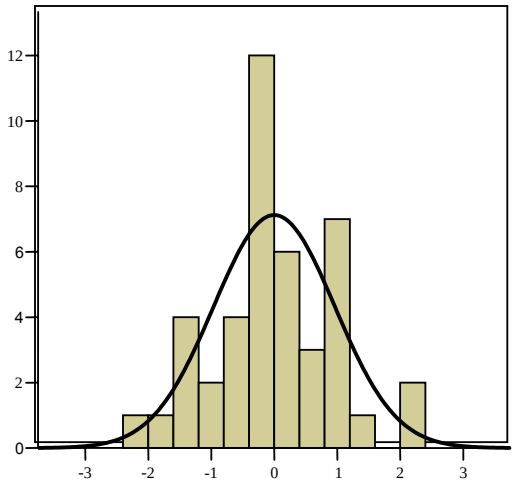

Figure 2. The standardized distribution of the average number of drinks per drinking day.

The assumption of homoscedasticity was examined to assure that the residuals were dispersed randomly throughout the range of the predicted value of the outcome variable (Figure 3). The scores are distributed around the center, and they did not follow any shape that indicated violation of homoscedasticity, but they did not follow rectangular shape because of the small sample size.

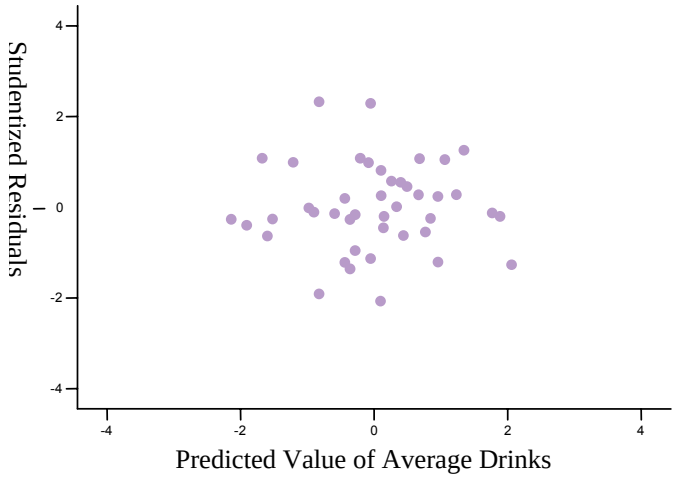

Figure 3. Plot of studentized and predicted values of average drinks per drinking day.

Linearity was examined by evaluating the correlation matrix scatterplots. The matrix displays the correlation between each two variables that are entered into the regression equation. A linear relationship should be presented in a linear line. However it is rare to have a complete, perfect linear correlation. For the current study only few variables had a positive strong or middle positive correlation. However, examining the correlation matrix is considered to be a

subjective task, thus examination of the residuals versus the observed scores is recommended. As shown in figure 3, the linearity assumption is not violated.

Multicollinearity exists when there are moderate to high inter-correlations among the predictors. Multicollinearity limits the size of R because the predictors are reflecting much of the same variance as the outcome variable. In order to examine the presence of multicollinearity, the Variance Inflation Factor (VIF) was examined. The VIF of a predictive variable indicates whether there is a strong linear association between that factor and all the other factors. It is recommended that multicollinearity is not a threat as long as the value of the VIF does not exceed the value of 10 (Stevens, 2002). For the current regression examination of the VIF did not show the presence of multicollinearity, all values were less than a value of two, indicating minimum or no multicollinearity.

Summary of the and Conclusion of the Results

Results of statistical regression showed that the best predictive regression equation included age, depression over a lifetime and conduct disorder after age 15. However, only 25% of the variance could be contributed to these three variables. Partial correlations show that depression over a lifetime was the most significant factor predicting the average number of drinks per drinking day and contributed the most to the variance in the average number of drinks per drinking day, about 37% of the variance, followed by age and conduct disorder after age 15. However, the other predictive variables are still important and cannot be ignored. The small sample size might have contributed to the non-significance of the ability of the predictive variables to explain the variance among the other

outcome variables. More variables need to be included in the analyses in order to understand which variables, and how much these variables affect the levels of alcohol consumption.

CHAPTER FIVE

This chapter contains a discussion of the results and an explanation of the relationships that emerged through the analyses performed. The chapter also includes a discussion of the limitations of the current investigation and recommendations for practice and for future research.

Discussion

The purpose of this study was to examine the relationship between selected predictive variables including age, psychological factors (conduct disorder before and after age 15, depression over a lifetime and in the previous year), and three outcome variables that are indicators of harmful drinking (including total number of standard drinks/month, average number of standard drinks per drinking day, and the number of binges per month) among women involved in an ARMVC.

A sample of 43 female participants (ages 18-45 years old, *M* = 28.8 years) were included in the analysis. Because subjects were primarily white, unmarried, and with some degree of education (beyond high school), the results of this study are not generalizable to more diverse populations.

Conduct Disorder

Descriptive data showed that the prevalence of conduct disorder in the study population of women who are harmful drinkers injured in an ARMVC was 20.9% both before and after the age of 15. Because no data were available for comparison of the prevalence of conduct disorders in harmful drinkers as a whole, comparisons are difficult to make. The prevalence of conduct disorder

ranges from 2% to 9% among girls and 6% to 16% among boys in the general population (National Mental Health Association [NMHA], 2005), and is clearly lower than in the study population. Thus, women injured in ARMVC are a high risk population with regard to conduct disorder.

The rates of conduct disorder in females injured in an ARMVC are similar to those found in other study populations of women drinkers. Kessler et al. (1997) found that the prevalence of conduct disorder among female alcohol abusers was 13.5%, and in female dependent drinkers was 22.8%. The sample that was used for the current study is considered a selective high risk group since they were involved in an ARMVC, and thus the finding that they had a high prevalence of conduct disorder is not unexpected. However, this finding indicates the need for assessment and preventive strategies in young women with this disorder and in young women injured in an ARMVC.

There is also a possibility that the prevalence of conduct disorder in the current sample might be higher than what was found. As reported by Barry et al. (1997), the instrument used to measure conduct disorder was modified from the DSM-III-R criteria and sensitive questions were omitted. Omission of sensitive questions might have led to underestimation of conduct disorder in women. Eventually, the underestimation of conduct disorder might have caused a weaker association as compared to what actually exists.

Depression

The prevalence of depression was also high among the participants. Fifteen participants (34.9%) met the criteria for depression over a lifetime, and 20

participants (46.58%) met the criteria for depression in the last year. In comparison, the reported prevalence of major depressive episodes among women in the general population has been reported as 21.3% (Kessler et al., 1994). The difference in prevalence is attributed again to the selective sample of harmful drinking females injured in an ARMVC. However, the prevalence of depression and conduct disorders in the current sample matched the general findings in the literature, which demonstrates that depression is associated more with women who are problem-drinkers than is conduct disorder (Helzer & Pryzbeck, 1988). No precise data are available about depression and conduct disorder among women who are harmful-drinkers; thus we compared the current findings with problem-drinkers. The current study prevalence is comparable to the findings of Wilsnack and colleagues, who found of a depression prevalence of 60% among a sample from the general population (Wilsnack, Klassen et al, 1986).

Conduct Disorder, Harmful Drinking, and ARMVC

Among women involved in an ARMVC, conduct disorder after age 15 was positively and significantly correlated with the average number of standard drinks per drinking day. Barry et al. (1997) reported findings similar to those of this study; that increased consumption of alcohol was significantly related to a history of conduct disorder and antisocial personality disorder. However these correlations resulted from a cross-sectional design, and thus could not denote causality. In addition, the populations in the current study and Barry et al. study differ. Barry et al. used primary care community setting, and the participants were

older compared to the population of the current study. The population in the current study is considered a high risk population compared to Barry et al. (1997) population, and thus it was expected that the current study findings would show a more significant relationship among the variables of interest.

There are two possible explanations for the relationship between conduct disorder and harmful drinking among women following an ARMVC: 1) that harmful drinking is a sign of conduct disorder, or 2) harmful drinking leads to conduct disorder. The literature does not contain a description of such a relationship; most of the research describes the relationship between conduct disorder and alcohol dependence or alcohol abuse mainly among male populations (Hill & Maughan, 2002,) and does not address drinking patterns among women who are harmful drinkers.

In the current investigation, it seems that engaging in a risky behavior started early in adolescence and continued beyond the early adolescence years into adulthood (as observed in the correlation between conduct disorder before and after age 15). A possible explanation is that the factors that led to a conduct disorder (psychological, biological, social, and environmental) continued beyond adolescence and led to harmful drinking, perhaps risky driving, and the risk for involvement in an ARMVC.

At the same time, it is also possible that social, environmental, mental and biological factors led to an early onset of alcohol use among young girls, and those factors also resulted in engaging in risky behavior. Early onset of alcohol use may also directly contribute to engaging in risky behavior (Angold, Costello,

& Erkanli, 1999). However, in the current investigation, it is not possible to decide the temporal relationship between conduct disorder and early drinking. Thus it is important for future investigators to study the onset of both disorders to determine the temporal relationship and to determine if causation exists.

Furthermore, at an early age, peer pressure and the need to be affiliated with a peer group is of importance in a young girl's development. Early use of alcohol or early manifestation of risky behaviors might be either accepted or rejected by conventional peer groups. Interaction with the new peer group leads to learning new social ways of acting and might lead to the young girls getting involved in other risky behaviors like drinking and driving and early use of alcohol. It is not possible to determine if peer pressure was a factor that played a role in risky behavior and alcohol use since no assessment was done about peer groups. Future studies of young girls should include assessment of peer groups' functions and how they affect girls becoming problem drinkers and engaging in other risky behaviors.

Scientists note that there is a relationship between substance abuse and other health risk behaviors such as injury and violence, but the precise sequence of the relationship is uncertain. Some studies have found that early age of alcohol use is associated with engaging in risky behaviors during early adolescence (DuRant, Smith, Daniel, & Krowchuk, 1999).

Symptoms of *Depression*, *Harmful Drinking and ARMVC*

The relationship between depression and alcohol consumption among women who participated in the current study can be explained in several ways.

The temporal relationship between depression and alcohol is not clear, although some scientists suggest that depression-like symptoms are alcohol induced, and should subside if drinking is discontinued (Schuckit, 1985). Thus one possibility is that the women in the current study started drinking early in life, and the excessive use of alcohol caused feelings of depression. On the other hand, as found by Wilsnack, Klassen, et al. (1986) patterns of heavy drinking tend to begin after, and not before, problems with depression.

One explanation for the strong relationship between depression and alcohol consumption among women is that women tend to drink in order to self-medicate feelings of depression and stress (Skaff, Finney, & Moos, 1999). Drinking in low quantities has euphoric effects on mood, and initially helps in a temporary relief of stress and depression. Alcohol is actually considered a short term stimulant and alcohol users feel that alcohol makes them more confident, more socially attractive, and positive (Behar et al., 1983). However, with prolonged and heavy alcohol consumption, alcohol acts as a depressant. Eventually a woman starts drinking even more to relieve the feelings of depression. Thus, a woman drinker falls into a vicious cycle of drinking to relieve depression, and yet drinking in turn causes more depression.

Therefore, given the discussion in the previous paragraph, it is suspected that the participants in the current study used alcohol as a depression relief measure, and were already in a stage where their depression led to higher levels of drinking. Alcohol consumption may have resulted in temporary relief of the depression, and at higher levels of drinking caused more depression. It is

obvious from examining the data on alcohol consumption that the women in the current study were already at high levels of drinking. Those high drinking levels were enough to cause serious harmful effects; in this case a serious crash related to alcohol consumption. Although the investigator is not able to predict causation and direction (drinking causes depression or depression causes drinking), the findings do point to a moderate association in the study population (harmful drinkers involved in an ARMVC). An attempt to explain how depression is related to involvement in an ARMVC is not easy to establish considering the data available about this population in the current study. Similar association was also found by other investigators. Moskowitz, Walker and Gomberg (1997) reviewed characteristics of DUI offenders available in the literature. They found that those convicted DUI offenders have significantly higher prevalence of stress from family and jobs, and a higher prevalence of personality disorders traits. Wilsnack and her team also demonstrated an indirect relationship between depression and problem drinking.

Using the conceptual model to explain the current study results, it is possible that having depression among women who are harmful drinkers increased levels of heavy drinking, and the chance of getting involved in an ARMVC. No direct relationship has been established in the literature. As reported by Gentilello et al. (2000) female trauma patients were significantly more likely than male trauma patients to have symptoms of emotional distress or depression, yet no explanations were offered by the investigator for these findings. However, the decision to get involved in risky behaviors because of

feelings of depression might lead to an ARMVC. A woman with depression might have feelings of helplessness and feelings of loneliness, and might even lead to a desire for suicide. Feelings of worthlessness and a decreased will to live might lead to behaviors that carry risk and harm to self such as drinking and driving. A woman might be aware of the risks involved with drinking and driving, yet might still make the decision to drive under the influence, or ride in a car with a driver who is under the influence because she is depressed. In fact, just the decision to drink and drive, or to ride in a care with a drinking driver, even if it does not result in a crash, is considered a risk-taking behavior. Furthermore, it is possible that those who have feelings of depression might have lower attention span, or be mentally occupied while driving. Decreased attention may increase the chance of a vehicular crash, although that explanation is not enough to attribute depression as the pure cause of a crash. The explanation also does not exclude the explanation that these crashes might be suicide attempts. Those women still made the decision to drink and drive, and that decision led to a crash; nevertheless depression might have decreased their attention span, and increased the chance for a crash.

In the current investigation, women with depression over a lifetime had high levels of drinking; however having depression in the last year did not affect levels of drinking as much as depression over a lifetime. Interestingly, the overall number of women with depression in the last year was higher than the number of women with depression over a lifetime. The only explanation the investigator can provide is that possibly the depression the women experienced in the last year

was not significant enough to change levels of drinking, or that the depression in the last year was in some way more transient and less debilitating than depression over a lifetime. The reason may be that a long period of time is needed before the viscous cycle between depression and heavy alcohol consumption develops. Data about the onset of drinking related to the current sample is not available to the investigator, and therefore it is difficult to speculate an alternative explanation for these findings.

Depression, Age, Conduct Disorder and Harmful Drinking

The most significant finding in this investigation was that depression over a lifetime, age, and conduct disorder after age 15 significantly predicted 25 % of the variance in the average number of standard drinks per drinking day. Correlations showed that age was negatively associated, and depression and conduct disorder were positively associated with average drinks per drinking day. The younger the participant was, with a higher number of depressive symptoms over a lifetime, and with a history of a higher number of symptoms of conduct disorder after age 15, the higher the number of drinks the woman consumed on a drinking day during the month before getting involved in an ARMVC. Although not previously tested, it is intuitive that a woman with these three predictive factors and with higher alcohol consumption would be more likely to be involved in risky situations such as an ARMVC. The current investigation verified the association among these variables, with some qualifications due to the limitations of the study, and allows the science to move forward to develop preventive interventions.

Although the other measures of alcohol consumption in this study were not significantly predicted in the regression equations, they are still worth mentioning, especially binge drinking and the predictive variables of interest. Binge drinking tends to occur in an infrequent way, and is perhaps intensified in those drinkers with conduct disorder because of the impulsivity that is symptomatic of conduct disorder before age15. Thus for the current sample, it is also possible that this association between binges, depression and conduct disorder is due to drinking at an early age combined with risky behaviors. As drinking continues beyond the teenage years into adulthood, depression also emerges as a consequence or co-occurrence of alcohol and other factors that were beyond the scope of this investigation.

Summary

In summary, results have shown an association among harmful drinking, history of depression and history of conduct disorder among women involved in an ARMVC. Although the temporal relationship cannot be established, according to the theoretical framework, depression and early engagement in risky behaviors among women increased the chance of becoming harmful drinkers into adulthood, and eventually getting involved in an ARMVC. Thus in order to prevent alcohol problems and ARMVCs, it is important to investigate these relationships in future studies. Moreover, it is important to develop screening strategies for young girls in schools, to screen for conduct disorders, depression and alcohol use. It is also important to assess for depression, conduct disorder/antisocial personality, and/or harmful drinking among women who

present in primary care settings with either of those disorders. Those identified with conduct disorders, depression, and/or alcohol use disorders should be referred for further diagnosis in order to receive proper treatment. Finally, those who are admitted to emergency rooms as a result of an ARMVC need to be assessed not only for alcohol use disorders, but also for the presence of depression and conduct disorders.

Limitations

The use of secondary analyses carries some disadvantages including having to use other investigators' work and dealing with the unknown errors that might have occurred. The investigator had no control over the participants' selection, no choice of the data that were collected, and no decision over what instruments should have been used. Measurement and methodological errors cannot be corrected and missing data cannot be corrected. Effective measures were carried out in the original study to reduce such errors. Also, for the current study, the investigator tried all the procedures and methods possible to reduce and discuss any errors that might have occurred. The investigator performed several steps such as visual screening of the data, identifying any missing data, dwelling with the data, and examining the assumptions of the statistical analyses. Results were also discussed and caution about using the results were indicated when appropriate.

Sample size

Small sample size is known to lower the power (the probability of rejecting the null hypothesis when it is false) of the analyses. According to Stevens (2002),

power is affected by the effect size (the extent to which the groups differ in the population on the dependent variable) and sample size. A larger sample size means that there is a higher chance of finding a significant relationship if it actually exists. The small sample size is one of the most important limitations of this study. In secondary analyses, the investigator has no control over the sample size. Statisticians (Tabachnick & Fidell, 2001) recommend a sample size of ≥50 for multiple regressions following the recommended equations (N=50 + 8m, where *m* is the number of predictive variables). For the current investigation, assuming a medium effect-size (medium effect size is the relationship between the predictive and the outcome variables at $\alpha = .05$, $\beta = .20$), a sample size of 95 or higher would have been needed for five predictive variables based on the mathematical formula (95 = 50 + 8*5). Stevens (2002) recommends 10-20 participants for each variable. One of the methods the investigator used to increase the statistical power was to reduce the number of predictive variables in a series of multiple regressions.

Measurement

One of the limitations of the study was the measurement strategy used to determine the presence of conduct disorder. The instrument used to measure conduct disorder (based on DSM-III-R criteria) was considered appropriate for the original study at the time of study initiation. Since that time, however, new criteria have been published (DSM-IV) and are now recommended for use instead of the DSM-III-R criteria. In a comparison between the DSM-III-R and the DSM-IV criteria for conduct disorders, the revision has incorporated a definition

for conduct disorder that is somewhat better in terms of internal consistency and test-retest reliability than the DSM-III-R, and the validity of the DSM-IV is slightly better than the DSM-III-R (Lahey et al., 1994). For example, out of all of the newly diagnosed cases of oppositional defiant disorder, 68.8% of those persons who met the criteria for DSM-IV but not for DSM-III-R received a clinician's diagnosis for oppositional defiant disorder.

There are several issues to be considered for the measurement of conduct disorders among female populations when using the DSM-III-R criteria. First, and as suggested by Zoccolillo, Tremblay, and Viatro (1996), the definition provided by the DSM-III-R has a tendency to under diagnose conduct disorders in female participants. In addition, decreasing the threshold of diagnoses for girls can result in an increase in the prevalence of conduct disorder, for instance using two symptoms instead of three as a cut point to make the diagnosis. The investigators tested the DSM-III-R effectiveness in identifying girls who are already diagnosed with conduct disorder. Results showed that only 3% of the girls with early-onset of antisocial behavior met the criteria for DSM-III-R. Lowering the threshold for DSM-III-R for conduct disorder from three to two symptoms, and adding the item of violation of rules to the criteria increased the rate of diagnosis to 35% in the pervasively antisocial girls. The results of this study support the opinion that conduct disorder manifests in girls differently than boys, and there is a need to have a modified criteria for girls. With females being more passive in general and less likely to act out (Zoccolillo, Tremblay, & Viatro,

1996), the cut point for the diagnosis of conduct disorder, therefore, needs to be lowered to reflect gender differences in behavior.

One of the important criteria for the diagnosis of conduct disorder is that the condition must have manifested for a minimum of six months. The current investigation did not contain a question about the onset and persistence of conduct disorder, and thus the temporal component of the associated behaviors could not be determined. Therefore the timing of the behaviors is not known, and the reported prevalence of conduct disorder in the sample is open to question. The prevalence may be lower than what was reported in this investigation. Further studies should include a specific question to determine if the symptoms of conduct disorder have persisted for six months or more.

Statistical Analyses

Due to the nature of the data available, regression was the most appropriate statistical procedure possible. One of the drawbacks of regression analyses is that it is not possible to draw causality. Thus, it was not possible to propose that conduct disorder and depression caused harmful drinking, nor that harmful drinking caused conduct disorder and depression in this sample.

Generalizability and Selection Bias

In secondary analyses, the investigator has no control over sample selection or data collection. Participants bring their unique characteristics into the investigation, such as character, education, attitude, personality, and all other defining variables. The current sample was drawn from women who were harmful drinkers and involved in an ARMVC. The results obtained can be applied only to

populations of matching characteristics. It is not possible to draw the same conclusion about female drinkers who experienced other alcohol-related problems like family and job related problems. It was not known to the investigator what other alcohol-related problems the participants experienced and if those problems had any effects on drinking levels and the risk for an ARMVC. In addition, it was noticed that the majority of the participants were Caucasians. The investigator cannot conclude that Caucasian woman have a higher rate of getting involved in an ARMVC (even if that were true). The investigators of the original study explained that it was hard to recruit black women into the study. Thus the majority of the sample being Caucasian is most likely due to selection bias (M. S. Sommers, personal communication, October 7th, 2005).

Recommendations for Future Research

Studies with a prospective longitudinal design are needed to investigate the temporal relationships among depression, conduct disorder, harmful drinking and risky behaviors. It is important to assess these disorders longitudinally to determine the onset of each disorder and how long it has persisted. For example when assessing conduct disorder and early substance use, the investigator needs to determine if a temporal order exists or if the conditions co-occur.

Several methodological considerations are necessary to move the science forward. Future studies should include a larger sample size and a population that will results in data that are generalizable to. This investigator suspects that variables other than depression over a lifetime might be correlated with higher

drinking levels among female harmful drinkers. A larger sample size will increase the likelihood of finding differences if differences exist. Furthermore, it is important to investigate other factors that might be correlated with harmful drinking and getting involved in an ARMVC. As suggested in the conceptual model, other factors such as education, marital status, and social characteristics may contribute directly or indirectly to alcohol consumption and harmful consequences of drinking.

In the future, gender-specific measurement instruments are important in order to understand conduct disorder among women. As it is suggested in the literature, the definition of conduct disorder and the instrument used was based on DSM-III-R criteria. As some of the literature showed that DSM-III-R has a tendency to under diagnose conduct disorder in women, some investigations suggest the need for another instrument. The DSM-IV has replaced the DSM-III-R since the latter was used for this study; meaning that the DSM-IV should be used in future studies. Furthermore, as suggested by other investigators, there is a need to develop gender-specific instruments to measure conduct disorder among women. In addition, investigators need to use strategies to reduce selection bias, and recruit women other than Caucasians.

Recommendations for Practice

Nurse practitioners, primary care physicians, and other health care workers need to assess for the presence of depressive symptoms in women who present with alcohol-related problems, and for the presence of alcohol-related problems if they present with depressive symptoms. Women who are admitted to

trauma care centers resulting from alcohol-related motor vehicle crashes need to be screened for depression and depressive symptoms.

Screening is the first step in identifying the presence of alcohol problems and/or psychological and mood disorders. Once any of these disorders are identified, there is a need for referral in order for women to receive the proper treatment and intervention. For example, those young women who screen positive for conduct disorder need to be referred for specialists for further screening and eventually receive the proper treatment that may include behavioral therapy, medication, anger management, stress management, social skills training and other management methods (Australian Psychological Association, 2002).

Finally, the previous investigation showed that among a sample of women involved in an ARMVC, younger women with a history of conduct disorder and a history of depression are more likely to be heavy drinkers as compared to their older counterparts. The results do not denote causality, but a strong association, and only apply to women who are Caucasian, single and with some level of education. The investigator concluded that there is a need to screen for one of the disorders in the presence of the others, and to complete longitudinal studies to investigate the relationship further.

References

Allen, J. P., Litten, R. Z., Fertig, J. B., & Babor, T. F. (1997). A review of investigation on the Alcohol Use Disorders Identification Test (AUDIT). *Alcoholism: Clinical and Experimental Research, 21*, 613-619.

American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders: DSM-IV*-TR. Washington, DC: Author.

Angold, A., Costello, E. J., & Erkani, A. (1999). Co-morbidity. *Journal of Child Psychology and Psychiatry, 40,* 57-87.

The Australian Psychological Association (2002). Conduct disorder. Retrieved October 8, 2005, from http://www.betterhealth.vic.gov.au/bhcv2/bhcarticles.nsf/pages/Conduct_disorder?OpenDocument

Babor T. F., & Grant, M. (1989). From clinical investigation to secondary prevention: International collaboration in the development of the Alcohol Use Disorders Identification Test (AUDIT). *International Perspectives, 13,* 371-374.

Barry, K. L., Fleming, M. F., Manwell, L. B., & Copeland, L. A. (1997). Conduct disorder and antisocial personality in adult primary care patients. *The Journal of Family Practice, 45*, 151-158.

Behar, D., Berg, C. J., Rapoport, J. L., Nelson, W., Linnoila, M., Cohen, M., Bozevich, C., & Marshall, T. (1983). Behavioral and physiological effects

of ethanol in high-risk and control children: A pilot study. *Alcoholism Clinical and Experimental Research, 7,* 404-410.

Brown, R. A., Monti, P. M., Myers, M. G., Martin, R. A., Rivinus, T., Duberuil, M. E., & Rohsenow, D. J. (1998). Depression among cocaine abusers in treatment: relation to cocaine and alcohol abuse and treatment outcome. *American Journal of Psychiatry, 155*, 220-225.

Capsi, A., Moffitt, T. E., Newman, D. L., & Silva, P. A. (1996). Behavioral observations at age 3 predict adult psychiatric disorders: longitudinal evidence from a birth cohort. *Archives of General Psychiatry, 53*, 1033-1039.

Cherpitel, C. J. (1997). Brief screening instruments for alcoholism. *Alcohol Health & Research World, 21*, 348-351.

Clark, D. B., & Bukstein, O. G. (1998). Psychopathology in adolescent alcohol abuse and dependence. *Alcohol Health & Research World, 22,* 117-121.

Clark, D. B., Klirisci, L., & Moss, H. B. (1998). Early adolescent gateway drug use in sons of fathers with substance use disorder. *Addictive Behaviors, 23*, 561-566.

Clark, D. B., Vanyukov, M., & Cornelius, J. (2002). Childhood antisocial behavior and adolescent alcohol use disorder. *Alcohol Research & Health, 26*, 109-114.

Committee on Injury and Poison Prevention and Committee on Adolescence. (1996). The teenage driver. *Pediatrics, 98*, 987-990.

Crum, R. M., Brown, C., Liang, K., & Eaton, W. E. (2001). The association of depression and problem drinking: analysis from the Baltimore ECA follow-up study. *Addictive Behaviors, 26*, 765-773.

Cunningham, J. A., Ansara, D., Wild, T. C., Toneatto, T., & Koski-Jannes, A. (1999). What is the price of perfection? The hidden costs of using detailed assessment instruments to measure alcohol consumption. *Journal of Studies on Alcohol, 60*, 756-758.

Dahlgren, L. (1978). Female alcoholics. Development and pattern of problem drinking. *Acta Psychitrica Scandinavia, 57*, 325-335.

Davidson, K. M. (1995). Diagnosis of depression in alcohol dependence: changes in prevalence with drinking status. *British Journal of Psychiatry, 166*, 199-204.

Dixit, A. R. & Crum, R. M. (2000). Prospective study of depression and the risk of heavy alcohol use in women. *American Journal of Psychology, 157*, 751-758.

Dyehouse, J. M., & Sommers, M. S. (1998). Brief intervention after alcohol-related injuries. *Nursing Clinics of North America, 33*, 93-104.

DuRant, R. H., Smith, J. A., Kreiter, S. R., & Krowchuk, D. P. (1999). The relationship between early age of onset of initial substance use and engaging in multiple health risk behaviors among young adolescents. *Archives of Pediatric and Adolescent Medicine,* 153, 286-31.

Edwards, G., Arif, A., & Hodgson, R. (1981). Nomenclature and classification of drug and alcohol-related problems; a WHO memorandum. *Bulletin of the World Health Organization, 59*, 225-245.

Fink, A. A., Morton, S. C., Beck, J. C., Hays, R. D., Spritzer, K., Oishi, S., & Moore, A. A. (2002) The alcohol-related problems survey: Identifying hazardous and harmful drinking in older primary care patients. *Journal of American Geriatric Society, 50,* 1717-22.

Fleming, M. F., & Barry, K. L. (1991). A three-sample test of a masked alcohol screening questionnaire. *Alcohol & Alcoholism, 26*, 81-91.

Fleming, M. F., Barry, K. L., Manwell, L. B., Johnson, K., & London, R. (1997). Brief physician advice for problem alcohol drinkers: A randomized controlled trial in community-based primary care practices. *Journal of the American Medical Association, 277*, 1039-1045.

Gentilello, L. M., Rivara, F. P., Donovan, D. M., Villaveces, A., Daranciang, E., Dunn, C.W., & Ries, R. R. (2000). Alcohol problems in women admitted to a level I trauma center: a gender-based comparison. *The Journal of Trauma: Injury, Infection, and Critical Care, 48,* 108-114.

Gmel, G., & Rehm, J. (2003). Harmful alcohol use. *Alcohol Research & Health, 27*, 52-62.

Grant, B. F., Dawson, D. A., Stinson, F. S., Chou, S. P., Dufour, M. C., & Pickering, R. P. (2004). The 12-month prevalence and trends in DSM-IV alcohol abuse and dependence: United States, 1991–1992 and 2001–2002. *Drug and Alcohol Dependence, 74*, 223-34.

Grant, B. F., & Harford, T. C. (1995). Co-morbidity between DSM-IV alcohol use disorders and major depression: results from a national survey. *Drug and Alcohol Dependence, 39*, 197-206.

Helzer J. E., & Pryzbeck, T. R. (1988). The co-occurrence of alcoholism with other psychiatric disorders in the general population and its impact on treatment. *Journal of Studies on Alcohol, 49*, 219-224.

Hill, J., & Maughan, B. (2001). *Conduct disorders in childhood and adolescence*. New York: Cambridge University Press.

Jessor R., Grafes, T., Hanson, R. C., & Jessor, S. L. (1968). *Society, personality, and deviant behavior: a study of a tri-ethnic community.* New York: Holt, Reinert & Winston.

Kessler, R. C., Crum, R. M., Warner, L. A., Nelson, C. B., Schulenberg, J., & Anthony, J. C. (1997). Lifetime co-occurrence of DSM-III-R alcohol abuse and dependence with other psychiatric disorders in the National Co-morbidity Survey. *Archives of General Psychiatry, 54,* 313-321.

Kessler R. C., McGonagle, K. A., Zhao, S., Nelson, C. B., Hughes, M., Eshleman, S., Wittchen, H. U., & Kendler, K. S. (1994). Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States. Results from the National Co-morbidity Survey. *Archives of General* Psychiatry, *51*, 8-19.

Lahey, B. B., Applegate, B., Barkley, R. A., Garfinkel, B., McBurnett, K., Kerdyk, L., Greenhill, L., Hynd, G. W., Frick, P. J., Newcorn, J., Biederman. J., Ollendick, T., Hart, E. L., Perez, D., Waldman, I., & Shaffer, D. (1994).

DSM-IV field trials for oppositional defiant disorder and conduct disorder in children and adolescents. *American Journal of Psychiatry, 151*, 1163-1171.

Lex, B. W., Goldberg, M. E., Mendelson, J. H., Lawler, N. S., & Bower, T. (1994). Components of antisocial personality disorder among women convicted for drunken driving. *Annals of the New York Academy of Science, 708,* 49-58.

Liban, C., & Smart, R. (1980). Generational and other differences between males and females in problem drinking and its treatment. *Drug and Alcohol Dependence, 5*, 207-221.

Liskow, B., Powell, B. J., Nickel, E., & Penick, E. (1991). Antisocial alcoholics: are there clinically significant diagnostic subtypes? *Journal of Studies on Alcohol, 52*, 62–69

Mannuzza, S., Klein, R. G., Bessler, A., Malloy, P., LaPadula, M. (1998). Adult psychiatric status of hyperactive boys grown up. *American Journal of Psychiatry, 155*, 493-498.

McCusker, M. T., Basquille, J., Khawaja, M., & Murray-Lyon, I. M. (2002). Hazardous and harmful drinking: a comparison of the AUDIT and CAGE screening questionnaires. *Quarterly Journal of Medicine, 95*, 591-595.

Mertler, C. A., & Vannatta, R. A. (2002). *Advanced and multivariate statistical methods: practical application and interpretation*. Los Angeles: Pyrczak

Moskowitz, H., Walker, J., & Gomberg, C. (1979). *Characteristics of DWIs, alcoholics and controls. Prepared for California Department of Alcohol and Drug Abuse.* Los Angeles, CA: University of California.

Myers, M. G., Stewart, B. A., & Brown, S. A. (1998). Progression from conduct disorder to antisocial personality disorder following treatment for adolescent substance abuse. *American Journal of Psychiatry, 155*, 279-485.

National Highway Traffic Safety Administration. (2001a). Decline in alcohol-related fatalities attributed to four factors. Retrieved September 10, 2005, from http://www.nhtsa.dot.gov/people/outreach/traftech/TT261.htm.

National Highway Traffic Safety Administration. (2001b). Targeting young female drivers with impaired driving messages. Retrieved October 5, 2005, from http://www.nhtsa.dot.gov/people/outreach/traftech/TT240.htm.

National Highway Traffic Safety Administration. (2003a). *2002 Annual Assessment of Motor vehicle crashes based on the fatality analysis reporting system, the national accident sampling system and the general estimates system*. Washington, DC: U.S. Department of Transportation.

National Highway Traffic Safety Administration. (2004). *Traffic safety facts 2003: alcohol. U.S. department of transportation, national center for statistics and analysis*, 2004. DOT HS 809 761. Retrieved February 3, 2005, from http://www-nrd.nhtsa.dot.gov/pdf/nrd-30/NCSA/TSF2003/809761.pdf.

National Institute on Alcohol Abuse and Alcoholism. (1990). Alcohol and women. *Alcohol Alert.* No. 10 PH 290. Retrieved March 20, 2005, from http://www.niaaa.nih.gov/publications/aa10.htm.

National Institute on Alcohol Abuse and Alcoholism. (1997). Alcohol metabolism. *Alcohol Alert*, No35. PH 371, Retrieved April, 2005 from http://www.niaaa.nih.gov/publications/aa35.htm.

National Institute on Alcohol Abuse and Alcoholism. (1999a). Are women more vulnerable to alcohol's effects. *Alcohol Alert*, No. 46. Retrieved October 2nd, 2005, from http://pubs.niaaa.nih.gov/publications/aa46.htm.

National Institute on Alcohol Abuse and Alcoholism. (1999b). Are women more vulnerable to alcohol's effects? *Alcohol Alert, No. 46.* Retrieved October, 20, 2005. from http://pubs.niaaa.nih.gov/publications/aa46.htm.

National Institute on Alcohol Abuse and Alcoholism. (2000). Medical consequences of alcohol abuse. *Alcohol Research & Health*, *24,* 27-31.

National Institute on Alcohol Abuse and Alcoholism. (2003a). Epidemiology and consequences of drinking and driving. *Alcohol Research & Health, 27*, 63-78. Retrieved September 8, 2005, from http://www.niaaa.nih.gov/publications/arh27-1/63-78.htm.

National Institute on Alcohol Abuse and Alcoholism. (2003b). *Quick facts: Self-reported amounts and patterns of alcohol consumption, Percent who drink beverage alcohol, by gender, 1939-2003*. Retrieved April 23, 2005 from http://www.niaaa.nih.gov/databases/dkpat1.htm.

National Institute on Alcohol Abuse and Alcoholism. (2004a). *Percent reporting alcohol use in lifetime by age group and demographic characteristics: NSDUH (NHSDA), 1994-2002*. Retrieved: April 10, 2005 from http://www.niaaa.nih.gov/databases/dkpat2.htm.

National Institute on Alcohol Abuse and Alcoholism. (2004b). *Co-morbidity of alcohol and psychiatric problems. Module 10E*. Retrieved April 30, 2005 from http://www.niaaa.nih.gov/publications/Social/Module10ECo-morbidity/Module10E.html.

National Institute on Alcohol Abuse and Alcoholism. (2005a). *Quick facts: Percent distribution of current drinking status, drinking levels, and heavy drinking days by sex for persons 18 years of age and older: United Status, NHIS, 1997–2003*. Retrieved April 23, 2005 from http://www.niaaa.nih.gov/databases/dkpat25.htm.

National Institute on Alcohol Abuse and Alcoholism (2005b). *Twelve-month prevalence and population estimates of DSM-IV alcohol abuse by age, sex, and race-ethnicity: United States, 2001–2002 (NESARC).* Retrieved April, 25, 2005 from http://www.niaaa.nih.gov/databases/abusdep1.htm.

National Institute on Alcohol Abuse and Alcoholism (2005c). *Twelve-month prevalence and population estimates of DSM-IV alcohol dependence by age, sex, and race-ethnicity: United States, 2001–2002 (NESARC).* Retrieved April, 25, 2005 from http://www.niaaa.nih.gov/databases/abusdep2.htm.

National Institute on Alcohol Abuse and Alcoholism (2005d). *Module10E-Comorbidity of alcohol and psychiatric problems*. Retrieved September 25, 2005 from

http://pubs.niaaa.nih.gov/publications/Social/Module10EComorbidity/Module10E.html.

National Institute of Health. (2003). *Medical encyclopedia, antisocial personality disorder*. Retrieved April 25, 2005 from http://www.nlm.nih.gov/medlineplus/ency/article/000921.htm.

National Mental Health Association. (2005). *Fact sheets: Conduct disorder*. Retrieved August 1, 2005 from http://www.nmha.org/infoctr/factsheets/74.cfm.

Nurnberger, J. I., Foroud, T., Flury, L., Meyer, E. T., & Wiegand, R. (2002). Is there a genetic relationship between alcoholism and depression? *Alcohol Research & Health, 26*, 233-240.

Office of Applied Studies. (2004a). *The NSDUH report: Gender differences in substance dependence and abuse*. Retrieved January 10, 2005 from http://www.oas.samhsa.gov/2k4/genderDependence/genderDependence.cfm.

Office of Applied Studies (2004b). *The NSDUH Report: Female youths and delinquent behaviors.* Retrieved January 10, 2005 from http://www.oas.samhsa.gov/2k4/girlDelinquents/girlDelinquents.pdf.

Popkins, C. L., Rudisill, L. C., Waller, P. F., & Geissinger, S. B. (1988). Female drinking and driving: recent trends in North Carolina. *Accident Analysis and Prevention, 20,* 219-225.

Reiger, D. A., Farmer, M. E., Rae, D. S., Locke, B. Z., Keith, S. J., Judd, L. L., & Goodwin, F. K. (1990). Co-morbidity of mental disorders with alcohol and

other drug abuse: results from the Epidemiologic Catchment Area (ECA) study. *Journal of the American Medical Association, 264*, 2511-2518.

Regier, D. A., & Robins, L. N. (1991). *Psychiatric disorders in America: the epidemiologic Cathment Area Study*. New York, NY: Free Press.

Reinert D. F., & Allen J. P. (2002). The alcohol use disorders identification test (AUDIT): a review of recent investigation. *Alcoholism: Clinical and Experimental Research, 26*, 272-279.

Robins, L. N., & Price, R. K. (1991). Adult disorders predicted by childhood conduct problems; results from the NIMH Epidemiologic Catchment Area Project. *Psychiatry, 54,* 116-132.

Ross, H., & Shirley, M. (1997). Life-time problem drinking and psychiatric co-morbidity among Ontario women. *Addiction*, *92,* 183-196.

Rydelius, P. A. (1981). Children of alcoholic fathers: their social adjustment and their health status over 20 years. *Acta Paediatrica Scandinavica, 286*, 1-83.

Saunders, J. B., Aasland, O. G., Babor, T. F., de la Fuenta, J. R., & Grant, M. (1993). Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption. II *Addiction, 88*, 791-804.

Savada, S. W. (1990). Problem drinking and alcohol-related problems. Widening the circle of covariation. In M. Galanter (Ed.), *Recent developments in alcoholism*. Volume 8. (pp.173-201). New York: Plenum Press.

Schuckit, M. A. (1985). The clinical implications of primary diagnostic groups among alcoholics. *Archives of General Psychiatry, 42,* 2043-1049.

Schuckit, M. A. (1986). Genetic and clinical implications of alcoholism and affective disorder. *American Journal of Psychiatry, 143,* 140-147.

Schutte, K. K., Heart, J., & Moos, R. H. (1997). Gender differences in the relations between depressive symptoms and drinking behavior among problem drinkers: a three-wave study. *Journal of Consulting and Clinical Psychology, 65,* 392-204.

Skaff, M. M., Finney, J. W., & Moos, R. H. (1999). Gender differences in problem drinking and depression: different vulnerabilities? *American Journal of Community Psychology, 27*, 25-54.

Selzer, M. L., Vinokur, A., & van Rooijen, L. (1975). A self-administered Short Michigan Alcoholism Screening Test (SMAAT). *Journal of Studies on Alcohol, 36*, 117-126.

Sobell, L. C., Brown, J., Leo, G. I., & Sobell, M. B. (1996). The reliability of the alcohol Timeline Followback when administered by telephone and by computer. *Drug and Alcohol Dependence, 42*, 49-54.

Sobell, L. C., Maisto, S. A., Sobell, M. B., & Cooper, A. M. (1979). Reliability of alcohol abusers' self-reports of drinking behaviors. *Behavioral Investigation Therapy, 17*, 157-160.

Sobell, L. C., & Sobell, M. B. (1992). Timeline follow-back. In R. Litten & J. Allen, Eds. Measuring alcohol consumption. Totowa, New Jersey: Humana Press.

Sobell, L. C., & Sobell, M. B. (1995). Alcohol consumption measures. In: J. P. Allen, & M. Columbus, (Eds.), *Assessing alcohol problems: a guide for clinicians and investigators* (pp. 55-73). Bethesda, MD: National Institute on Alcohol Abuse and Alcoholism.

Sobell, L. C., & Sobell, M. B. (2000). Alcohol timeline followbak (TLFB). In *Handbook of psychiatric measures* (pp. 477-479). Washington, DC: American Psychiatric Association.

Sobell, M., Sobell, L. C., Klajner, F., Pavan, D., & Baisian, E. (1986). The reliability of a timeline method for assessing normal drinker college students' recent drinking history: utility for alcohol investigation. *Addiction Behavior, 11*, 149-162.

Sobell, L. C., Sobell, M., Leo, G. I., & Cancilla, A. (1988). Reliability of a timeline method: Assessing normal drinkers' reports of recent drinking and a comparative evaluation across several populations. *British Journal of Addiction, 83*, 393-402.

Sommers, M.S. (In press). Measurement of alcohol consumption: issues and challenges. *Annual Review of Nursing Research*, Volume 23.

Sommers, M. S., Howe, S. R., Dyehouse, J. M., Fleming, M., Fargo, J. D., & Schafer, J. C. (2005). Patterns of drinking four weeks prior to an alcohol-related vehicular crash. *Traffic Injury Prevention, 6,* 110-116.

Sommers, M. S., Howe, S. R., Fleming, M., & Fargo, J. D. (In press). Effectiveness of brief interventions following an alcohol-related motor

vehicle crash: A randomized controlled trial with injured patients. *Journal of Trauma.*

Stevens, J. (2002). *Applied multivariate statistics for the social sciences.* Mahwah, New Jersey: Lawrence Erlbaum Associates.

SPSS Inc (2005). SPSS, version 12.

Sullivan, L. E., Fiellin, D. A., & O'Connor, P. G. (2005). The prevalence and impact of alcohol problems in major depression, a systematic review. *The American Journal of Medicine, 118,* 330-341

Tabachnick, B. G., & Fidell, L. S. (2001). *Using Multivariate Statistics*. Fourth edition. Needham Heights: Allen & Bacon.

United States Department of Agriculture. (2005). *Dietary guidelines for Americans 2005. Chapter 9 alcoholic beverages.* Retrieved September 25, 2005 from http://www.health.gov/dietaryguidelines/dga2005/document/html/chapter9.htm.

U. S. Department of Health and Human Services. (1997). *Ninth special report to the U.S. congress on alcohol and health from the secretary of health and human services.* Washington, DC: Author.

U. S. Department of Health and Human Services. (2000). *Tenth special report to the U.S. congress on alcohol and health: highlights from the current research*. Rockville, MD: Author.

Vogeltanz N. D., & Wilsnack S. C. (1997). Alcohol problems in women: Risk factors, consequences, and treatment strategies. In S. J. Gallant, G. P. Keita, & R. Royak-Schaler (Eds.), *Health Care for Women. Psychological, Social, and Behavioral Influences*. Washington DC: American Psychological Association.

Wallace, P., Culter, S., & Haines, A. (1988). Randomized controlled trial of general practitioner intervention in patients with excessive alcohol consumption. *British Medical Journal, 279*, 663-668.

Waller, P., & Blow, F. (1995). Women, alcohol, and driving. In Galanter M (Ed.). *Recent developments in alcoholism*: *Volume 12. Alcoholism and women*. (pp. 103-123). New York: Plenum Press.

Wang, J., & Patten, S. B. (2002). Prospective study of frequent heavy alcohol use and the risk of major depression in the Canadian general population. *Depression and Anxiety, 15*, 42-45.

Wilsnack, R. W., & Cheloha, R. (1987). Women's roles and problem drinking across the lifespan. *Social Problems, 34*, 231-248.

Wilsnack, S. C., Klassen, A. D., Schur, B. E., & Wilsnack R. W. (1991). Predicting onset and chronicity of women's problem drinking: a five-year longitudinal analysis. *American Journal of Public Health, 81,* 305-318.

Wilsnack, R. W., Klassen, A. D., & Wilsnack, S. C. (1986). Retrospective analysis of lifetime changes on women's drinking behavior. *Advances in Alcohol and Substance Abuse, 5,* 9-28.

Wilsnack, S. C., & Wilsnack, R. W. (2002). International gender and alcohol investigation: recent findings and future directions. *Alcohol Research & Health, 26,* 245-250.

Wilsnack, R. W., Wilsnack, S. C., & Klassen, A. D. (1984). Women's drinking and problems: patterns from a 1981 national survey. *American Journal of Public Health, 74*, 1231-1238.

Wilsnack, R. W., Wilsnack, S. C., & Klassen, A. D. (1986). Antecedent and consequences of drinking and drinking problems in women: patterns from a U.S. national survey. *Nebraska Symposium on Motivation*, *34*, 85-158.

World Health Organization (WHO). (1992). *The tenth revision of the international classification of diseases and related health problems* (ICD-10). Geneva: WHO.

World Health Organization (WHO). (2003). *International classification of disease (ICD)*. Retrieved, March 10, 2005 from http://www3.who.int/icd/vol1htm2003/gf10.htm.

World Health Organization (WHO). (2005). *Lexicon of alcohol and drug terms published by the World Health Organization*. Retrieved, March 10, 2005 from http://www.who.int/substance_abuse/terminology/who_ladt/en/.

Zador, P. L. (1991). Alcohol-related relative risk of fatal driver injuries in relation to driver age and sex. *Journal of Studies on Alcohol, 52,* 302-310.

Zoccolillo, M. (1993). Gender and the development of conduct disorder. *Development and Psychology, 5*, 65-78.

Zocolillo, M., Tremblay, R., & Viatro, F. (1996). DSM-III-R criteria for conduct disorder in preadolescent girls: specific but intensive. *Journal of the American Academy of Child and Adolescent Psychiatry, 35,* 461-99.

Appendix A

Scale for Conduct Disorder I

Before you were 15 years old did you:	Yes	No
Skip school more than 10 times	1	2
Get suspended or expelled from school	1	2
Get arrested	1	2
Run away from home overnight more than once	1	2
Vandalize or destroy property	1	2
Start fires	1	2
Shoplift or steal	1	2
Have sexual intercourse with more than one person	1	2
Start Physical fights	1	2

Scale for Conduct Disorder II

After you were 15 years old did you:	Yes	No
Skip school more than 10 times	1	2
Get suspended or expelled from school	1	2
Get arrested	1	2
Run away from home overnight more than once	1	2
Vandalize or destroy property	1	2
Start fires	1	2
Shoplift or steal	1	2
Start Physical fights	1	2

Scale for Depression I

Have you experienced any of these symptoms in the past (except for the past year?)

Loss of appetite or weight loss	1	2	0
Increased appetite or weight gain	1	2	0
Unable to sleep	1	2	0
Unable to sleep through the night	1	2	0
Sleeping too much	1	2	0
Loss of energy, fatigue	1	2	0
Loss of interest or pleasure in sex	1	2	0
Loss of enjoyment of usual activities	1	2	0
Extreme guilt	1	2	0
Feeling worthless	1	2	0
Trouble concentrating or thinking	1	2	0
Thoughts of suicide	1	2	0

Scale for Depression II

In the past twelve months, have you experienced?

Depressive Symptoms	Yes	No
Loss of appetite or weight loss	1	2
Increased appetite or weight gain	1	2
Unable to sleep	1	2
Unable to sleep through the night	1	2
Sleeping too much	1	2
Loss of energy, fatigue	1	2
Loss of interest or pleasure in sex	1	2
Loss of enjoyment of usual activities	1	2
Extreme guilt	1	2
Feeling worthless	1	2
Trouble concentrating or thinking	1	2
Thoughts of suicide	1	2