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Differences in Substance Abuse and Dependence between Veterans and Nonveterans in a National Sample

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by

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A.B., Davidson College, 2003

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An abstract of a thesis submitted to the Faculty of the

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Abstract

Elizabeth McLean Allen

Differences in Substance Abuse and Dependence between
Veterans and Nonveterans in a National Sample

It has been assumed that veterans have higher rates of substance abuse and dependence compared to nonveterans, but there are few comprehensive studies comparing rates between these two groups. Existing literature suggests veterans have higher rates of substance abuse and dependence because they are disproportionately composed of the demographic groups most likely to abuse or be dependent upon illicit drugs or alcohol. However, these studies suffer from limitations due to sample size or composition, obsolete or inconsistent definitions of outcome measures, or few controls for confounders. Using a large, nationally representative dataset, this study improves upon prior research by comparing the likelihood of engaging in heavy drinking and illicit drug or alcohol abuse or dependence between veterans and nonveterans with a more comprehensive analysis examining several measures of substance abuse or dependence and controlling for a wider range of covariates. Using data from the 2001-2007 National Household Survey on Drug Use and Health, this study assesses whether or not veterans have greater odds than nonveterans to drink heavily or to suffer from abuse or dependence of illicit drugs or alcohol within the general adult population and within a subpopulation of adults with serious psychological distress. After conducting a series of multi-stage, multivariable logistic regressions where I control for demographic and socioeconomic characteristics, as well as severity of mental illness and overall physical health, I find veterans in the general population are more likely than nonveterans to drink heavily and to abuse or be dependent upon both illicit drugs and alcohol. Within a subpopulation of adults with serious psychological distress, I find veterans are significantly more likely than nonveterans to drink heavily and abuse or be dependent upon marijuana. These results show veterans are a high risk population for heavy drinking and abuse or dependence of illicit drugs and alcohol.

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List of Abbreviations

DOD	U.S. Department of Defense
DSM-IV	*Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*
MEPS	Medical Expenditure Panel Survey
NHIS	National Health Interview Survey
NHSDA	National Household Survey of Drug Abuse
NSDUH	National Survey on Drug Use and Health
NSDA	National Survey on Drug Use
NSVG	National Survey of the Vietnam Generation
NVVRS	National Vietnam Veterans Readjustment Study
OEF	Operation Enduring Freedom (Afghanistan)
OIF	Operation Iraqi Freedom (Iraq)
PTSD	Posttraumatic Stress Disorder
RTI	Research Triangle Institute
SAMHSA	Substance Abuse and Mental Health Services Administration
SMI	Serious Mental Illness
SPD	Serious Psychological Distress
VA	U.S. Department of Veterans Affairs

Introduction

It is widely assumed that veterans have higher rates of substance abuse and dependence than nonveterans, even though few comprehensive studies comparing the two groups have been conducted (Robins, Helzer, & Davis, 1975). Much of the existing literature examines substance abuse and dependence within the veteran population or within other special subpopulations, with no distinction made for veteran status. Studies that do compare rates of substance abuse and dependence between veterans and nonveterans have produced mixed results: some find veterans are more likely than nonveterans to abuse or be dependent upon illicit drugs or alcohol until controlling for basic demographics, such as age and gender (Boscarino, 1979a, 1981a, 1981b). They suggest veterans have higher rates of substance abuse and dependence not because of their previous military experience, but because they are disproportionately comprised of the demographics most likely to abuse and be dependent upon illicit drugs and alcohol. Yet others studies find these differences remain even after controlling for demographics (Richards, Goldberg, Anderson, & Rodin, 1990; Richards, Goldberg, Rodin, & Anderson, 1989). Each study suffers from several major limitations due to sample size, problems with outcome measures, or few controls for potential confounders.

This study seeks to compare the odds of substance abuse and dependence between veterans and nonveterans within a national sample by controlling for a wide range of demographic and socioeconomic covariates. Given the well documented relationship between mental illness and substance abuse and dependence within the general population (Epstein, Barker, Vorburger, & Murtha, 2004; Harris & Edlund, 2005), as well as the growing rates of mental illness among younger veterans (Seal et al., 2009), this study will also examine potential associations between mental illness and substance abuse and dependence in both the general population and within a subpopulation of adults with serious psychological distress (SPD).

Literature Review

Substance Use among Veterans and Nonveterans

Approximately 21.8 million people over the age of 12, or 8.7 percent of the general U.S. population, were current (i.e., past month) users of illicit drugs in 2009, an increase from 19.5 million, or 8.3 percent in 2002 (SAMHSA, 2003b, 2010). While rates of use have increased, rates of substance abuse or dependence have remained fairly stable since 2002. In 2009, 22.5 million, or 8.9 percent of the population, abused or were dependent upon illicit drugs or alcohol, compared to 22 million or 9.4 percent in 2002 (SAMHSA, 2010). In contrast, abuse or dependence of pain relievers has increased, from 1.5 million in 2002 to 1.9 million in 2009 (SAMHSA, 2010). This continues a trend from the previous decade, where the prevalence of non-medical prescription drug use disorders increased by 67 percent between 1991 and 2002 (Blanco et al., 2007).

Substance use among current and former military personnel has been increasing, as well. Findings from the 2008 Department of Defense (DOD) Health Behavior Survey found rates of heavy alcohol use among active duty military personnel increased significantly between 1998 and 2008, and non-medical use of prescription drugs almost tripled from 2005 to 2008 (Bray et al., 2010). Analysis of substance use disorder diagnoses among veterans of the wars in Afghanistan (OEF) and Iraq (OIF) suggests these trends continue even after military personnel separate from active duty. Within this group, rates of new alcohol use disorders diagnoses increased from 1.1 percent to 7.1 percent and rates of new drug use disorder diagnoses increased from 0.2 percent to 3.0 percent between 2002 and 2008 (Seal, et al., 2009). Across all veterans, diagnoses of opioid dependence increased 7.3 percent between 2003 and 2005 (Gordon et al., 2007).

Differences between Veterans and Nonveterans

Concerns about substance use, abuse, and dependence among active duty personnel and veterans have persisted for more than a century (Bachman, Freedman-Doan, O'Malley, Johnson, & Segal, 1999). Alcoholism among Civil War veterans was a concern even after they had reached old age (Achenbaum, Howell, & Parker, 1993). Additionally, when the U.S. Army began testing soldiers returning from combat duty in Vietnam for drugs, the 5 percent prevalence for tests positive for heroin prompted widespread concern and a special study mandated by the White House Special Action Office for Drug Abuse Prevention (Robins, et al., 1975).

Unadjusted Comparisons

Some of these straightforward rates come from population-based surveys, such as the 2002-2003 National Survey on Drug Use and Health (NSDUH), which showed veterans were more likely than nonveterans to smoke frequently, drink heavily, use marijuana, and drive under the influence of drugs or alcohol (SAMHSA, 2005a, 2005b; Wagner et al., 2007). These results are based on the prevalence of certain outcomes within the veteran population; when they are compared to the prevalence of the same outcomes within the civilian population, there is usually no consideration of any potential confounding factors. There is often no consideration of any demographic differences which may contribute to the likelihood of drug or alcohol abuse/dependence among veterans and nonveterans. Both Nace et al. and Ballweg et al. compare drug and alcohol related outcomes between active duty military personnel and civilians without controlling for any demographic characteristics (Ballweg & Li, 1989; Nace & Meyers, 1974).

Comparisons Adjusting for Demographic Differences

Some of the earliest research comparing rates of drug and alcohol abuse/dependence between veterans and nonveterans focused on the Vietnam War generation. Despite prevailing public opinion that veterans as a whole were drug addicts and alcoholics (Robins, 1993; Robins, et al., 1975), several

studies showed any differences in drug and alcohol abuse/dependence between veterans and nonveterans decreased considerably or lost significance completely after controlling for demographics (Boscarino, 1979b, 1980, 1981a). Subsequent studies continued to adjust their comparisons for demographic differences, but they often found significant differences between veterans and nonveterans remained even after including these controls (Richards, et al., 1990; Richards, et al., 1989; Tessler, Rosenheck, & Gamache, 2005; Wagner, et al., 2007). Exactly how they controlled for these demographic differences and the number of demographics they included varied considerably.

The four most prevalent methods used to control for demographic differences among the studies included in this literature review are sample restriction, matching, statistical adjustment (e.g., weighting or standardizing), and controlling through multivariable regression analysis. The most commonly used method was sample restriction. Most of the studies reviewed in this chapter that limited their samples did so on gender only (Boscarino, 1979b; Winkleby & Fleshin, 1993). Others limited their samples using a combination of gender and age (Polich, 1981; Richards, et al., 1990; Richards, et al., 1989; Tessler, et al., 2005), or gender and race (Goldberg, Richards, Anderson, & Rodin, 1991).

Another common method was performing statistical adjustments on data to create samples of veterans and nonveterans that resembled each other based on certain characteristics. Jordan et al. standardized both nonveterans and Vietnam era veterans to Vietnam theater veterans by age, race/ethnicity (men only), and occupation (women only) (Jordan et al., 1991). Wagner et al. adjusted the nonveterans in their sample to match veterans on age, gender, and geographic region; they also used weighting techniques to control for factors related to the complex survey design for their data (Wagner, et al., 2007). Another method of controlling for the potential influences of confounding variables was through multivariable analysis, such as stepwise multiple regression or logistic regression. These models enabled controls for more variables, such as demographics, socioeconomic

status, and geographic region (Boscarino, 1979b, 1980, 1981a; Richards, et al., 1990; Richards, et al., 1989).

The majority of studies controlled for demographics through a combination of techniques, such as matching on age and adjusting data on other variables, such as gender and ethnic composition (Norquist, Hough, Golding, & Escobar, 1990). Others restricted their samples and performed statistical adjustments on their data (Boscarino, 1979a; Polich, 1981). Several used multivariable analyses in combination with either sample limitation (Richards, et al., 1990; Richards, et al., 1989; Tessler, et al., 2005) or statistical adjustment (Boscarino, 1980, 1981a, 1981b).

Even though the majority of studies examining the differences in drug and alcohol abuse/dependence between veterans and nonveterans do control for demographic factors, the range of variables considered is limited. They control for some combination of the following: (1) demographics (i.e., gender, age, marital status, race, and ethnicity), (2) socioeconomic status (i.e., income, education, and occupation (one study only and limited to women)), and (3) geography (i.e., U.S. region and urban vs. rural location).

Differences in the Prevalence of Mental Health Problems

Mental illness affects more veterans than nonveterans. The 2002-2003 NSDUH estimated male veterans aged 18-25 had higher rates of serious mental illness (SMI), a designation of mental, behavioral, or emotional disorders severe enough to limit major life activities, than their nonveteran counterparts in the same age cohort as well as older veterans (SAMHSA, 2004). This group of veterans was also more likely to have a co-occurring SMI and substance abuse disorder (SAMHSA, 2004). An estimated 340,000 male veterans of all ages suffered from both substance abuse disorder and SMI (SAMHSA, 2004).

Among veterans and military personnel, combat deployments have been shown to be positively associated with increased rates of mental illness. Using logistic regression to control for age, gender, ethnicity, marital status during deployment, education, branch of service, rank, duty

(i.e., active duty, National Guard, or Reserve), and other deployments, Fiedler et al. found differences in mental illness between combat veterans who had been deployed to the first Gulf War compared to Gulf War era veterans who had not been deployed (Fiedler et al., 2006). Ten years after deployment, combat veterans had almost twice the rates of past-year anxiety disorders and depression than non-deployed veterans of the same era (Fiedler, et al., 2006).

Similar associations between combat deployments and mental illness have been observed among veterans of the current wars in Iraq and Afghanistan. Seal et al. found among this group of veterans seeking care through the Department of Veterans Affairs (VA) health system, new mental health diagnoses increased from 6.4 percent in 2002 to 36.9 percent in 2008 (Seal, et al., 2009). Identified mental health problems are also more complex, as the majority of those with new mental health diagnoses had two or more comorbid mental health conditions (Seal, et al., 2009). After stratifying by component type (i.e., active duty, National Guard, or Reserve) and adjusting for socioeconomic, demographic, military service factors (age, gender, race/ethnicity, marital status, rank, branch of service, multiple deployment experience) and calendar quarter of first visit to a VA medical facility, Seal et al. found the youngest group of veterans (age 16-24) had almost twice the risk for diagnoses of Posttraumatic Stress Disorder (PTSD), more than twice the risk for diagnosis of alcohol disorder, and almost five times the risk for drug use disorder diagnoses, compared to veterans older than 40 years (Seal, et al., 2009).

These differences in rates of mental illness between veterans and nonveterans are important to consider because research has reported consistent associations between mental illness and substance use disorders. Within the general population, approximately one-quarter of adults suffer from symptoms of mental illness, but among those with a substance use disorder, almost half have mental health problems (Harris & Edlund, 2005). Within the general population, those with depression are up to 9 times more likely to be dependent upon or abuse drugs and/or alcohol (Karney, Ramchand, Osilla, Caldarone, & Burns, 2008). Research has found that mental illness is associated

with an increase of both initiation and continuation of regular opioid use (Sullivan, Edlund, Zhang, Unutzer, & Wells, 2006), as well as non-medical use of sedatives and tranquilizers (Becker, Fiellin, & Desai, 2007).

Furthermore, as the severity of mental illness increases, so do the rates of substance use disorders. In the general population, 4.3 percent of adults suffer from a substance use disorder, but that rate is almost double among those with symptoms of mental illness (7.7 percent) (Harris & Edlund, 2005). Among those with SMI, 15.1 percent have a comorbid substance use disorder (Epstein, et al., 2004; Harris & Edlund, 2005).

Comparing Veterans and Nonveterans: Gaps in Existing Literature

Despite the extensive descriptive data on substance use and mental illness in the literature, there is little addressing the interplay between the two within the veteran population, and even less comparing this population to their nonveteran counterparts. The few studies that do compare substance use and dependence between veterans and nonveterans suffer from limitations that restrict the generalizability of their results.

Early Studies: 1970s-1980s

Some of the earliest studies that determined differences in rates of alcohol and substance use between veterans and nonveterans originated from reports that soldiers were returning from the Vietnam War addicted to drugs, most notably heroin (Robins, et al., 1975). One of the earliest studies comparing veterans to nonveterans focused on just this problem. In an analysis of soldiers returning from Vietnam who reported to Army medical facilities for problems related to substance use, one-third reported becoming addicted to heroin while in Vietnam (Nace & Meyers, 1974). The study sought to determine if these combat veterans were different from chronic addicts among civilians based on certain characteristics believed to be determinants of prognosis, specifically levels of education, employment, socioeconomic status, military service, family stability during childhood and adolescence, antisocial behavior, and age of first drug use and addiction (Nace & Meyers, 1974).

The study found this group of combat veterans fared better than civilian addicts in terms of education, employment, socioeconomic status, military history, and family stability; they were no different than civilian addicts in regard to antisocial behavior, age of first drug use, age of first use of narcotics, and age of addiction (Nace & Meyers, 1974). These results are not generalizable to the larger veteran population for several reasons. First, the sample size was too small (n=101) and was taken from only treatment-seeking individuals. The characteristics examined in this study may be different for individuals who seek treatment compared to those who do not. Second, the sample included only currently active duty Army enlistees who had returned from the Vietnam War, and is not representative of all veterans, combat veterans, or even combat veterans from the Vietnam War. Third, the study based its comparisons to civilian addicts on findings in the literature and did not actually compare individuals similar to the study's subjects.

Later studies of Vietnam veterans did include nonveteran counterparts in their samples. Boscarino published several studies in the late 1970s and early 1980s examining differences in rates of alcohol and substance abuse between veterans and nonveterans. Three of these studies were based on data from a national survey conducted in 1974-1975 to assess attitudes and behaviors related to legal and illegal psychoactive substances (Boscarino, 1979a, 1979b, 1980). Two others used data from the 1977 National Survey on Drug Abuse (NSDA) (Boscarino, 1981a, 1981b). Boscarino contended that veterans had higher rates of alcohol and drug abuse not because they were veterans, but because they were disproportionately composed of the demographics most likely to abuse drugs and alcohol: young, unmarried men (Boscarino, 1979a, 1979b). In all four studies comparing alcohol consumption or abuse between veterans and nonveterans, Boscarino found the veterans in his sample were more likely than nonveterans to either drink more heavily or abuse alcohol (Boscarino, 1979a, 1980, 1981a, 1981b). When he began controlling for demographics, however, these differences decreased (Boscarino, 1979a), were significant for only certain measures of alcohol use (Boscarino, 1981a), or lost significance completely (Boscarino, 1979b, 1981b). His findings for drug involvement

were mixed. In one, he found both Vietnam era and Vietnam theater veterans had higher rates of drug involvement than nonveterans, even after adjusting for covariates (Boscarino, 1981a). In another, he found the same trend as in his studies of alcohol use, where veterans had significantly higher rates of drug use than nonveterans until controlling for demographics (Boscarino, 1979b).

Boscarino's studies suffer from several methodological issues and other limitations, some of which Richards et al. explain in relation to their own findings (Richards, et al., 1989). One of the main limitations of Boscarino's results is sample size. For the three studies based on the survey conducted in 1974-1975, the total sample was just over 3,000, with the number of veterans ranging from 105 (when limited to Vietnam veterans) (Boscarino, 1979b) to 681 (Boscarino, 1979a, 1980). Sample sizes from the 1977 NSDA were similar (veterans n=684, nonveterans n=2,609).

Additionally, across all five of Boscarino's studies, he made most of his comparisons based upon cross-tabular analyses of veteran status for one demographic variable at a time, which limits the granularity of demographic comparisons considerably. For example, he compared two age groups, those under 35 and those 35 and older; education as less than a high school education and more than a high school education; and marital status as married compared to unmarried (Boscarino, 1979a, 1979b, 1981b). He performed stepwise regression analysis in three of his studies, which allowed him to add more detail to his demographics, such as education, income, and age (Boscarino, 1979b, 1980, 1981b), but other demographics were measured much more broadly, such as race (white vs. non-white) and geographic region (north vs. south).

There are additional limitations specific to each study. In his first comparison of rates of alcohol abuse, Boscarino used a definition of alcohol abuse that, while appropriate for the time, is now obsolete and makes the results incomparable to more recent studies (Boscarino, 1979a). In his study of drug use, he compared Vietnam veterans to non-Vietnam veterans, a category that includes nonveterans as well as veterans from other wars or eras (Boscarino, 1979b). This limits comparability of the results to only Vietnam veterans. The results of this study are made even more incomparable by

the outcome variable: "current drug involvement" is defined by a cumulative index which measures a combination of frequency of use and intention for future use of 12 groups of drugs weighted by the severity of the drug in terms of "potential psychopharmacological and social impact" (Boscarino, 1979b). While he did use the same scale in another study (Boscarino, 1981a), it is not validated in other studies, nor is it used as an outcome in other research, which makes the results incomparable to other studies.

The studies that followed Boscarino's examined differences in alcohol use between military personnel and civilians instead of veterans and nonveterans (Ballweg & Li, 1989; Polich, 1981). These found higher rates of alcohol use among military personnel than civilians; but, like Boscarino, Polich found the differences decreased after standardizing the military population to match civilians in age, education, and marital status (Polich, 1981). Unlike Boscarino, who determined the differences were no longer statistically significant in three of his studies (Boscarino, 1979b, 1980, 1981b), Polich was unable to report statistical significance. Polich established rates of problem drinking among Air Force personnel only and then compared these rates to results from several other studies (of civilians and other military branches); consequently, he was unable to conduct any statistical analysis to determine if the differences were significant. The results are based on standardizing the military population on the civilian demographic distributions for age, education, and marital status (Polich, 1981). His results showed even after standardizing to civilian demographics, military personnel had higher rates of problem drinking than civilians, though it is unknown whether the differences are significant.

In their study comparing health habits of military personnel and civilians, Ballweg et al. found drinking was more prevalent among active duty military personnel compared to civilian men, as fewer military men were non-drinkers (Ballweg & Li, 1989). However, their study design limits the generalizability of their results. Ballweg et al. used data from two different surveys: data on military personnel came from the 1985 Worldwide Survey of Alcohol and Nonmedical Drug Use

among Military Personnel, and civilian data came from the 1985 NHIS Health Promotion and Disease Prevention Survey (Ballweg & Li, 1989). The surveys used different methods to quantify number of drinks per day and to define "non-drinkers." These differences affect the validity of comparisons. Additionally, they controlled for demographics by comparing rates of drinking within military or civilian populations (e.g., rates of drinking among military personnel by age category), but not when comparing rates between the two (Ballweg & Li, 1989).

Using the previous studies as a base for comparison, Richards et al. use the National Health Interview Surveys (NHIS) from 1977, 1983, and 1985 to examine differences in alcohol consumption between veterans and nonveterans and between Vietnam era veterans and nonveterans (Richards, et al., 1990; Richards, et al., 1989). In both studies, after controlling for demographics (i.e., age, geographic region, urbanization, ethnicity, marital status, education, and income), veterans were more likely than nonveterans to drink heavily and report adverse consequences related to their drinking, such as family or marital problems, an alcohol-related motor vehicle crash, or alcohol-related health problems (Richards, et al., 1990; Richards, et al., 1989). These results differ from Boscarino's findings and suggest differences between veterans and nonveterans in regard to alcohol consumption do exist, even after adjusting for demographics.

Although these two studies improved on previous studies with much larger sample sizes for veterans (veterans n=8,214 in (Richards, et al., 1989) and veterans n=2,874 in (Richards, et al., 1990)), they suffer from a few key limitations. Even though they control for several demographics, they do not define each category, so the detail of comparisons is unknown. Additionally, the generalizability of results is limited due to the restriction of the sample to white men (Richards, et al., 1989) or to men born after 1938 to produce a population of Vietnam era veterans or comparable nonveterans who were eligible for military service during that era (Richards, et al., 1990). Richards et al. were able to justify limiting their samples by gender and race, but the demographics of

military personnel, and consequently, veterans, have changed since the late 1970s to mid-1980s when their data were collected.

Research from the 1990s

Throughout the 1970s and 1980s, comparative studies between veterans and nonveterans focused primarily on alcohol use, abuse, and dependence, with only two studies addressing illicit drug use. After the National Vietnam Veterans Readjustment Study (NVVRS) and its interview component, the National Survey of the Vietnam Generation (NSVG), were completed in the late 1980s, researchers had more data related to both substance use and psychological problems suffered by Vietnam veterans and comparable nonveterans. Jordan et al. used these data to compare lifetime and current rates of several psychiatric disorders in addition to alcohol and drug abuse/dependence between Vietnam era veterans and nonveterans (Jordan, et al., 1991). More specifically, they stratified the sample to Vietnam theater veterans, Vietnam era veterans, and nonveterans; they also standardized the era veterans and nonveterans to theater veterans based on age. Additionally, they standardized male era veterans and male nonveterans to male theater veterans on race/ethnicity and female era veterans and female nonveterans to female theater veterans on occupation, as over 80 percent of female theater veterans were nurses (Jordan, et al., 1991).

Compared to male civilians, male theater veterans had higher lifetime rates of antisocial personality disorder, alcohol abuse/dependence, major depressive episode, obsessive-compulsive disorder, and dysthymia (Jordan, et al., 1991). There were no differences between theater veterans and nonveterans for lifetime rates of drug abuse or dependence, nor were there any significant differences between theater and era veterans. Compared to both era veterans and civilians, male theater veterans had higher rates of current major depressive episode, obsessive-compulsive disorder (compared to era veterans) and antisocial personality disorder (compared to civilians) (Jordan, et al., 1991). There was no difference in current alcohol or drug abuse or dependence between veterans and nonveterans. Among female veterans, lifetime rates for alcohol abuse or dependence and lifetime and

current rates for depression were higher for theater veterans than other veterans or nonveterans (Jordan, et al., 1991). The higher rates of lifetime alcohol abuse or dependence among all theater veterans confirmed Boscarino's findings that differences exist between veterans and nonveterans prior to controlling for demographics, but not his findings about illicit drug abuse or dependence. Additionally, these studies do not control for any demographics other than those used to standardize the samples, so it is unknown whether or not these differences would hold after a more detailed analysis.

While the NVVRS has several benefits over other surveys, such as more detailed information about military service, psychological problems, and substance use, it has its limitations. While there are 2,348 veterans included in this sample, there are only 668 nonveterans included, which may limit generalizability. Additionally, Jordan et al. do not control for any demographics or other covariates other than those used to standardize the samples; they do separate analysis by gender and race/ethnicity, but do not consider any other factors (Jordan, et al., 1991). This study is important, though, as it is the first to examine both substance use and mental illness between veterans and nonveterans.

Norquist et al. also compared rates of mental illness between veterans and nonveterans using data gathered through a survey of adults in five U.S. cities (New Haven, CT; Baltimore, MD; St. Louis, MO; Piedmont, NC; and Los Angeles, CA) (Norquist, et al., 1990). They compared lifetime and six-month prevalence of psychiatric disorders between veterans of several eras (World War II, Korea, Vietnam, and post-Vietnam) to nonveterans matched on age (Norquist, et al., 1990). The data were also weighted to age, gender, and ethnic composition of the communities surveyed, and the estimates produced were standardized by race to the total male population cross the five sites. The only age group to show a statistical difference in substance use disorders, either drug or alcohol, between veterans and nonveterans was the post-Vietnam era group. Veterans in this age group had higher rates of lifetime drug and alcohol abuse/dependence than nonveterans (Norquist, et

al., 1990).The results were similar for six-month prevalence, where post-Vietnam era veterans had higher rates of substance use disorders than nonveterans of the same era (Norquist, et al., 1990). There were no differences between veterans and nonveterans of any other era (Norquist, et al., 1990).

While Norquist et al. benefit from a large sample size (veterans n=2,738, nonveterans n=4,165) their data come from five cities and are not a true national sample. Through matching and other statistical adjustments, Norquist et al. control for age, gender, and ethnic composition of their survey respondents. However, because they control for only three demographic characteristics, many characteristics that may influence rates of drug or alcohol abuse or dependence remain uncaptured.

In a similar vein as Richards et al. and Norquist et al., Winkleby et al. surveyed homeless men in Santa Clara County, CA during the winter of 1989-1990 and found veterans (both combat and non-combat) were more likely than nonveterans to report using alcohol excessively prior to losing shelter, but this difference was only perceived, as there was no statistically significant difference in actual use between groups (Winkleby & Fleshin, 1993). Based on self-report, combat veterans had higher rates of psychiatric hospitalizations and physical injuries than nonveterans and non-combat veterans (Winkleby & Fleshin, 1993). Though rates of illicit drug use were lower among veterans than nonveterans, the difference was not statistically significant (Winkleby & Fleshin, 1993).

While this study is a good illustration of substance use and psychiatric hospitalizations among the homeless in one geographic location, it is not generalizable to the larger veteran or adult population. Additionally, it is limited by not controlling for any demographics other than type of veteran (combat vs. non-combat).

Using results from the 1977, 1983, and 1985 NHIS, Goldberg et al. examined levels of alcohol consumption in a cohort of men born between 1950-1952 (Goldberg, et al., 1991). Men from this cohort were included in the Vietnam War draft in the years 1970-1972, when eligibility was determined by birth date through a lottery (Goldberg, et al., 1991). Goldberg et al., used draft eligibility (the lottery numbers called up each year) as a way to control for any characteristics or

experiences which may have preceded military service (Goldberg, et al., 1991). They found no difference in levels of alcohol consumption between draft-eligible and ineligible men (Goldberg, et al., 1991). They did find a significant association between previous military service and alcohol consumption, with veterans more likely than nonveterans to be heavy drinkers (Goldberg, et al., 1991).

This study employs unique controls for demographics and other characteristics that may influence alcohol consumption, using what the authors call a "natural experiment" (Goldberg, et al., 1991), and their results suggest previous military service is associated with levels of alcohol consumption. They do not take into consideration other factors that may have influenced whether or not a draft-eligible man actually entered the military (e.g., failure to meet physical/mental health requirements, educational deferments, etc.). Consequently, their results may suffer from omitted variable bias.

More Recent Research: 2000s

In the past decade, only two studies with the express purpose of determining differences in rates of alcohol and substance abuse/dependence between veterans and nonveterans have been conducted. There has been extensive research on mental illness and substance use among veterans and within other subpopulations, such as women and teenagers, but very little has been done to compare veterans and nonveterans.

Tessler et al. use data from the 1994, 1997, and 1998 National Household Survey of Drug Abuse (NHSDA) to compare rates of drug or alcohol use and rates of treatment between veterans and nonveterans (Tessler, et al., 2005). They found the veterans in their sample were *less* likely than nonveterans to report any past year illicit drug use, but *more* likely to report daily or almost daily alcohol use. Additionally, in comparing results from each of the three survey years, they found the proportion of veterans who reported illicit drug use and daily or almost daily alcohol use increased

from 1994 to 1998 (Tessler, et al., 2005). Among nonveterans, rates of illicit drug use increased significantly, but daily or almost daily drinking declined (Tessler, et al., 2005).

These findings confirm previous research suggesting differences in alcohol and drug use exist between veterans and nonveterans. However, because they did not control for any demographic variables, it is unknown whether or not the veterans in this sample have different rates than nonveterans due to differences in their demographic composition. While the study benefits from a large sample size (veterans n=2,462, nonveterans n=10,018) and from the fact NHSDA is a nation-wide survey, additional research is needed to assess whether these differences persist after adjusting for age, gender, and other key demographic variables.

Wagner et al. compared the prevalence of substance use disorders between veterans and nonveterans, using data from the National Survey on Drug Use and Health (NSDUH) from years 2000 to 2003 to do so (Wagner, et al., 2007). This is the same nation-wide, annual study as the NHSDA, only renamed, so it provides a large sample (pooled across years, veterans n=12,072, nonveterans n=184,339). It also has many different measures of alcohol and substance use, including past month use, past year use, and past year abuse and dependence.

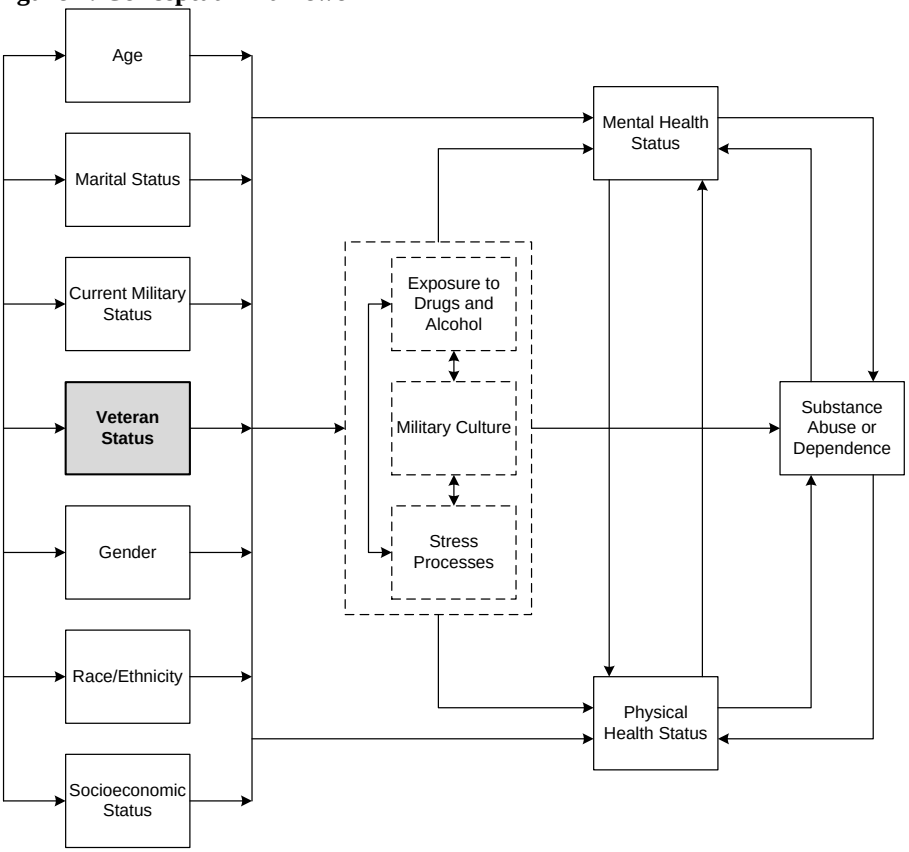
Compared to nonveterans, veterans in this sample had significantly higher rates of past month alcohol use, heavy alcohol use, daily smoking, and marijuana use (Wagner, et al., 2007). However, there were *no differences* between veterans and nonveterans in any measure of past year use of alcohol or illicit drugs, alcohol abuse or dependence, or illicit drug abuse or dependence (Wagner, et al., 2007). Because these results come from a national survey, are based on a large sample size, and are more recent, they are more generalizable to the larger veteran population. However, they are limited because the study adjusted only for age, gender, and geographic region (Wagner, et al., 2007). Additional research is needed to adjust for other important demographic and health measures that may confound the relationship between veteran status and substance abuse/dependence such as race/ethnicity, marital status, education, and measures of socioeconomic status.

A consistent finding across all of these studies is that there are differences in rates of alcohol or drug abuse/dependence between veterans and nonveterans when making unadjusted comparisons, but these differences are generally no longer significant after controlling for demographic variables such as age, gender, and education. To address this gap in the literature, this study assesses whether or not these differences persist after a more thorough and detailed analysis. Specifically, this study improves upon others by examining several different dependent variables that measure rates of heavy alcohol use as well as past year abuse or dependence of illicit drugs or alcohol. The analysis will use a model building approach and will sequentially adjust for more covariates than previous studies: measures of current military status, demographics, and socioeconomic status. Unlike previous studies, this analysis will also control for mental and physical health. Additionally, this analysis will provide a more robust investigation by analyzing both the full population of adults and a subpopulation with serious psychological distress.

Conceptual Framework

The literature identifies several variables correlated with veteran status and substance abuse or dependence, as well as several key pathways that should be considered. The following conceptual framework illustrates these proposed pathways (Figure 1).

Figure 1: Conceptual Framework



Confounders

Age

Overall, younger adults tend to use alcohol and illicit substances more frequently and at greater rates than older adults (Jacobson et al., 2008). This holds true among the veteran population, as well. Among OEF/OIF veterans seeking care at VA health care facilities, those aged 18-24 had the highest risk of being diagnosed with a mental health problem, especially PTSD (Seal, Bertenthal, Miner, Sen, & Marmar, 2007). Adults aged 18 to 25 have the highest rates of illicit drug use, both across the general population and among veterans (SAMHSA, 2001b, 2002b, 2010). One consideration for this research is that veterans are disproportionately older than the rest of the population, which is reflected in population-based surveys (Tessler, et al., 2005; VA, 2001; Wagner, et al., 2007).

Gender

Numerous studies have found differences in rates of both mental illness and substance use between men and women. While women have higher rates of mental illness than men (SAMHSA, 2003a), men tend to use alcohol and illicit substances at greater rates than women, though the prevalence among women is increasing (SAMHSA, 2009b). Men are almost twice as likely as women to abuse or be dependent upon illicit drugs or alcohol (SAMHSA, 2010). The types of drugs used often differ between the genders, as well. Becker et al. found women had higher rates of non-medical sedative and tranquilizer use than men; Gearon et al. found men were more likely than women to meet criteria for marijuana dependence while women were more likely to meet criteria for heroin dependence (Becker, et al., 2007; Gearon, Nidecker, Bellack, & Bennett, 2003).

Other Demographics and Socioeconomic Factors

Rates of substance use disorders vary by a variety of demographic and socioeconomic factors, including race/ethnicity, marital status, education levels, employment, and income. In a study of the 12-month and lifetime prevalence of substance use disorders, Compton et al. found Native Americans had the highest rates of drug use disorders for both time periods (Compton, Thomas, Stinson, & Grant, 2007). A national study of nonmedical prescription drug use found Hispanics were more likely to report use than African-Americans and Asians, but less likely than whites (Ford & Rivera, 2008).

Illicit substance abuse tends to be more prevalent among those with incomes less than $20,000, less education, and those who are unemployed (Compton, et al., 2007; SAMHSA, 2009b). In contrast, those abusing alcohol are often more likely to be employed, married, and to have completed high school (Jacob, Blonigen, Koenig, Wachsmuth, & Price, 2010). Younger alcoholics are more likely to have completed college and to be married (Jacob, et al., 2010).

Mediating Pathways

Substance Use and Mental Illness in the Veteran Population

Even though rates of comorbid mental illness and substance use are highest among younger veterans, all ages are affected. Studies conducted among Vietnam veterans support the intertwined relationship between substance abuse disorder and SMI. Among veterans from this era, 30.3 percent had a substance or alcohol disorder (Crawford, Drescher, & Rosen, 2009). Additionally, 75 percent of those who had suffered at some point from PTSD also suffered from substance or alcohol abuse (Tanielian & Jaycox, 2008), and their mortality rates were almost twice the expected rate for all men (Boscarino, 2006; Crawford, et al., 2009). Additionally, veterans from this era, who are now in their 50s and 60s, make up half of all VA psychiatric and substance abuse patients (Rosen, Kuhn, Greenbaum, & Drescher, 2008).

Much of the existing research comparing rates of substance use among veterans and nonveterans with mental illness has been limited to studies of individuals with PTSD. Among those with PTSD, Vietnam veterans are more likely than civilians to be heavy drinkers, use narcotics or other hard drugs, and are more likely to have smoked cigarettes heavily, even after controlling for certain demographics and other potential confounders (Boscarino, 2006).

Other studies of Vietnam veterans with PTSD have found that as mental illness symptoms increase in severity, so do rates of substance use. In a retrospective analysis of PTSD symptoms and substance abuse among Vietnam veterans, Bremner et al. found respondents' PTSD symptoms increased steadily in the first few years after deployment and then became chronic (Bremner, Southwick, Darnell, & Charney, 1996). The respondents also reported alcohol and substance abuse increased along with their PTSD symptoms (Bremner, et al., 1996). Rates of lifetime substance dependence were high among this group: 79 percent had been diagnosed with alcohol dependence at some point, 34 percent had been diagnosed with cocaine dependence, 32 percent with sedative dependence, and 30 percent with dependence on more than one substance (Bremner, et al., 1996).

Military Culture and Exposure to Drugs and Alcohol

The higher rates of both mental illness and substance use among veterans may have their roots in unquantifiable aspects of military culture. The association between drug and alcohol use and the military goes back throughout history. Providing soldiers alcohol and cigarettes was often viewed as an important component for maintaining morale, especially during wartime (Bachman, et al., 1999; Smith & Malone, 2009). Cigarettes were included in K-rations and C-rations during World War I and World War II (McKinney, McIntire, Carmody, & Joseph, 1997). Even more recently, tobacco companies aggressively targeted deployed troops and their families, giving away free cigarettes and ways for troops to communicate with their families during the first Gulf War in 1990-1991 (Smith & Malone, 2009). Despite the military's attempts to reduce smoking among its active duty personnel, evidence suggests military commanders enabled this practice among deployed troops (Smith & Malone, 2009).

While tobacco use is a legitimate public health problem, nicotine addiction is less of a concern than alcohol and illicit drug abuse and dependence. Active duty military personnel are exposed to both alcohol and drugs at varying rates during their careers. This exposure has the potential to influence alcohol and drug usage after separating from the armed forces. In one study examining military culture and drinking, Ames et al. found rates of alcohol abuse among active duty Navy careerists were 28 percent for men and 15 percent for women, which is higher than the rates for similarly aged civilians (Ames, Cunradi, Moore, & Stern, 2007). The difference between genders disappeared when it came to heavy drinking or heavy episodic drinking (Ames, et al., 2007). Through interviews with Navy careerists, Ames et al. found an association between these drinking behaviors and beliefs about peer approval and expected drinking while on liberty (Ames, et al., 2007).

Even though non-deployed military personnel are exposed to illicit drugs, as indicated by the recent increase in prescription drug misuse, evidence suggests deployment may bring additional opportunities for exposure (Bray, et al., 2010). Vietnam theater veterans were exposed to many

different types of illicit drugs during their tours of duty, including barbiturates and amphetamines. The most commonly used illicit drug, however, was heroin (Robins, et al., 1975). Interviews with almost 900 Vietnam veterans identified reasons for abusing heroin and other illicit drugs. Almost half of all Vietnam veterans interviewed reported having tried any narcotic at least once, and twenty percent of all veterans reported being addicted to heroin while in Vietnam (Robins, et al., 1975). Veterans commonly reported using heroin for its "euphoria-producing effects" and for dealing with boredom, depression, and fear (Robins, et al., 1975).

Stress Processes Unique to Military Personnel

Military personnel are exposed to stressors their civilian counterparts do not experience, such as combat deployments, separation from family, and jobs subject to great danger and extreme pressure (Ames, et al., 2007; Blume, Schmaling, & Russell, 2010; Bray, Fairbank, & Marsden, 1999). These stressors have been linked to cigarette, alcohol, and illicit substance use among active duty military personnel. In studies of perceived stress and substance use, Bray et al. found both men and women experienced high levels of stress related to their work in the military (Bray, et al., 1999). These types of stress were related to deployment, permanent change of station, problems with superiors, and concerns about future separation from the military (Bray, Camlin, Fairbank, Dunteman, & Wheeless, 2001). Stressors related to combat deployments have been associated with increased alcohol abuse or dependence among Vietnam theater veterans compared to Vietnam era veterans (Jordan, et al., 1991). More recently, in a comparison of alcohol use before and after deployment, Blume et al. found younger, non-active duty (i.e., Reserves or National Guard personnel) male soldiers reporting more general stress after deployment were more likely than others to drink heavily per occasion (i.e., binge drinking) (Blume, et al., 2010).

Compared to active duty men reporting low stress at work, men experiencing high work-related stress were more likely to use alcohol heavily, smoke cigarettes, or use illicit drugs (Bray, et al., 1999). Women in the military who experience high levels of stress related to work or to

their families did not turn to alcohol, cigarettes, or illicit drugs to cope. This was not the case, however, for women reporting high levels of stress associated with being a woman in the man's world of the military; these women were more likely to smoke cigarettes or use illicit drugs than women experiencing low levels of stress (Bray, et al., 1999). Women also face additional risks in the military. Among OEF/OIF veterans who received medical care through the VA, 15.1 percent of the female veterans reported sexual trauma during their military careers (Kimerling et al., 2010). These women had increased odds for receiving a mental health diagnosis, such as PTSD, anxiety disorders, depression, or substance use disorders (Kimerling, et al., 2010).

Some of the stress processes active duty military personnel face may not be obvious, and may suggest longer lasting problems. Suicides among active duty Army members have increased in the past few years, and many have cited long and frequent combat deployments as a probable cause (Kang & Bullman, 2008; Kuehn, 2010b). In a recent analysis of substance use and mental health trends across active duty personnel, Bray et al. report rates of heavy alcohol use were higher among personnel who had been combat deployed (Bray, et al., 2010). Personnel who had been combat deployed were also more likely to report high perceived work and family stress in the past year and were more likely than non-combat deployed personnel to need further anxiety or PTSD evaluation (Bray, et al., 2010). While suicidal ideation was highest among personnel who had been combat deployed to theaters other than to OEF/OIF, those who had not been deployed were more likely to have attempted suicide than those who had been deployed, which suggests the true cause of increasing suicides rates may be unknown (Bray, et al., 2010).

Health Status

Numerous studies have found associations between mental illness and physical health problems. PTSD has been associated with poorer health functioning as well as a wide range of health conditions, such as diabetes, thyroid disease, rheumatoid arthritis, cardiovascular and gastrointestinal diseases, and many others (Boscarino, 2004; Jakupcak, Luterek, Hunt, Conybeare, & McFall, 2008).

One study of veterans with PTSD found they had an average of 7.9 health conditions compared to veterans without PTSD, who had an average of 3.7 (Deykin et al., 2001).

The relationship among mental health, physical health, and substance use is not a linear one; each has the potential to affect the others, and determining the distinct effects of each can be difficult, if not impossible. Among individuals with a substance use disorder, those with comorbid PTSD report more cardiovascular and neurological symptoms and worse bodily pain and general health (Ouimette, Goodwin, & Brown, 2005). They also are more likely to rate their overall health status as fair or poor (Barrett et al., 2002). Substance abuse and dependence are also associated with disability, with greater disability reported for dependence than abuse (Compton, et al., 2007).

Conclusion

Given the associations among demographic factors, mental health status, physical health status, and substance abuse/dependence, a more comprehensive analysis comparing the rate of substance abuse and dependence between veterans and nonveterans is warranted to understand better the potential differences in drug and alcohol abuse/dependence between these groups. Using the demographic and socioeconomic variables shown to have established connections with substance abuse/dependence will give a more nuanced analysis of these potential differences between veterans and nonveterans; adding mental health and physical health status will give additional insight into the various factors which may be associated with substance abuse/dependence and how they may be associated with veterans differently than nonveterans.

Methods

Dataset

This analysis employed data from the National Survey on Drug Use and Health to determine if any differences in rates of substance abuse or dependence exist between veterans and nonveterans in the general population and in a subpopulation with serious psychological distress. Each year, the Substance Abuse and Mental Health Services Administration (SAMHSA), through the Research Triangle Institute (RTI), conducts the NSDUH, surveying approximately 70,000 civilian, non-institutionalized people aged 12 and older to assess the use of alcohol, tobacco, and illicit drugs across the U.S. population (RTI, 2010; SAMHSA, 2002a). This nation-wide survey also gathers data on mental health problems to examine the prevalence of comorbid substance and psychiatric disorders.

The survey sample is based on a 50-state design and uses an independent, multistage area probability sample for each of the states and the District of Columbia (SAMHSA, 2001a). Each state is divided into equally sized geographic regions, which are divided into smaller areas composed of adjacent Census blocks. These smaller segments are the primary sampling units for the survey. Each primary sampling unit has a minimum of 175 dwelling units (SAMHSA, 2001a). Each respondent is chosen from these dwelling units. Consequently, each participant has a known non-zero probability of selection.

In order to control for non-response and post-stratification, I used the NSDUH-provided sample weights, which represent the total number of people each survey respondent represents. These weights are a product of three stagewise sampling probabilities: first, the probability the individual's segment is chosen given the state and geographic region in which he or she resides; second, the

probability the individual's dwelling unit is selected given the selection of his or her primary sampling unit; and third, the probability the individual is selected within his or her given dwelling unit (SAMHSA, 2001a) .

The survey is administered by two different methods designed to protect the participant's privacy, described in greater detail in the Dependent Variables section of this chapter. Weighted survey response rates for the survey years used vary from 73 to 79 percent. Beginning with the 2002 NSDUH, SAMHSA gave participants $30 for completing the survey. This cash incentive improved survey response rate (SAMHSA, 2002a).

Sample and Subpopulations

Because I am interested in the differences in substance abuse and dependence between veterans and nonveterans, I limited the sample to respondents age 18 and older. I also pooled data from seven years of surveys (2001-2007) to increase sample size and statistical power, particularly among veterans. The public use data files include approximately 55,000 records for each of the years included in my analysis, resulting in a total population of 387,091. Adults age 18 and older make a sample of 260,736 respondents, 17,981 (6.9 percent) of which are veterans.

I am also interested in differences in the rates of substance abuse and dependence between veterans and nonveterans with SPD, so I analyzed a subpopulation of those who meet the criteria for SPD. The NSDUH determines serious psychological distress using the K6 scale, which was developed for use in the National Health Interview Survey (Kessler et al., 2002; Kessler et al., 2003). This scale has been tested and found to have good psychometric precision in identifying mental illness within community samples and across major sociodemographic subsamples (Kessler, et al., 2002). Using a series of six questions (shown in table 1), the scale assesses how often respondents experience different symptoms of non-specific psychological distress during a one month period when they were at their worst emotionally. Scores for each question indicate how frequently symptoms occur, from none of the time (0 points) to all of the time (4 points). The unweighted scores

are summed and range from 0 to 24, with a score of 13 or greater indicating SPD (Kessler, et al., 2003; Swartz & Lurigio, 2006). This subpopulation has a total of 34,261 adults, 1,458 (4.3 percent) of which are veterans. I did not include data from the 2008 NSDUH because the mental health section of the survey changed to ascertain both past month and past year SPD, rendering the 2008 responses incomparable to those from previous years (SAMHSA, 2009a).

Table 1: Questions from K6 Questionnaire

Most people have periods when they are not at their best emotionally. Think of one month in the past 12 months when you were the most depressed, anxious, or emotionally stressed. If there was no month like this, think of a typical month. During that month, how often did you feel:

1. Nervous?
2. Hopeless?
3. Restless or fidgety?
4. So sad or depressed that nothing could cheer you up?
5. That everything was an effort?
6. Down on yourself, no good, or worthless?

Dependent Variables

This study uses five different dependent variables to measure substance abuse or dependence. The first four indicate past year abuse or dependence of any illicit drugs or alcohol, any illicit drugs other than marijuana, marijuana, or alcohol. The fifth dependent variable indicates heavy alcohol use, defined as having five or more drinks on the same occasion (binge drinking) on each of five or more days in the past 30 days (SAMHSA, 2006a).

The NSDUH does not ask whether or not the respondent has been formally diagnosed with abuse or dependence of a substance, but rather asks specific questions based on criteria established in the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (*DSM-IV*) (APA, 2002), listed in table 2. Not every survey participant answers questions about substance abuse or dependence. Only those participants who report any past year use of stimulants, heroin, cocaine, hallucinogens, pain relievers, tranquilizers, inhalants, or sedatives are asked questions to determine if their use qualifies as abuse or dependence (SAMHSA, 2006a). Participants who report having used alcohol or marijuana on six or more days during the past year are asked questions to determine abuse or dependence of these particular substances (SAMHSA, 2006a).

Table 2: *DSM-IV* Criteria for Dependence or Abuse

Category	Criteria
Dependence	For marijuana, inhalant, hallucinogen, or tranquilizer dependence, a positive response to three or more of the following criteria: 1. Spent a great deal of time over a period of a month getting, using, or getting over the effects of the substance 2. Unable to keep set limits on substance use or used more often than intended 3. Needed to use substance more than before to get desired effects or noticed that using the same amount had less effect than before 4. Unable to cut down or stop using the substance every time he or she tried or wanted to 5. Continued to use substance even though it was causing problems with emotions, nerves, mental health, or physical problems 6. Reduced or gave up participation in important activities due to substance use For alcohol, pain reliever, cocaine, heroin, sedative, and stimulant dependence, an additional question about withdrawal symptoms specific to each substance is asked.
Abuse	For alcohol, marijuana, cocaine, heroin, hallucinogen, inhalant, pain reliever, tranquilizer, stimulant, or sedative abuse, a positive response to one or more of the following criteria: 1. Respondent reported having serious problems due to substance use at home, work, or school 2. Respondent reported using substance regularly and then doing something where substance use might have put them in physical danger 3. Respondent reported substance use causing actions that repeatedly got him/her into trouble with the law 4. Respondent reported having problems caused by substance use with family or friends and continuing to use substance even though it was thought to be causing problems with family and friends.

Source: National Household Survey on Drug Abuse, 2002 Public Use File Codebook

Because the NSDUH relies on the participant's self-report of substance use and does not validate against external sources (e.g., medical records, insurance claims, criminal records), the potential for under-reporting of use remains. However, the NSDUH administers the survey through methods designed to ensure the respondent's confidentiality, using a computer-aided method administered by an interviewer and an audio computer-assisted self-interviewing method for questions requiring greater privacy (Becker, et al., 2007; SAMHSA, 2006b). Previous studies have determined the substance use reported by survey participants is valid (Harrison & Hughes, 1997; Jordan, Karg, Batts, Epstein, & Wiesen, 2008). Han et al., validated rates of illicit drug use in their own study of data from the 2005-2007 NSDUH against the NHIS and the Medical Expenditure Panel

Survey (MEPS) and found each survey provided similar estimates of use (Han, Grfroerer, & Colliver, 2010).

Independent Variables

The primary independent variable is veteran status. For the purposes of this analysis, I considered any respondent who answered affirmatively to having ever been in the U.S. Armed Forces to be a veteran. Because the NSDUH surveys only those non-institutionalized adults, active duty military personnel living on military bases are not included in this analysis. A follow-up question about current military service ascertains whether the respondent who reported having ever served in the U.S. Armed Forces is currently in a Reserves component or is retired or separated from Reserves or active duty. I use Reserves status as an additional control variable, as those currently in a military Reserves component are subject to random drug testing, which may influence an individual's decision to use illicit substances.

Demographic Variables

The main demographic variables of interest are age, gender, race/ethnicity, marital status, and measures of socioeconomic status (i.e., employment, education and income), each of which is described in table 3. In the public use datasets, there are several different age variables. Each provides different categorizations of this measure, which allows for analysis at differing degrees of granularity. I chose to re-categorize age into five groups: 18-25, 26-34, 35-49, 50-64, and 65 and older. I chose these categories to maximize sample size and allow for comparability to other studies (Han, et al., 2010).

Gender is a dichotomous variable, male and female. The NSDUH includes seven categories for race/ethnicity. In order to simplify my analysis and increase the sample size for the categories, I measured race/ethnicity with the following four categories: Non-Hispanic white, Non-Hispanic Black, Hispanic, and Other (including Non-Hispanic Native American/Alaskan Native, Non-Hispanic Native Hawaiian/Other Pacific Islander, Non-Hispanic Asian, and non-Hispanic more than one race).

I measured socioeconomic status by three variables: employment status, education level, and total family income. Education is a categorical variable measuring the highest degree attained, and is divided into four groups: less than a high school graduate, high school graduate, some college, and college graduate. Employment is a categorical variable measuring the amount the respondent works. The respondent's status is designated as employed full-time, employed part-time, unemployed, or other (including those not in the work force). NSDUH reports total annual family income in seven categories. In order to simplify analysis and to report income comparably with other studies using the same data source, I measured income with the following categories: less than $20,000, $20,000 to $39,999, $40,000 to $74,999, and $75,000 or more (Becker, et al., 2007; Han, et al., 2010).

Measure of Mental Illness Severity

Even among those with mental illness, variations in severity exist. In order to account for these potential variations, I included SPD score in the analysis of both populations. While a score of 13 on the K6 is considered the cut point for a diagnosis of SPD, scores range from 0 to 24, with higher scores indicating greater frequency of psychological distress symptoms (Swartz & Lurigio, 2006).

Measure of Overall Health Status

Overall health may potentially affect rates of substance abuse or dependence (Barrett, et al., 2002). I used two measures to serve as proxies for overall health: self-reported overall health and disability. Self-reported health status is a categorical variable reporting the respondent's overall health within one of five categories: excellent, very good, good, fair, and poor. I ascertained disability status from a recoded variable about past week work status within the data. The NSDUH asked participants about their work status in the previous week. If they reported not working at all during the past week, they were asked to give the reason, one of which was being disabled (Gilson, Chilcoat, & Stapleton, 1996). I created a binary variable from this response to control for disability status.

Year Fixed Effects

Because the cross-sectional data are pooled from seven different years of surveys, I created dummy variables for each survey year to implement year fixed effects.

Table 3: Description of Independent Variables

Independent Variables	Description
Primary Independent Variable	
Veteran	Categorical variable indicating whether or not the respondent has ever served in the U.S. Military
Other Measure of Military Status	
Reserves	Indicator variables to control for individuals who reported ever having served in the U.S. Military (veterans) and who are currently members of a military Reserves unit
Demographic Variables	
Age	Categorized into age groups: 1. 18-25 2. 26-34 3. 35-49 4. 50-64 5. 65 and older
Gender	Categorized as male or female
Marital Status	Categorized as: 1. Married 2. Widowed 3. Divorced or separated 4. Never married
Race/Ethnicity	Categorized as: 1. Non-Hispanic White 2. Non-Hispanic Black 3. Hispanic 4. Other
Education	Categorized into levels: 1. Less than high school graduate 2. High school graduate 3. Some college 4. College graduate
Employment	Categorized as: 1. Employed full-time 2. Employed part-time 3. Unemployed 4. Other (including not in labor force)
Income	Total household income categorized into levels: 1. Less than $20,000 2. $20,000-$39,999 3. $40,000-$74,999 4. $75,000 or more

Independent Variables	Description
Severity of Mental Illness	
SPD Score	Continuous variable indicating level of serious psychological distress, as defined by K6 scale. Scores range from 0-24. The cut point for SPD is a score of 13 or greater.
Measure of Health Status	
Health	Self-reported overall health categorized as: 1. Excellent 2. Very good 3. Good 4. Fair 5. Poor
Disability	Indicator variable to control for disability status
Additional Variable	
Year	Dummy variables to control for year of survey (2001-2007)

Hypotheses and Analyses

This research sought to determine if differences in rates of substance abuse or dependence exist between veterans and nonveterans in two populations: all adults and those with serious psychological distress. I posed the question for each population: are veterans more likely than nonveterans to drink heavily or abuse or be dependent upon alcohol or illicit substances? I specified the following hypotheses for each population:

H_1: Veterans will be more likely than comparable nonveterans to meet diagnostic criteria for past year abuse or dependence of any illicit drug or alcohol.

a. Among all adults

b. Within a subpopulation with SPD

H_2: Veterans will be more likely than comparable nonveterans to meet diagnostic criteria for past year abuse or dependence of any illicit drug other than marijuana.

a. Among all adults

b. Within a subpopulation with SPD

H_3: Veterans will be more likely than comparable nonveterans to meet diagnostic criteria for past year marijuana abuse or dependence.

a. Among all adults

b. Within a subpopulation with SPD

H_4: Veterans will be more likely than comparable nonveterans to meet diagnostic criteria for past year alcohol abuse or dependence.

a. Among all adults

b. Within a subpopulation with SPD

H_5: Veterans will be more likely than comparable nonveterans to have engaged in heavy alcohol use within the past 30 days.

a. Among all adults

b. Within a subpopulation with SPD

As each dependent variable is dichotomous, I performed my analyses based on the binary logit functional form:

$$\Pr(y=1)= \frac{e^{(\alpha+\beta_{1i}X_{1i}+\ldots\beta_{xi}X_{xi})}}{1+e^{(\alpha+\beta_{1i}X_{1i}+\ldots\beta_{xi}X_{xi})}}$$

I used multi-stage, multivariable logistic regression models to examine the differences between veterans and nonveterans for each of the five dependent variables of interest. The models below list the variables included in each step of my analysis. The regressions build in the following order:

Model 1

$$Y_i = \beta_1 \text{ veteran} + \beta_2 \text{ reserves} + \boldsymbol{\beta}_3 \text{ year} + \varepsilon$$

Model 2

$$Y_i = \beta_1 \text{ veteran} + \beta_2 \text{ reserves} + \boldsymbol{\beta}_3 \text{ year} + \boldsymbol{\beta}_4 \text{ age} + \beta_5 \text{ male} + \varepsilon$$

Model 3

$$Y_i = \beta_1 \text{ veteran} + \beta_2 \text{ reserves} + \boldsymbol{\beta}_3 \text{ year} + \boldsymbol{\beta}_4 \text{ age} + \beta_5 \text{ male} + \boldsymbol{\beta}_6 \text{ race \& ethnicity} + \boldsymbol{\beta}_7 \text{ marital status} + \boldsymbol{\beta}_8 \text{ employment}_8 + \boldsymbol{\beta}_9 \text{ education} + \boldsymbol{\beta}_{10} \text{ income} + \varepsilon$$

Model 4

$$Y_i = \beta_1 \text{ veteran} + \beta_2 \text{ reserves} + \boldsymbol{\beta}_3 \text{ year} + \boldsymbol{\beta}_4 \text{ age} + \beta_5 \text{ male} + \boldsymbol{\beta}_6 \text{ race \& ethnicity} + \boldsymbol{\beta}_7 \text{ marital status} + \boldsymbol{\beta}_8 \text{ employment}_8 + \boldsymbol{\beta}_9 \text{ education} + \boldsymbol{\beta}_{10} \text{ income} + \beta_{11} \text{ SPD score} + \boldsymbol{\beta}_{12} \text{ health status} + \beta_{13} \text{ disability} + \varepsilon$$

The bolded betas identify vectors of variables. For example, β_3 is a vector of variables for year fixed effects, and β_4 is a vector of variables indicating different age groups. The unbolded betas represent the coefficients associated with dichotomous (i.e., β_1, β_2, β_5, and β_{13}) or continuous (i.e., β_{11}) variables.

All data cleaning and formatting were performed using SAS version 9.2 of the SAS System for Windows © (2002-2008), of the SAS Institute, Inc. (Cary, NC) (SAS Institute, 2002-2008). All regressions and other analysis were performed using the complex survey functionality in Stata Statistical Software, Release 11 of StataCorp (StataCorp, 2009).

Results

Descriptive Statistics

The weighted demographic comparisons between veterans and nonveterans are shown in tables 4 and 5. In comparison to nonveterans within the entire adult population, the veterans in this sample were older, more likely to be white males ($p<0.001$) with higher incomes ($p<0.001$) and higher levels of education ($p<0.001$). More veterans were married, divorced, or separated compared to nonveterans ($p<0.001$), who were more likely to have never been married. Veterans were also more likely to be disabled ($p<0.001$) and report fair or poor overall health ($p<0.001$). Veterans had a lower average SPD score than nonveterans, indicating less frequent symptoms of psychological distress ($p<0.001$).

Within the sample of adults with SPD, similar differences between veterans and nonveterans remained. Veterans were still more likely than nonveterans to be older ($p<0.001$), white males ($p<0.001$) who were married, divorced, or separated ($p<0.001$), versus never married. They were also more likely than nonveterans to have a high school diploma ($p<0.01$) or completed some college ($p<0.001$). Rates of disability ($p<0.001$) and poorer health ($p<0.001$) status remained similar between the two groups.

There are, however, some notable differences in demographic characteristics between the entire adult population and SPD subpopulation. Unlike the full population, there were no significant differences in incomes between veterans and nonveterans in the population with SPD. Additionally, the differences in full-time employment and unemployment rates between veterans and nonveterans were not significant in this subpopulation. In the entire adult population, veterans were disproportionately male, and while that imbalance remains in the SPD subpopulation, the proportion

of women veterans increased from 6 percent to over 14 percent. While veterans had lower mean SPD scores in the entire adult population, there was no significant difference in scores between groups in the SPD population, with both averaging a score between 16 and 17 points.

Table 4: Weighted Characteristics of Veterans and Nonveterans among All Adults and within SPD Subpopulation

	All Adults		SPD Subpopulation	
Characteristic	**Veteran %**	**Nonveteran %**	**Veteran %**	**Nonveteran %**
Age				
18-25	2.12	16.64***	5.43	25.19***
26-34	6.89	17.53***	11.86	20.57***
35-49	19.94	31.78***	32.76	32.04
50-64	34.28	20.96***	35.41	16.09***
65 and older	36.77	13.09***	14.53	6.11***
Gender				
Male	93.96	41.47***	85.54	31.61***
Female	6.04	58.53***	14.46	68.39***
Race/Ethnicity				
White	81.73	69.00***	78.40	71.04***
Black	10.54	11.33*	11.84	10.84
Hispanic	4.71	13.43***	4.89	12.40***
Other	3.03	6.24***	4.86	5.73
Marital Status				
Married	70.44	54.41***	51.31	38.20***
Widowed	6.48	6.28	5.49	4.86
Divorced/Separated	14.33	12.84***	25.39	19.09***
Never married	8.75	26.47***	17.82	37.85***
Employment				
Full-time	49.10	56.18***	45.20	48.19
Part-time	9.13	13.57***	6.76	15.61***
Unemployed	2.09	3.53***	5.51	6.18
Other	36.69	26.72***	42.53	30.02***
Education				
Less than high school	11.68	17.68***	12.48	21.53***
High school graduate	33.59	31.37***	37.54	32.26**
Some college	28.26	24.74***	34.11	27.43***
College graduate	26.47	26.21	15.86	18.79
Total Family Income				
< $20,000	12.85	20.33***	28.01	29.96
$20,000-$39,999	25.69	24.10**	29.03	26.21
$40,000-$74,999	33.35	29.52***	26.36	26.30
≥$75,000	28.11	26.05***	16.60	17.53
Self-Reported Overall Health				
Excellent	20.26	25.54***	11.97	15.77*
Very Good	33.86	35.84***	23.39	30.86***
Good	29.39	26.29***	31.64	29.89
Fair	12.20	9.73***	19.49	16.39
Poor	4.24	2.58***	13.52	7.07***

	All Adults		SPD Subpopulation	
Characteristic	**Veteran %**	**Nonveteran %**	**Veteran %**	**Nonveteran %**
Disability Status				
Disabled	4.96	4.33**	20.03	11.61***

*p<0.05 **p<0.01 ***p<0.001
Pearson chi-square test of significance

Table 5: SPD Score and Health Ratings Means for All Adults and SPD Subpopulation

	All Adults		SPD Subpopulation	
	Veteran	**Nonveteran**	**Veteran**	**Nonveteran**
Serious psychological distress score	3.64	5.00***	16.63	16.58
Self-reported overall health	2.46	2.28	2.99	2.68***

*p<0.05 **p<0.01 ***p<0.001
Pearson chi-square test of significance

Within the entire adult population, 9.83 percent met the criteria for SPD, with a K6 score of 13 or higher. Additionally, 8.97 percent met criteria for abuse or dependence of any illicit drug or alcohol in the past year. In comparison to nonveterans, veterans had lower rates of SPD (5.95 percent vs. 10.38 percent). Rates of abuse or dependence of illicit drugs or alcohol were also lower among veterans (7.3 percent) than nonveterans (9.21 percent). Rates of drug and alcohol abuse and dependence were higher for adults with SPD (22.12 percent) than their counterparts without SPD (7.54 percent). These differences remained when I examined rates of drug and alcohol abuse and dependence among veterans and nonveterans separately. Veterans with SPD were more likely to have abused or been dependent upon any illicit drugs or alcohol in the past year (23.25 percent) than veterans without SPD (6.29 percent). Similarly, nonveterans with SPD were more likely to have abused or been dependent upon any illicit drugs or alcohol in the past year (22.02 percent) than nonveterans without SPD (7.73 percent). Table 6 provides the differences in rates of drug and alcohol abuse and dependence within these populations.

Table 6: Rates of Alcohol and Substance Abuse and Dependence between those with and without SPD

	All Veterans		All Nonveterans	
Variable	**SPD**	**No SPD**	**SPD**	**No SPD**
Past year abuse or dependence of any illicit drug or alcohol	23.25	6.29***	22.02	7.73***
Past year abuse or dependence of any illicit drug other than marijuana	6.35	0.65***	5.74	0.98***
Past year marijuana abuse or dependence	4.46	0.38***	4.79	1.23***
Past year alcohol abuse or dependence	18.79	5.78***	17.14	6.63***
Heavy drinking in past 30 days	12.23	7.34***	9.59	6.76***

*p<0.05 **p<0.01 ***p<0.001
Pearson chi-square test of significance

Preliminary Statistical Analysis

My initial analysis sought to determine differences between veterans and nonveterans for each of the five dependent variables, without controlling for any confounding variables. These results are shown in table 7. Among all adults, a significantly higher percentage of veterans than nonveterans had engaged in heavy drinking within the past 30 days. In contrast, significantly fewer veterans than nonveterans abused or were dependent upon alcohol, marijuana, any illicit drug other than marijuana, and any illicit drug or alcohol in the past year.

Within the subpopulation of adults with SPD, a statistical difference between veterans and nonveterans existed for the heavy drinking variable only: 12.23 percent of veterans engaged in heavy drinking within the past 30 days, compared to only 9.6 percent of nonveterans. There were no other statistically significant differences in the percentage of veterans and nonveterans for any other measure of alcohol or drug abuse or dependence.

Table 7: Rates of Alcohol and Substance Abuse among All Adults and in SPD Subpopulation

	All Adults		SPD Subpopulation	
Variable	**Veteran**	**Nonveteran**	**Veteran**	**Nonveteran**
Past year abuse or dependence of any illicit drug or alcohol	7.30	9.21***	23.25	22.02
Past year abuse or dependence of any illicit drug other than marijuana	0.99	1.48***	6.35	5.72
Past year marijuana abuse or dependence	0.63	1.60***	4.79	4.76
Past year alcohol abuse or dependence	6.56	7.72***	18.79	17.14
Heavy drinking in past 30 days	7.63	7.06*	12.23	9.59*

*p<0.05 **p<0.01 ***p<0.001
Pearson chi-square test of significance

Logistic Regression

I performed a series of multi-stage, multivariable logistic regressions for each of the five dependent variables. In addition to estimating the relationship between veteran status and each outcome measure, the first model in the series controlled for current military status and included year fixed effects. Age and gender were added to the second model. The third model also controlled for other demographics (race/ethnicity and marital status) as well as socioeconomic status (employment, education, and total family income). The fourth and final model added covariates to control for mental health status (SPD score) and overall health status (self-reported health status and disability status). Table 8 shows the variables included in each model.

Table 8: Variables Included in Each Model of Multivariable Regressions

Model	Variables
Model 1	Veteran status, current military status
Model 2	Veteran status, current military status, age, gender
Model 3	Veteran status, current military status, age, gender, race/ethnicity, marital status, employment, education, total family income
Model 4	Veteran status, current military status, age, gender, race/ethnicity, marital status, employment, education, total family income, SPD score, self-reported overall health, disability status

Note: Each model includes year fixed effects

Past Year Abuse or Dependence of Any Illicit Drug or Alcohol

I hypothesized that veterans, both in the general population and within a subpopulation of those with SPD, would be more likely than comparable nonveterans to meet criteria for past year abuse or dependence of any illicit drug or alcohol. My results support this hypothesis in all four

models estimated for the general population, but only in the third model when examining the SPD subpopulation. Table 9 shows the change in odds ratios for veteran status among all adults, and table 10 shows the same for the SPD subpopulation.

Within the general population, veterans were less likely than nonveterans to have abused or been dependent upon any illicit drugs or alcohol in the past year when I controlled for military status only. Once I added demographics and other covariates, veteran status was significant, with an odds ratio greater than one. In the SPD subpopulation, veteran status was significant only in model 3, with an odds ratio of 1.25, suggesting veterans have 25 percent greater odds than nonveterans for abuse or dependence of any illicit drug or alcohol when controlling for demographics and socioeconomic factors. After adding additional controls for mental and physical health status in Model 4, veteran status was only marginally significant (at $p<0.1$).

Table 9: Odds Ratios for Veteran Status in Multivariable Regressions among All Adults

	Past Year Abuse or Dependence of Any Illicit Drug or Alcohol		Past Year Abuse or Dependence of Any Illicit Drug (not Marijuana)		Past Year Marijuana Abuse or Dependence		Past Year Alcohol Abuse or Dependence		Heavy Drinking Past 30 Days	
	OR	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
Model 1	0.77***	(0.71, 0.84)	0.66***	(0.55, 0.79)	0.39***	(0.32, 0.47)	0.83***	(0.76, 0.91)	1.08*	(1.01, 1.17)
Model 2	1.16**	(1.06, 1.28)	1.22*	(1.01, 1.48)	0.99	(0.80, 1.22)	1.18**	(1.07, 1.30)	1.25***	(1.15, 1.35)
Model 3	1.18**	(1.08, 1.30)	1.25*	(1.03, 1.51)	1.04	(0.84, 1.28)	1.20***	(1.09, 1.32)	1.21***	(1.12, 1.31)
Model 4	1.15**	(1.05, 1.27)	1.17	(0.96, 1.42)	0.99	(0.80, 1.23)	1.18**	(1.07, 1.30)	1.20***	(1.11, 1.30)

*p<0.05 **p<0.01 ***p<0.001

Table 10: Odds Ratios for Veteran Status in Multivariable Regressions in SPD Subpopulation

	Past Year Abuse or Dependence of Any Illicit Drug or Alcohol		Past Year Abuse or Dependence of Any Illicit Drug (not Marijuana)		Past Year Marijuana Abuse or Dependence		Past Year Alcohol Abuse or Dependence		Heavy Drinking Past 30 Days	
	OR	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
Model 1	1.07	(0.89, 1.30)	1.14	(0.83, 1.56)	0.95	(0.65, 1.38)	1.11	(0.91, 1.37)	1.30*	(1.04, 1.64)
Model 2	1.19	(0.97, 1.47)	1.35	(0.97, 1.87)	1.37	(0.93, 2.02)	1.18	(0.95, 1.47)	1.31*	(1.03, 1.67)
Model 3	1.25*	(1.01, 1.56)	1.38	(0.99, 1.91)	1.53*	(1.03, 2.27)	1.25	(0.99, 1.57)	1.32*	(1.02, 1.69)
Model 4	1.23	(0.97, 1.53)	1.33	(0.96, 1.85)	1.50*	(1.01, 2.23)	1.24	(0.98, 1.56)	1.31*	(1.01, 1.69)

*p<0.05 **p<0.01 ***p<0.001

Many covariates had significant, positive associations with the dependent variable in both populations (shown in table 11). Within the general population, as age increased, the odds ratios for illicit drug or alcohol abuse or dependence decreased from 7.32 (95% CI=5.91, 9.06) for 18-25 year olds to 2.23 (95% CI=1.77, 2.81) for 50-64 year olds. The same trend was observed within the SPD subpopulation, where 18-25 year olds had an odds ratio of 8.44 (95% CI=4.16, 17.13) and 50-64 year olds had an odds ratio of 2.19 (95% CI=1.42, 5.96). Men were more likely than women to have abused or been dependent upon illicit drugs or alcohol, as were those who were divorced, separated, or who had never been married, compared to those who were married. SPD score was positively associated with this dependent variable. For each additional point on the SPD scale, there was a 10 percent increase in odds within the general population (95% CI=1.10, 1.11), and a 6 percent increase among those in the SPD subpopulation (95% CI=1.05, 1.07).

Other covariates significantly and positively associated with the dependent variable include white, black, and Hispanic race/ethnicity in the general population and white and black race in the SPD subpopulation. In each population, those who were unemployed or within the "other" employment category had greater odds of past year abuse or dependence of any illicit drug or alcohol than those employed full-time or part-time. Those without a high school diploma and those with only some college level education had greater odds than college graduates. Within the general population, those earning between $20,000 and $74,999 had lower odds of any illicit drug or alcohol abuse or dependence, compared to those earning $75,000 or more. There was no difference in the odds of past year abuse or dependence of any illicit drugs or alcohol across income categories in the SPD subpopulation.

Table 11: Multivariable Logistic Model of Past Year Abuse or Dependence of Any Illicit Drug or Alcohol

	All Adults		SPD Subpopulation	
Variable	**Odds Ratio**	**95% CI**	**Odds Ratio**	**95% CI**
Veteran Status				
Veteran	1.15**	(1.05, 1.27)	1.23	(0.99, 1.53)
Nonveteran	**1.00**		**1.00**	
Military Status				
In Reserves component	0.82	(0.62, 1.09)	0.59	(0.33, 1.07)
Retired/Separated	**1.00**		**1.00**	
Age				
18-25	7.32***	(5.91, 9.06)	8.44***	(4.16, 17.13)
26-34	5.58***	(4.47, 6.97)	6.79***	(3.37, 13.69)
35-49	4.04***	(3.24, 5.02)	5.16***	(2.54, 10.50)
50-64	2.23***	(1.77, 2.81)	2.19**	(1.42, 5.96)
65 and older	**1.00**		**1.00**	
Gender				
Male	2.76***	(2.66, 2.86)	2.17***	(2.00, 2.37)
Female	**1.00**		**1.00**	
Race/Ethnicity				
White	1.57***	(1.43, 1.72)	1.56***	(1.30, 1.87)
Black	1.21**	(1.08, 1.34)	1.30*	(1.05, 1.61)
Hispanic	1.28***	(1.14, 1.44)	1.19	(0.95, 1.49)
Other	**1.00**		**1.00**	
Marital Status				
Married	**1.00**		**1.00**	
Widowed	1.01	(0.79, 1.28)	1.22	(0.80, 1.87)
Divorced/Separated	2.07***	(1.93, 2.22)	2.05***	(1.76, 2.38)
Never married	2.19***	(2.05, 2.34)	2.08***	(1.82, 2.38)
Employment				
Full-time	**1.00**		**1.00**	
Part-time	0.99	(0.94, 1.05)	1.02	(0.91, 1.13)
Unemployed	1.18***	(1.08, 1.30)	1.22*	(1.02, 1.46)
Other	0.81***	(0.76, 0.86)	0.81**	(0.70, 0.93)
Education				
Less than high school	1.19***	(1.11, 1.27)	1.26**	(1.09, 1.47)
High school graduate	1.06	(0.99, 1.13)	1.08	(0.95, 1.23)
Some college	1.14***	(1.08, 1.21)	1.16*	(1.02, 1.33)
College graduate	**1.00**		**1.00**	
Total Family Income				
<$20,000	1.03	(0.97, 1.10)	1.11	(0.97, 1.27)
$20,000-$39,999	0.92***	(0.86, 0.97)	0.99	(0.86, 1.14)
$40,000-$74,999	0.90***	(0.85, 0.95)	0.97	(0.85, 1.12)
≥$75,000	**1.00**		**1.00**	
SPD Score	1.10***	(1.10, 1.11)	1.06***	(1.05, 1.07)

	All Adults		SPD Subpopulation	
Variable	**Odds Ratio**	**95% CI**	**Odds Ratio**	**95% CI**
Self-Reported Overall Health				
Excellent	**1.00**		**1.00**	
Very Good	1.26***	(1.19, 1.33)	1.24**	(1.08, 1.41)
Good	1.34***	(1.26, 1.43)	1.30***	(1.14, 1.48)
Fair	1.26***	(1.15, 1.38)	1.20*	(1.03, 1.41)
Poor	1.09	(0.90, 1.32)	0.97	(0.73, 1.28)
Disability Status				
Disabled	0.97	(0.85, 1.11)	0.92	(0.75, 1.13)
Not Disabled	**1.00**		**1.00**	
*p<0.05 **p<0.01 ***p<0.001				

Past Year Abuse or Dependence of Any Illicit Drug other than Marijuana

I hypothesized that veterans, both in the general population and within a subpopulation of those with SPD, would be more likely than comparable nonveterans to meet criteria for past year abuse or dependence of any illicit drug other than marijuana. Results support this hypothesis in part for veterans in the general population, shown in table 9. As with abuse or dependence of any illicit drug or alcohol, when controlling only for current military status, I found veteran status was negatively associated with abuse or dependence of any illicit drug other than marijuana. After adding demographics and socioeconomic status in models 2 and 3, I found veteran status was positively and significantly associated with the dependent variable. After adjusting for mental and physical health in the full model, I found veteran status was still positively associated with the dependent variable, but was no longer significant.

Within the SPD population, veteran status was positively associated with abuse or dependence of any illicit drug other than marijuana in each of the four models (shown in table 10). Veterans had odds ranging from 14 percent (OR=1.14; 95% CI=0.83, 1.56) to 38 percent (OR=1.38; 95% CI=0.99, 1.91) greater than nonveterans' odds. However, these odds ratios only approached statistical significance in models 2, 3, and 4 ($p<0.1$).

Covariates positively and significantly associated with the dependent variable in both populations include age, gender, marital status, employment, education, SPD score, and self-reported

overall health (shown in table 12). In both populations, as age increased, odds of past year abuse or dependence of any illicit drug other than marijuana decreased. Men were more likely than women to have abused or been dependent upon any illicit drugs other than marijuana, as were those who were divorced, separated, or never married, compared to those who were married. Of all the employment variables, only unemployment had a significant association with the dependent variable.

In both populations, there was an inverse relationship between the level of education and odds of drug abuse or dependence upon substances other than marijuana. Those without a high school diploma had the highest odds of abuse or dependence (entire population: OR=2.65; 95% CI=2.20, 3.20; SPD subpopulation: OR=2.94; 95% CI=2.29, 3.78). SPD score was also significantly and positively associated with the dependent variable. In the general population, there was a 13 percent increase in odds of abuse or dependence for each point increase in SPD score (OR=1.13; 95% CI=1.13, 1.14); in the SPD subpopulation, there was a 9 percent increase (OR=1.09; 95% CI=1.07, 1.11). Those reporting less than excellent overall health had greater odds of abuse or dependence than those reporting excellent health.

Income was significantly associated with the dependent variable in the general population, but only for those earning less than $20,000 a year versus those making $75,000 or more. Additionally, disability was significant and positive for the general population only, with 32 percent greater odds for abuse or dependence of any illicit drug other than marijuana among the disabled (OR=1.32; 95% CI=1.05, 1.65).

Table 12: Multivariable Logistic Model of Past Year Abuse or Dependence of Any Illicit Drug other than Marijuana

	All Adults		SPD Subpopulation	
Variable	**Odds Ratio**	**95% CI**	**Odds Ratio**	**95% CI**
Veteran Status				
Veteran	1.17	(0.96, 1.42)	1.33	(0.96, 1.85)
Nonveteran	**1.00**		**1.00**	
Military Status				
In Reserves component	1.05	(0.56, 1.99)	0.33	(0.11, 1.02)
Retired/Separated	**1.00**		**1.00**	
Age				
18-25	20.17***	(9.26, 43.95)	30.51***	(7.78, 119.66)
26-34	19.96***	(9.24, 43.12)	31.44***	(8.16, 121.22)
35-49	16.82***	(7.80, 36.26)	20.84***	(5.43, 79.97)
50-64	6.35***	(2.86, 14.07)	9.34**	(2.26, 38.53)
65 and older	**1.00**		**1.00**	
Gender				
Male	2.04***	(1.87, 2.23)	1.82***	(1.60, 2.06)
Female	**1.00**		**1.00**	
Race/Ethnicity				
White	1.22	(0.97, 1.52)	1.48*	(1.06, 2.07)
Black	1.08	(0.82, 1.41)	1.20	(0.80, 1.80)
Hispanic	1.11	(0.87, 1.42)	1.02	(0.67, 1.55)
Other	**1.00**		**1.00**	
Marital Status				
Married	**1.00**		**1.00**	
Widowed	1.21	(0.76, 1.92)	1.35	(0.73, 2.48)
Divorced/Separated	2.21***	(1.92, 2.54)	1.96***	(1.52, 2.52)
Never married	2.48***	(2.18, 2.82)	1.89***	(1.55, 2.29)
Employment				
Full-time	**1.00**		**1.00**	
Part-time	1.01	(0.89, 1.16)	1.00	(0.84, 1.19)
Unemployed	1.67***	(1.41, 1.98)	1.73***	(1.39, 2.17)
Other	1.10	(0.97, 1.25)	1.22	(0.97, 1.53)
Education				
Less than high school	2.65***	(2.20, 3.20)	2.94***	(2.29, 3.78)
High school graduate	2.02***	(1.66, 2.45)	2.18***	(1.71, 2.78)
Some college	2.01***	(1.65, 2.46)	2.16***	(1.71, 2.72)
College graduate	**1.00**		**1.00**	
Total Family Income				
<$20,000	1.19*	(1.02, 1.40)	1.15	(0.92, 1.45)
$20,000-$39,999	1.11	(0.96, 1.28)	1.17	(0.90, 1.52)
$40,000-$74,999	0.99	(0.86, 1.14)	1.03	(0.81, 1.31)
≥$75,000	**1.00**		**1.00**	
SPD Score	1.13***	(1.13, 1.14)	1.09***	(1.07, 1.11)

	All Adults		SPD Subpopulation	
Variable	**Odds Ratio**	**95% CI**	**Odds Ratio**	**95% CI**
Self-Reported Overall Health				
Excellent	**1.00**		**1.00**	
Very Good	1.46***	(1.28, 1.67)	1.37**	(1.12, 1.69)
Good	1.76***	(1.54, 2.00)	1.71***	(1.40, 2.09)
Fair	2.08***	(1.73, 2.50)	1.80***	(1.45, 2.23)
Poor	1.35	(0.98, 1.86)	1.40	(0.91, 2.15)
Disability Status				
Disabled	1.32*	(1.05, 1.65)	1.01	(0.73, 1.40)
Not Disabled	**1.00**		**1.00**	
*p<0.05 **p<0.01 ***p<0.001				

Past Year Marijuana Abuse or Dependence

I hypothesized that veterans, both in the general population and within a subpopulation of those with SPD, would be more likely than comparable nonveterans to meet criteria for past year marijuana abuse or dependence. Again, results are mixed and shown in tables 9 and 10. In the general population, veteran status was significantly and negatively associated with marijuana abuse or dependence, with an odds ratio of 0.39 in the first model. In the full model, which controlled for demographics, socioeconomic status, and mental and physical health, the odds ratio for veteran status increased to 1.04, but was not significant.

The results were different for the SPD subpopulation. Veteran status was negatively, but not significantly, associated with marijuana abuse or dependence in the first model, with an odds ratio of 0.95. In model 2, which controlled for demographics, veteran status was positively, though not significantly associated with the dependent variable. Once I controlled for socioeconomic status, however, veteran status showed a significant, positive association with the dependent variable. In models 3 and 4, veterans had odds ratios of 1.53 (95% CI=1.03, 2.27) and 1.50 (95% CI=1.01, 2.23), respectively, compared to nonveterans for marijuana abuse or dependence, suggesting veterans have approximately 50 percent greater odds than comparable nonveterans for marijuana abuse or dependence.

Many covariates were significantly and positively associated with marijuana abuse and dependence (shown in table 13). In both populations, age was significant across all age groups, with the odds of marijuana abuse or dependence decreasing as age increased. Men had higher odds of marijuana abuse or dependence in both populations, as did those divorced, separated, and never married versus those who were married. Relative to those of other races, whites and blacks were significantly more likely to abuse or be dependent upon marijuana in the general population, whereas this positive association was significant only for blacks in the SPD subpopulation.

Education level was inversely related to the odds of marijuana abuse or dependence in both populations, with odds ratios decreasing as education level increased. SPD score was significantly and positively associated with marijuana abuse or dependence in both populations. In the general population, for every point increase in SPD score, there was a corresponding 10 percent increase in odds of marijuana abuse or dependence (OR= 1.10; 95% CI=1.10, 1.11); in the SPD subpopulation, there was a 5 percent increase (OR=1.05; 95% CI=1.03, 1.07).

As health status deteriorated from very good to fair, the odds of marijuana abuse or dependence increased. Within the general population, poor health was significantly and positively associated with marijuana abuse or dependence; poor health in the SPD subpopulation was not significant. In contrast, disability in the general population was significantly and negatively associated with marijuana abuse or dependence, with an odds ratio of 0.75 (95% CI=0.59, 0.96); however, disability was not significant in the SPD subpopulation. In both populations, being in a Reserves unit was significantly and negatively associated with marijuana abuse or dependence. Those in Reserve units in the general population had an odds ratio of 0.25 (95% CI=0.12, 0.51), while those in the SPD subpopulation had an odds ratio of 0.11 (95% CI=0.02, 0.71). Income was also negatively associated with this dependent variable, though only for those in the general population making between $40,000 and $74,999 (OR=0.88; 95% CI=0.77, 0.99).

Table 13: Multivariable Logistic Model of Past Year Marijuana Abuse or Dependence

	All Adults		SPD Subpopulation	
Variable	**Odds Ratio**	**95% CI**	**Odds Ratio**	**95% CI**
Veteran Status				
Veteran	0.99	(0.80, 1.23)	1.50*	(1.01, 2.23)
Nonveteran	**1.00**		**1.00**	
Military Status				
In Reserves component	0.25***	(0.12, 0.51)	0.11*	(0.02, 0.71)
Retired/Separated	**1.00**		**1.00**	
Age				
18-25	69.05***	(20.15, 236.62)	34.22**	(4.47, 261.87)
26-34	36.33***	(10.63, 124.17)	20.93**	(2.76, 158.81)
35-49	20.18***	(5.84, 69.73)	12.24*	(1.61, 93.11)
50-64	6.59**	(1.90, 22.88)	6.61	(0.81, 53.90)
65 and older	**1.00**		**1.00**	
Gender				
Male	2.98***	(2.75, 3.21)	2.31***	(2.02, 2.64)
Female	**1.00**		**1.00**	
Race/Ethnicity				
White	1.48***	(1.24, 1.76)	1.36	(0.98, 1.89)
Black	1.72***	(1.42, 2.09)	1.49*	(1.03, 2.16)
Hispanic	0.99	(0.80, 1.23)	0.86	(0.58, 1.27)
Other	**1.00**		**1.00**	
Marital Status				
Married	**1.00**		**1.00**	
Widowed	0.63	(0.29, 1.37)	0.55	(0.17, 1.76)
Divorced/Separated	2.12***	(1.76, 2.55)	2.09***	(1.49, 2.93)
Never married	2.87***	(2.50, 3.29)	2.65***	(2.03, 3.47)
Employment				
Full-time	**1.00**		**1.00**	
Part-time	1.21***	(1.09, 1.34)	1.19	(0.99, 1.45)
Unemployed	1.55***	(1.36, 1.76)	1.54**	(1.17, 2.03)
Other	1.06	(0.96, 1.18)	0.95	(0.79, 1.14)
Education				
Less than high school	2.16***	(1.86, 2.51)	2.87***	(2.20, 3.74)
High school graduate	1.58***	(1.37, 1.83)	1.93***	(1.52, 2.44)
Some college	1.48***	(1.26, 1.73)	1.65***	(1.30, 2.11)
College graduate	**1.00**		**1.00**	
Total Family Income				
<$20,000	0.99	(0.89, 1.10)	0.99	(0.82, 1.18)
$20,000-$39,999	0.90	(0.79, 1.03)	0.92	(0.73, 1.16)
$40,000-$74,999	0.88*	(0.77, 0.99)	0.95	(0.75, 1.19)
≥$75,000	**1.00**		**1.00**	
SPD Score	1.10***	(1.10, 1.11)	1.05***	(1.03, 1.07)

	All Adults		SPD Subpopulation	
Variable	**Odds Ratio**	**95% CI**	**Odds Ratio**	**95% CI**
Self-Reported Overall Health				
Excellent	**1.00**		**1.00**	
Very Good	1.35***	(1.21, 1.50)	1.33**	(1.06, 1.66)
Good	1.67***	(1.49, 1.86)	1.62***	(1.29, 2.03)
Fair	1.87***	(1.60, 2.20)	1.65***	(1.32, 2.06)
Poor	1.83**	(1.23, 2.70)	1.11	(0.66, 1.86)
Disability Status				
Disabled	0.75*	(0.59, 0.96)	0.90	(0.63, 1.29)
Not Disabled	**1.00**		**1.00**	

*p<0.05 **p<0.01 ***p<0.001

Past Year Alcohol Abuse or Dependence

I hypothesized that veterans, both in the general population and within a subpopulation of those with SPD, would be more likely than comparable nonveterans to meet criteria for past year alcohol abuse or dependence. Within the general population, veteran status was significantly associated with alcohol abuse or dependence for all four models (shown in table 9). In the first model, which controlled for current military status only, veterans had lower odds than nonveterans for alcohol abuse or dependence (OR=0.83; 95% CI=0.76, 0.91). In subsequent models which controlled for other demographic factors, veterans had 18 to 20 percent greater odds than nonveterans (models 2 and 4 $p<0.01$, model 3 $p<0.001$).

In the SPD subpopulation, veteran status showed a positive association with alcohol abuse or dependence and trended toward significance (shown in table 10). When I controlled for socioeconomic status and mental and physical health (models 3 and 4), veteran status was marginally significant at the $p<0.1$ level.

The covariates significantly and positively associated with alcohol abuse or dependence were similar to those with other dependent variables, such as age, gender, race/ethnicity, marital status, SPD score, and self-reported overall health (shown in table 14). In both populations, the odds of alcohol abuse or dependence decreased as age increased. Men had greater odds than women for alcohol abuse or dependence in both populations, as did those who were white or black relative to

other races. Hispanics had greater odds than those of other races/ethnicities in the general population only. In both populations, those who were divorced, separated, or never married had greater odds of alcohol abuse or dependence than those who were married. In the general population only, those with incomes between $20,000 and $39,999 and between $40,000 and $74,999 have lower odds of alcohol abuse or dependence than those making more than $75,000. Also within the general population only, those with some college had slightly greater odds for alcohol abuse or dependence than those with college degrees.

SPD score was positively associated with alcohol abuse or dependence. In the general population, for every additional point scored on the K6 scale, there was a 9 percent increase in odds for alcohol abuse or dependence (OR=1.09; 95% CI=1.09, 1.10), compared to a 5 percent increase in the SPD subpopulation (OR=1.05; 95% CI=1.04, 1.07).

Table 14: Multivariable Logistic Model of Past Year Alcohol Abuse or Dependence

	All Adults		SPD Subpopulation	
Variable	**Odds Ratio**	**95% CI**	**Odds Ratio**	**95% CI**
Veteran Status				
Veteran	1.18**	(1.07, 1.30)	1.24	(0.98, 1.56)
Nonveteran	**1.00**		**1.00**	
Military Status				
In Reserves component	0.86	(0.65, 1.15)	0.75	(0.42, 1.35)
Retired/Separated	**1.00**		**1.00**	
Age				
18-25	5.71***	(4.61, 7.08)	5.48***	(2.60, 11.57)
26-34	4.51***	(3.61, 5.64)	4.33***	(2.09, 9.01)
35-49	3.29***	(2.63, 4.10)	3.51**	(1.67, 7.38)
50-64	1.94***	(1.52, 2.47)	2.13*	(1.02, 4.48)
65 and older	**1.00**		**1.00**	
Gender				
Male	2.78***	(2.66, 2.89)	2.20***	(2.00, 2.42)
Female	**1.00**		**1.00**	
Race/Ethnicity				
White	1.62***	(1.47, 1.79)	1.50***	(1.23, 1.84)
Black	1.16*	(1.04, 1.31)	1.27*	(1.01, 1.61)
Hispanic	1.38***	(1.24, 1.55)	1.27	(0.99, 1.63)
Other	**1.00**		**1.00**	

	All Adults		SPD Subpopulation	
Variable	**Odds Ratio**	**95% CI**	**Odds Ratio**	**95% CI**
Marital Status				
Married	**1.00**		**1.00**	
Widowed	1.04	(0.81, 1.33)	1.26	(0.78, 2.05)
Divorced/Separated	2.06***	(1.91, 2.23)	2.06***	(1.77, 2.40)
Never married	2.13***	(1.99, 2.29)	2.01***	(1.73, 2.34)
Employment				
Full-time	**1.00**		**1.00**	
Part-time	0.96	(0.91, 1.02)	0.98	(0.88, 1.09)
Unemployed	1.07	(0.98, 1.18)	1.03	(0.86, 1.24)
Other	0.75***	(0.70, 0.81)	0.70***	(0.60, 0.82)
Education				
Less than high school	1.04	(0.96, 1.12)	1.03	(0.87, 1.20)
High school graduate	0.97	(0.91, 1.04)	0.93	(0.80, 1.08)
Some college	1.08*	(1.02, 1.15)	1.03	(0.89, 1.20)
College graduate	**1.00**		**1.00**	
Total Family Income				
<$20,000	1.03	(0.96, 1.10)	1.08	(0.93, 1.25)
$20,000-$39,999	0.90**	(0.85, 0.96)	0.94	(0.82, 1.07)
$40,000-$74,999	0.90**	(0.85, 0.96)	0.97	(0.83, 1.13)
≥$75,000	**1.00**		**1.00**	
SPD Score	1.09***	(1.09, 1.10)	1.05***	(1.04, 1.07)
Self-Reported Overall Health				
Excellent	**1.00**		**1.00**	
Very Good	1.22***	(1.15, 1.30)	1.17*	(1.02, 1.35)
Good	1.25***	(1.17, 1.34)	1.14	(0.99, 1.31)
Fair	1.12*	(1.01, 1.24)	1.08	(0.90, 1.30)
Poor	0.98	(0.77, 1.25)	0.89	(0.64, 1.23)
Disability Status				
Disabled	0.91	(0.78, 1.06)	0.85	(0.66, 1.08)
Not Disabled	**1.00**		**1.00**	

*p<0.05 **p<0.01 ***p<0.001

Heavy Drinking During the Past 30 Days

I hypothesized that veterans, both in the general population and within a subpopulation of those with SPD, would be more likely than comparable nonveterans to have engaged in heavy drinking in the past 30 days. Results support this hypothesis through all models in both populations (shown in tables 9 and 10). In the general population, veterans had 8 to 25 percent greater odds than nonveterans for heavy drinking in the past 30 days, even after controlling for demographics, socioeconomic status, and heath status. Within the SPD subpopulation, veterans had 30 to 32 percent

greater odds than nonveterans for heavy drinking in the past 30 days, even after controlling for all covariates.

Age, gender, race/ethnicity, marital status, SPD score, and self-reported overall health were significantly and positively associated with heavy drinking (shown in table 15). In both populations, males, younger adults, and those who were divorced, separated, or never been married versus those were married had greater odds of heavy drinking in the past 30 days. Those with less than a college degree were more likely to have engaged in heavy drinking in the general population only. Within the SPD subpopulation, education level was significant for only those with some college education. There was very little difference among income and employment categories in either population.

SPD score was positively associated with heavy drinking in the past 30 days in both populations, though the increase in odds with each additional point on the SPD scale was only 2 percent for the general population (OR=1.02; 95% CI=1.02, 1.03) and 3 percent for the SPD population (OR=1.03; 95% CI=1.02, 1.05). As with many other dependent variables, the odds of heavy drinking were higher for those reporting less than excellent health, compared to those reporting excellent health. Disability status was not significantly associated with heavy drinking in either population.

Table 15: Multivariable Logistic Model of Heavy Drinking in the Past 30 Days

	All Adults		SPD Subpopulation	
Variable	**Odds Ratio**	**95% CI**	**Odds Ratio**	**95% CI**
Veteran Status				
Veteran	1.20***	(1.11, 1.30)	1.31*	(1.01, 1.69)
Nonveteran	**1.00**		**1.00**	
Military Status				
In Reserves component	0.80	(0.61, 1.04)	0.87	(0.43, 1.75)
Retired/Separated	**1.00**		**1.00**	
Age				
18-25	6.50***	(5.17, 8.17)	9.14***	(3.08, 27.14)
26-34	5.07***	(4.06, 6.34)	7.09**	(2.39, 21.04)
35-49	4.00***	(3.19, 5.01)	5.14**	(1.71, 15.47)
50-64	2.53***	(2.03, 3.14)	3.46*	(1.15, 10.45)
65 and older	**1.00**		**1.00**	

	All Adults		SPD Subpopulation	
Variable	**Odds Ratio**	**95% CI**	**Odds Ratio**	**95% CI**
Gender				
Male	3.63***	(3.45, 3.81)	2.85***	(2.56, 3.16)
Female	**1.00**		**1.00**	
Race/Ethnicity				
White	2.23***	(1.98, 2.51)	1.68***	(1.30, 2.18)
Black	1.05	(0.91, 1.21)	1.10	(0.78, 1.53)
Hispanic	1.19**	(1.05, 1.36)	0.98	(0.70, 1.39)
Other	**1.00**		**1.00**	
Marital Status				
Married	**1.00**		**1.00**	
Widowed	1.15	(0.89, 1.48)	1.33	(0.76, 2.35)
Divorced/Separated	1.92***	(1.78, 2.06)	1.73***	(1.42, 2.10)
Never Married	1.97***	(1.86, 2.09)	1.91***	(1.62, 2.25)
Employment				
Full-time	**1.00**		**1.00**	
Part-time	0.99	(0.93, 1.06)	0.88	(0.76, 1.02)
Unemployed	1.11*	(1.01, 1.22)	1.03	(0.85, 1.25)
Other	0.83***	(0.77, 0.89)	0.77**	(0.65, 0.91)
Education				
Less than high school	1.27***	(1.17, 1.37)	1.15	(0.95, 1.38)
High school graduate	1.29***	(1.21, 1.38)	1.14	(0.96, 1.35)
Some college	1.34***	(1.26, 1.42)	1.32*	(1.12, 1.55)
College graduate	**1.00**		**1.00**	
Total Family Income				
<$20,000	1.06	(0.98, 1.13)	1.25*	(1.03, 1.51)
$20,000-$39,999	0.95	(0.88, 1.01)	0.98	(0.82, 1.16)
$40,000-$74,999	0.97	(0.91, 1.05)	0.99	(0.81, 1.21)
≥$75,000	**1.00**		**1.00**	
SPD Score	1.02***	(1.02, 1.03)	1.03***	(1.02, 1.05)
Self-Reported Overall Health				
Excellent	**1.00**		**1.00**	
Very Good	1.27***	(1.20, 1.34)	1.17*	(1.01, 1.35)
Good	1.31***	(1.23, 1.41)	1.24*	(1.05, 1.48)
Fair	1.23***	(1.11, 1.36)	1.26*	(1.01, 1.57)
Poor	0.98	(0.79, 1.21)	0.99	(0.65, 1.52)
Disability Status				
Disabled	0.85	(0.72, 1.01)	0.75	(0.56, 1.01)
Not Disabled	**1.00**		**1.00**	

*p<0.05 **p<0.01 ***p<0.001

Summary

Results provide partial support for my hypotheses in both populations. Turning first to the full population, my hypotheses are fully supported when examining abuse or dependence of any illicit drug or alcohol, alcohol abuse or dependence, and heavy drinking within the past 30 days. Results partially support my hypotheses for abuse or dependence of any illicit drug other than marijuana, as veteran status is significant with an odds ratio greater than one in models 2 and 3. Lastly, I am unable to support my hypothesis for marijuana abuse or dependence in the full population.

Within the SPD subpopulation, I am able to support my hypotheses fully for marijuana abuse or dependence and heavy drinking. I am able to support my hypotheses partially for abuse or dependence of any illicit drug or alcohol, as veteran status was significant at the $p<0.05$ level in model 3 and was marginally significant ($p<0.1$) in model 4. Veteran status was positive, but only marginally significant ($p<0.1$) in models 3 and 4 for abuse or dependence of any illicit drug except for marijuana and for alcohol abuse or dependence.

Discussion

Review of Findings

I hypothesized veterans would be more likely than nonveterans to drink heavily and abuse or be dependent upon drugs and alcohol, both within the general population and within a subpopulation of adults with serious psychological distress. After controlling for demographics and socioeconomic status, veterans in the general population were significantly more likely than nonveterans to have engaged in heavy drinking in the past 30 days and to have suffered from abuse or dependence of any illicit drug or alcohol, any illicit drug other than marijuana, and alcohol. After adding controls for mental and physical health, the difference between veterans and nonveterans for abuse and dependence of any illicit drug other than marijuana was no longer significant.

In the subpopulation with serious psychological distress, veterans were more likely than nonveterans to have engaged in heavy drinking in the past 30 days or to have suffered from abuse or dependence of marijuana or of any illicit drug or alcohol, after controlling for demographics and socioeconomic status. Veterans were more likely to have abused or been dependent upon alcohol or any illicit drug other than marijuana, but these differences were only marginally significant. In the full model, which included controls for mental and physical health, veterans were more likely than nonveterans to have engaged in heavy drinking in the past 30 days and to have suffered from marijuana abuse or dependence. Veteran status was marginally significant in the full models for abuse or dependence of any illicit drug or alcohol, any illicit drug other than marijuana, and alcohol. The small sample of veterans within this subpopulation may have prevented the results for these three outcomes from reaching significance.

Implications

This study's results diverge from the existing literature for both unadjusted and adjusted comparisons. The existing literature has found differences in rates of alcohol or drug abuse/dependence between veterans and nonveterans exist when making unadjusted comparisons (Ballweg & Li, 1989; Nace & Meyers, 1974). In most of these studies, the unadjusted comparisons found veterans had higher rates of alcohol and drug use, abuse, and dependence. Unlike prior research, this study found veterans had significantly *lower* rates of drug or alcohol abuse/dependence than nonveterans before adjusting for any covariates, due to unadjusted age and gender differences between the two groups. In the subpopulation with SPD, there was no statistical difference between veterans and nonveterans for any measures of abuse or dependence. Only for heavy drinking did veterans have significantly higher rates than nonveterans, a finding which held for both populations.

The existing literature provides varying results about differences in rates of alcohol and drug abuse/dependence between veterans and nonveterans after controlling for covariates. As explained previously, many earlier studies indicated the differences in rates of alcohol or drug abuse/dependence between veterans and nonveterans were no longer statistically significant after controlling for demographics (Boscarino, 1979b, 1980, 1981a). More recent research (Richards, et al., 1990; Richards, et al., 1989; Tessler, et al., 2005; Wagner, et al., 2007) has shown the differences continue to exist after controlling for covariates, but the number and type of covariates controlled for, in addition to the various methods used to produce these controls, limit the usefulness and generalizability of the results. Many of these studies suffer from limitations due to sample size or composition (e.g., limiting the sample to only white men), obsolete or inconsistent definitions of outcome measures, or few controls for confounders.

This study improves upon the prior literature through several means. First, few studies use national samples as this one does. Second, this study uses several different measures of substance abuse and dependence, which facilitate a better understanding of the types of substances for which

veterans face an increased risk of abuse or dependence. Third, the model building approach provides a detailed understanding of which variables account for the differences between veterans and nonveterans. Fourth, this study controls for more confounders than previous studies. More specifically, this study controls for demographics, measures of socioeconomic status, the presence and severity of mental illness, and measures of physical health. Finally, this study produces a more robust analysis because it determines differences between veterans and nonveterans within the general adult population and within a subpopulation of adults with serious psychological distress.

The models employed in this study identified that veterans are a group at risk for substance abuse/dependence, even after considering demographics and socioeconomic status. This increased risk among all veterans has implications for the VA and other clinicians to improve screening of and outreach to this population. The models also identified veterans with serious psychological distress are vulnerable to problems with alcohol and marijuana. Consequently, mental health providers should be cognizant of the possibility of problematic drinking and potential abuse or dependence of marijuana among their veteran patients.

Limitations

This study suffers from several limitations. I relied upon data from NSDUH, a yearly, nationwide survey designed to assess levels of substance use across the U.S. adolescent and adult population. Because it is not designed to study the veteran population specifically, there may be measurement error when assessing veteran status. A respondent is coded as being a veteran if he or she answers affirmatively to the question "Have you ever served in the U.S. Armed Forces?" There is no way to tell if the respondent was an active duty member or was in a Reserves component or the National Guard. This distinction is important when considering the potential for exposure to combat, level of debriefing after deployments, and social support from other military personnel, all of which may affect a veteran's likelihood of developing mental or substance use problems (Thomas et al., 2010).

Additionally, there is no way to determine from these data the respondent's branch or era of service, which prevents identification of combat veterans. Exposure to higher levels of combat has been shown to affect rates of combat related trauma, but this research is unable to account for this potential confounder (Jordan, et al., 1991). I was also unable to determine the respondent's occupation within the service, and this limitation prevents parsing out those veterans who may have had repeated exposure to traumas likely to lead to emotional distress and/or substance use.

Third, NSDUH excludes the homeless population, one disproportionally affected by mental illness and substance use. Veterans are also disproportionately represented among the homeless (Gamache, Rosenheck, & Tessler, 2001; Gamache, Rosenheck, & Tessler, 2003; Rosenheck, Frisman, & Chung, 1994). By excluding these subgroups, these results may understate the rate of mental illness and substance abuse or dependence, as well as the true severity of each condition in veteran and nonveteran populations. Consequently, the exclusion of the homeless from the sample may bias the coefficients and corresponding odds ratios toward the null hypothesis.

Another limitation to consider is that the results are based upon self-reported symptoms and behaviors. Because mental illness and substance use are each conditions fraught with stigma, individuals may underreport their use of alcohol or drugs. They may not report the true severity of their mental illness symptoms or adverse consequences of their substance use. This is a minor limitation, however, as previous studies have determined self-reported drug use data from NSDUH to be valid (Han, et al., 2010; Harrison & Hughes, 1997).

There may also be differences in how veterans respond to questions about mental illness and substance use compared to nonveterans. Stigma toward mental illness or substance use within the veteran population may produce results that differ from the nonveteran population. Additionally, perceptions of symptom severity may be different between veterans and nonveterans. Military training may increase a veteran's threshold for what he or she considers as "nervous" or "restless or

fidgety"; this altered perception may cause veterans to understate the severity of their mental health symptoms.

Another limitation related to self-report on surveys is recall bias. NSDUH asks participants to report their symptoms and behaviors for the past year. For example, questions addressing serious psychological distress ask participants to think back on their "worst month" emotionally in the past year and assess the severity of their symptoms for that month. The length of time between the "worst month" and the time the participants responded to the survey may influence the accuracy of memories of symptom severity.

Results are also limited by the cross-sectional nature of the data. Mental health problems and substance use disorders are each long term, often chronic conditions, which may occur with varying severity over multiple years in a person's life. NSDUH asks about the previous year only, so it is possible the survey does not capture the true extent of the respondent's conditions over their life course. Cross-sectional data are also limited because they affect the capacity for causal modeling, so this research is limited to analyzing associations between veteran status and substance related problems.

Future Directions

Efforts to Reduce Alcohol and Drug Use among Active Duty Military Personnel

The U.S. Military has achieved reductions in tobacco and illicit drug use among active duty personnel since 1980, despite recent (since 2002) increases in prescription drug misuse (Bray, et al., 2010). Reductions in illicit drug use are attributed to a zero-tolerance policy and wide-scale drug testing (Bray, et al., 2010). The reductions in smoking are also attributed to policies and other promotions the military instituted beginning in the 1980s (Bray, et al., 2010).

Research indicates active duty military personnel have higher rates of heavy alcohol use, abuse, and dependence than civilians, even after adjusting for demographic differences (Ballweg & Li, 1989; Polich, 1981). This use may be related to a perception of expected drinking behaviors, as

Ames et al. found in their study of active duty Navy personnel (Ames, et al., 2007). Navy personnel perceived strong peer approval for heavy drinking and support for observance of traditions surrounding alcohol use (Ames, et al., 2007). Even among personnel who report problematic alcohol use, support for treatment may be lacking (Milliken, Auchterlonie, & Hoge, 2007). In light of its successes in reducing smoking and illicit drug use among active duty personnel, the DOD should consider additional efforts and policies to address problematic alcohol consumption.

Outreach to Veterans

This study identifies that all veterans and veterans with SPD face an elevated risk of heavy drinking and substance abuse or dependence compared to nonveterans. These findings held even after controlling for age, race/ethnicity, and other demographic factors. While there has been increased focus by the VA and DOD on potential substance-related problems and mental illness among younger veterans, all age groups may be affected. In order to reduce the risk of substance abuse/dependence among veterans, the VA should consider implementing educational campaigns about risky drinking and substance abuse/dependence, especially among more high-risk groups (e.g., those with mental health problems, combat exposure, etc.). These campaigns should target all veterans and not only those who already receive their health care through the VA.

As the findings in this study of increased risk for alcohol and drug abuse/dependence among veterans held in the subpopulation with SPD, the VA and clinicians should especially consider increasing education and awareness of this risk among mental health providers. Mental health providers outside of the VA system who treat veterans should also consider the increased risk for substance-related problems among this population. Additionally, the VA should consider addressing the unique treatment needs of individuals suffering from both mental health and substance-related problems. Research has found outcomes for both conditions are better for individuals who receive integrated treatment compared to those who receive treatment for each disorder separately (Grella & Stein, 2006; Kuehn, 2010a; McLellan, Luborsky, Woody, O'Brien, & Druley, 1983). The VA has

recently demonstrated success in reducing smoking while improving PTSD symptoms among patients receiving integrated treatment addressing both conditions, compared to those receiving separate care (McFall et al., 2010). Building upon this success, the VA should consider expanding this treatment approach to more locations and to include more types of substance-related and mental health disorders.

Improved Data Collection and Future Research

One of the unavoidable weaknesses of this study is the reliance on cross-sectional data. While cross-sectional data are well equipped to provide information on prevalence, only longitudinal studies can give insight into the life course of mental illness and substance abuse and dependence. The current wars in Afghanistan and Iraq may provide a good opportunity to conduct these types of studies. As veterans are a high risk population for drug and alcohol abuse and dependence, and because many new veterans are being diagnosed with mental illness, this group may serve as a perfect group to track the development of problems, the change in severity over time, and the effects of treatment (or lack thereof).

Future research should also address some of the data limitations mentioned earlier in this chapter. Additional information on substance use and mental health within homeless populations might provide a more accurate assessment of veterans' risk for substance abuse/dependence. Other research should include more information on characteristics of veterans' military service. As studies have shown, alcohol and drug use, abuse, and dependence are associated with type of service (i.e., active duty, National Guard, or Reserves) (Blume, et al., 2010; Jacobson, et al., 2008), branch of service (Polich, 1981), and exposure to combat (Bray, et al., 2010; Fiedler, et al., 2006; Seal, et al., 2009). More comprehensive data are needed to determine what factors may be closely associated with, or may possibly cause, alcohol and drug abuse/dependence among veterans.

Conclusion

Veterans are a population at risk for substance abuse and dependence, regardless of the presence of mental illness. While the results do not support every hypothesis, they do show distinct differences in the odds of abuse or dependence of alcohol and illicit drugs between veterans and nonveterans, both in the general population and within a group with serious psychological distress. Additionally, this study contributes to the existing literature in several ways. First, it builds upon existing research by using national survey data. Second, it uses several different measures of heavy alcohol use and substance abuse/dependence. Third, it uses a model building approach, which allows for a more detailed understanding of which variables account for differences between veterans and nonveterans. Fourth, this study controls for more confounders than previous studies, including the presence and severity of mental illness and measures of physical health. Finally, unlike previous studies, this study examines the relationship between mental health and substance abuse/dependence within the general population and within a subpopulation of adults with serious psychological distress. This study contributes a more thorough and nuanced understanding of differences in heavy drinking and illicit drug and alcohol abuse/dependence between veterans and nonveterans.

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