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A Longitudinal Population Based Analysis of Alcohol Use Disorders and Co-Occurring Mental Health Disorders in the Military Health System

by

CPT Gim M. Reo

Dissertation submitted to the Faculty of the
Medical & Clinical Psychology Graduate Program
Uniformed Service University
In partial fulfillment of the requirements for the degree of
Doctor of Philosophy

UNIFORMED SERVICES UNIVERSITY OF THE HEALTH SCIENCES
SCHOOL OF MEDICINE GRADUATE PROGRAMS
Graduate Education Office (A 1045), 4301 Jones Bridge Road, Bethesda, MD 20814

June 18, 2020

MEMORANDUM FOR: **DR. JEFFREY L. GOODIE**
DR. DAVID S. RIGGS
DR. JOSHUA C. GRAY
DR. TRACEY KOEHLMOOS

SUBJECT: Appointment to the Final Doctoral Examination Committee for Gim Michael Reo

In accordance with the School of Medicine Graduate Program Guidelines, you are formally appointed to the Final Examination Committee of Gim Michael Reo, doctoral student in the Department of Medical and Clinical Psychology.

This Committee will evaluate the scope and quality of the student's Dissertation and certify the document's acceptability.

In addition, the Committee will conduct an Oral Examination of the student's scientific knowledge, as well as the knowledge and understanding of the research project and Dissertation. This examination constitutes the Private Defense.

The Private Defense for Gim Michael Reo will take place on Wednesday, June 24, 2020 at 9:15 AM via Zoom.

Dr. Jeffrey Goodie is appointed Chair of the Examination Committee. Dr. Goodie will oversee the examination. Passage of the Private Defense will be by majority vote. If corrections to the Dissertation are needed, the Chair may oversee this process and sign-off after the corrections are made.

The Committee Chair should return the signed and dated Final Examination/Private Defense Form and the Dissertation Approval Form to the Graduate Education Office.

GEO thanks you in advance for your participation in the SOM Graduate Program process.

[redacted]

Saibal Dey, Ph.D.
Associate Dean for Graduate Education

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FINAL EXAMINATION/PRIVATE DEFENSE FOR THE DEGREE OF DOCTOR OF PHILOSOPHY
IN THE DEPARTMENT OF MEDICAL AND CLINICAL PSYCHOLOGY

Name of Student: Gim Michael Reo

Date of Examination: June 24, 2020
Time: 9:15 AM

DECISION OF EXAMINATION COMMITTEE MEMBERS:

	PASS	FAIL
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APPROVAL OF THE DOCTORAL DISSERTATION IN THE DEPARTMENT OF MEDICAL AND CLINICAL PSYCHOLOGY

Title of Dissertation: "A Longitudinal Population Based Analysis of Alcohol Use Disorder and Co-Occurring Mental Health Disorders in the Military Health System"

Name of Candidate: Gim Michael Reo
Doctor of Philosophy Degree
June 24, 2020

DISSERTATION AND ABSTRACT APPROVED:

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July 19th, 2021

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ABSTRACT

Title of Dissertation: A Longitudinal Population Based Analysis of Alcohol Use Disorders and Co-Occurring Mental Health Disorders in the Military Health System

Gim M. Reo, Ph.D. Candidate, 2021

Thesis directed by: David Riggs, Ph.D.

Alcohol Use Disorder (AUD) is a significant public health problem in the US. Further, US military and veteran samples consistently produce higher prevalence estimates of probable AUD, compared to the US general population. In addition, the literature indicates US military and veteran samples are at significantly higher risk of common mental health disorders co-occurring with AUD, compared to the US general population. This is important because co-occurring disorders have a negative impact on treatment outcomes.

Utilizing the Military Health System (MHS) data repository (MDR) collected between FY2008 and FY2015, this study aimed to identify annual incidence rates of initial AUD diagnosis among active duty service members as well as the relation of demographic and military characteristics to initial AUD diagnosis. There was a 24.18% decline from FY2009 through FY2014, and a 15% increase from FY2014 to FY2015. Future research should examine how policy decisions used to determine the size of the active duty population impact annual incidence rates of initial combined AUD. Further, results indicated certain active duty service member groups (i.e., male, marital separation, other racial group, motor transportation personnel, senior officer, US Army personnel) were more likely to receive an initial combined AUD diagnosis over the study period.

This study was also the first study to assess the eight-year period prevalence rates of common mental health disorder diagnoses co-occurring with AUD diagnosis in active duty service members and to compare them to those without an AUD diagnosis. The most common mental health disorder diagnoses co-occurring with AUD were: 1) adjustment disorders, 2) depressive disorders, 3) anxiety disorders, 4) PTSD, and 5) insomnia. Service members with a history of combined AUD had significantly higher eight-year period prevalence rates for all common mental health disorder diagnoses, when compared to those with no AUD. In addition, with the exception of insomnia, service members with a history of combined AUD had significantly higher eight-year period prevalence rates for having a co-occurring (i.e., diagnosed 90 days prior to or following a combined AUD diagnosis) common mental health disorder diagnosis, compared to those with no history of combined AUD diagnosis.

Lastly, there are currently no studies examining the chronology (i.e., order) of medical diagnosis between common mental health disorders co-occurring with AUD, regardless of the population. This was important to examine because chronology of diagnosis has an impact on treatment considerations and outcomes. For the third aim, we examined the chronology of co-occurring common mental health disorder diagnosis in relation to an active duty service member's initial AUD diagnosis. With the exception of adjustment disorders, combined AUD tended to be diagnosed prior to the common mental health disorders assessed within the current study. However, this was far from universal. Future research should examine whether the order of diagnosis impacts the delivery or outcome of treatment.

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CHAPTER 1: Introduction

The public health and societal costs associated with alcohol use disorder (AUD) place a tremendous burden on the United States (US) general population. According to Rehm (1), there are 30 medical conditions which attribute AUD as the primary underlying cause. Further, AUD has also been identified as a contributing factor for numerous additional illnesses and conditions including cancer, diabetes, cardiovascular disease, infectious disease, liver and pancreas disease, neuropsychiatric diseases, and intentional and unintentional injury. In addition, Rehm (1) indicated that alcohol use is significantly associated with interpersonal conflict, such as domestic violence, child abuse and neglect, and abuse in other interpersonal relationships (e.g., extended family, friends, co-coworkers, and strangers). Also, AUD has been shown to be significantly associated with other societal issues to include death and hospitalizations to self and others from driving under the influence (DUI), family disruptions (e.g., separation, divorce), financial difficulties, and legal problems (1). Given this, AUD is a significant focus of research and development, and policy initiatives throughout all levels of the US public health system (1).

Alcohol abuse is defined by the *Diagnostic and Statistical Manual of Mental Health Disorders* (*DSM*), fourth edition (*DSM-IV*; American Psychiatric Association [APA], 2) as the presence of one or more symptoms associated with abuse of alcohol within the past year (see Table 1). In contrast, alcohol dependence is defined as having three or more symptoms associated with dependence to alcohol within the past year (see Table 2). The APA (3) combined alcohol abuse and dependence upon release of the *DSM*, fifth edition (*DSM-5)* to create a single diagnostic classification of AUD. AUD is

defined by the *DSM-5* (3) as having the presence of two or more symptoms within the past year associated with alcohol abuse or dependence (see Table 3). The *DSM-5* (3) also introduced a severity index to remove the classifications of abuse versus dependence by creating the severity categories of mild (i.e., 2-3 symptoms), moderate (i.e., 4-5 symptoms), and severe (i.e., 6 or more symptoms) symptomatology.

Cheng, Kaakarli, Breslau, and Anthony (4) recently conducted an analysis of the United States (US) annual prevalence estimates of probable alcohol abuse and dependence, as defined by the *DSM-IV* (2). Utilizing the National Surveys on Drug Use and Health (NSDUH), Cheng and colleagues (4) reported annual prevalence estimates for probable alcohol abuse ranged from 3.7% to 4.4% and probable alcohol dependence ranged from 3.3% to 3.6% over a 12-year period from 2002 to 2014.

Earlier studies utilizing the *DSM-IV* (2) classification for probable alcohol abuse and dependence found similar results to Cheng and colleagues (4). According to Hasin, Stinson, Ogburn, and Grant (5), the 2001-2002 National Epidemiological Survey on Alcohol and Related Conditions (NESARC) indicated the US 12-month prevalence estimate of combined probable alcohol abuse and dependence was 8.5% and lifetime combined prevalence estimate was 30.3%. The 2001-2003 National Comorbidity Survey (NCS) indicated slightly lower estimates; 12-month prevalence estimates for combined probable alcohol abuse and dependence were 4.4% and lifetime estimates were at 18.8% (6).

Grant and colleagues (7) were the first to examine prevalence estimates utilizing the *DSM-5* (3) classification of AUD. These researchers analyzed the 2012-2013 NESARC for probable AUD and found the US 12-month and lifetime prevalence

estimates were 14% and 32.6%, respectively. Grant and colleagues (7) concluded from their findings there was a substantial increase in US 12-month prevalence of probable AUD from previous studies utilizing the *DSM-IV* (2) classification of alcohol abuse and dependence.

Cheng and colleagues (4) addressed the findings from Grant and colleagues (7) by conducting an analysis to assess changes in probable alcohol abuse and dependence from 2002 through 2014. The authors concluded there was no significant increase in annual probable alcohol abuse (ranged from 3.7% to 4.4%) or dependence (ranged from 3.3% to 3.6%) throughout the 12-year period. This study provided evidence contrary to Grant and colleagues (7) claim of there being a significant increase in probable AUD in the US general population samples in recent years. Given the two studies utilized different *DSM* definitions of AUD, it is likely the changes in definition could account for the differences in rates of probable AUD. However, it is also possible differences in rates of probable AUD are related to other methodological differences between the two studies. Additional studies are required to verify if rates of probable AUD utilizing the new classification continue to stay consistent over time.

A subgroup of the US general population that appears particularly at risk for AUD is US military and US veteran populations (8; 9; 10; 11; 12; 13; 14; 15; 16; 17). Notably, there is very limited research directly comparing the prevalence estimates of probable AUD among US military, veteran, and general populations. However, the studies examining US military and veteran prevalence estimates for probable AUD have consistently shown these populations report significantly higher rates of alcohol misuse and probable AUD, when compared to US general population prevalence estimate studies

(8; 9; 10; 11; 12; 13; 14; 15; 16; 17). It is important to note there are differences in methodology used to assess probable AUD between independent studies examining US military, veteran, and general population samples, which will be discussed below.

AUD in US Military and US Veteran Populations

Military readiness has been identified by the Department of Defense (DoD) as one of their primary objectives for their subordinate organizations, in order to ensure the national security of the US. The health consequences associated with AUD have the potential to negatively impact unit readiness throughout the DoD. Further, US service members experience significant administrative consequences for negative alcohol related incidents through the Uniform Code of Military Justice (UCMJ), which has the potential to put a significant strain on general readiness. Because of the negative consequences associated with AUD in the domains of health and social functioning (i.e., 1), the DOD has placed a special emphasis on treatment of AUD and prevention of negative alcohol related incidents (i.e., domestic abuse, DUI). The DoD also has emphasized research and development, and policy initiatives aimed at reducing the negative impact of AUD in US service member populations.

Riddle and colleagues (14) conducted an analysis of three-year period prevalence (i.e., 2001-2003) for mental health disorders, including AUD, in US service members participating in the baseline assessment of the Millennium Cohort Study (MCS). Results indicated there was a 12.6% period prevalence of probable alcohol abuse amongst these service members. Jacobson and colleagues (12) conducted a follow-up study from 2004 to 2006 with service members participating in the MCS. Their results indicated prevalence estimates of possible alcohol dependence were 18.5% and 18.2% from

baseline and follow-up data, respectively (12). Utilizing *DSM-IV* (2) definitions of alcohol abuse and dependence throughout their analyses, the MCS consistently reported higher rates of probable AUD, when compared to US general population prevalence estimate studies utilizing similar methods of diagnostic classification (e.g., 4; 5; 6).

Bray and colleagues (9) conducted an analysis of the DoD 2008 Health Related Behaviors Survey (HRBS). Utilizing the *Alcohol Use Disorders Identification Test* (AUDIT-C), researchers found approximately 25% of service members engaged in hazardous drinking behaviors (i.e., score of 8 to 15). Further, approximately 20% of service members engaged in heavy alcohol use (i.e., five or more drinks on one occasion) on a weekly basis. In contrast, approximately 14% of US civilians participating in the study engaged in heavy alcohol use on a weekly basis. These results suggest there are significantly higher rates of heavy alcohol use in US military samples.

The rates of active duty service member heavy alcohol use reported in Bray and colleagues (9) were consistent with nine previous iterations of the DoD Worldwide Surveys of Health Related Behaviors from 1980 to 2005 (8). Bray and Hourani (8) reported prevalence of heavy alcohol use for service members ranged from approximately 19% to 25% over that period. Taken together, these studies provide evidence of consistency regarding rates of heavy alcohol use over a 28 year period (i.e., 1980 to 2008). The alcohol use specified in the 2008 HRBS and the nine previous iterations from 1980 to 2005 would likely be classified as probable alcohol abuse for the time period, given these service members were engaging in weekly binge drinking. As mentioned above, 12-year annual prevalence estimates for probable alcohol abuse in US general population samples are also fairly stable (i.e., 4), though at a lower rate (ranged

from 3.7% to 4.4%) than among the military service members. Thus, it appears that rates of heavy alcohol use in military populations has been higher than among the US general population for decades.

Meadows and colleagues (13) examined data from the 2015 version of the HRBS. The researchers found approximately 35% of service members engaged in hazardous drinking behaviors in 2015. Further, 30% endorsed current weekly binge drinking (i.e., five or more drinks on one occasion), which is somewhat higher than previous estimates of weekly binge drinking (8; 9; 10). However, the later study changed the original definition of heavy alcohol use from binge drinking at a rate of 4 or more times over a 30-day period, to binge drinking at a rate of 5 or more times over a 30-day period, specifying that binge drinking on average must occur more than once a week for heavy alcohol use to be present. As a result, the rates of estimated heavy alcohol use dropped from approximately 20% over a nearly three-decade period, to 5.4%. However, US military service members are still engaging in similar rates of weekly binge drinking as the previous studies and would still likely meet classification for a probable alcohol abuse under the *DSM-IV* (2) categorization.

According to the US military studies discussed above, service members with probable alcohol abuse, alcohol dependence, and AUD were most likely to be young (i.e., 17-24), single, white, enlisted (i.e., E1 to E6), and males (8; 9; 12; 13; 14). Further, the highest proportional rates of alcohol misuse were found in the US Marine Corps, with the lowest proportional rates found within the US Air Force (8; 9; 10; 12; 13; 14). It is important to note that, like prevalence estimates, the demographic and military

characteristics associated with probable AUD in US military samples were consistent over time (8; 9; 10; 12; 13; 14).

There have also been multiple AUD prevalence estimate studies conducted in US veteran populations. Seal and colleagues (18) conducted a population-based analysis of the 10-year period prevalence of new users of the Department of Veterans Affairs (VA) healthcare system. These researchers found that 10% of new VA healthcare system users were diagnosed with combined AUD (i.e., alcohol abuse or dependence) during the 10-year period. It is important to note this number does not include new VA users with AUD symptomology who were never diagnosed with an AUD. Wilson and colleagues (17) conducted an analysis of lifetime estimates of probable AUD in a US veteran sample. Researchers indicated the lifetime estimates of probable AUD in male and female veterans were 43.9% and 23.2%, respectively. These estimates were similar to findings reported by Fuehrlein and colleagues (11), who indicated the past year and lifetime prevalence rates of probable AUD for US veterans were 14.8% and 42.2%, respectively.

In each of the above prevalence estimate studies, US military and veterans are reporting higher rates of probable AUD, when compared to the US general population prevalence estimates. Further, the VA released a population-based analysis regarding rates of actual diagnosis of combined AUD throughout the VA healthcare system, indicating 10% of new VA users over a ten-year period were diagnosed with either alcohol abuse or dependence (i.e., 18). These rates of combined AUD diagnosis are higher than current annual prevalence estimates of combined AUD in US general population samples, during the same time period (4; 5; 6).

In comparison to the US military AUD prevalence estimates based on studies utilizing self-report measures, current annual prevalence of combined AUD diagnosis estimated from active duty service member medical records is much lower (19). The DoD (19) commissioned a report describing annual period prevalence of various mental health disorder diagnoses, including combined AUD, in active duty service members receiving treatment throughout the Military Health System (MHS) from fiscal year (FY) 2005 through FY2016. Utilizing the MHS Data Repository (MDR), the DoD (19) had access to all direct care claims records within the MHS when running their analyses. Given this, the report provided a population-based analysis of the rates of mental health disorder diagnosis throughout the various active branches of service (i.e., Air Force, Army, Marines, Navy), including all active National Guard and Reserve service members. According to the DoD (19), the annual period prevalence rates of combined AUD diagnosis throughout all branches of service from FY2005 through FY2016, ranged from approximately 1.8% to 2.4%. Additional analyses indicated Army and Marine personnel had the highest annual period prevalence rates of combined AUD diagnosis from FY2005 through FY2016, with the Air Force consistently reporting the lowest rates of annual combined AUD diagnosis.

The report commissioned through the DoD (19) provided significant insight into the rate at which active duty service members are receiving services for mental health disorders throughout the MHS. However, the DoD (19) only included inpatient and outpatient visits within the direct care systems. This only includes patient encounters for active duty service members within military treatment facilities throughout the MHS. It is important to note the TRICARE insurance claims system allows for the utilization of

both direct care and purchased care systems. Purchased care systems include the utilization of medical treatment facilities outside of the MHS (i.e., civilian medical treatment facilities). Given this, it is possible the DoD (19) report is excluding a large number of active duty service members who received services for combined AUD within the purchased care systems. Other studies examining service member diagnoses and health care utilization in the MHS accessed both direct care and purchased care systems to conduct their analyses (e.g., 20).

The methods utilized in the DoD (19) report allowed for the inclusion of active duty service members with a combined AUD diagnosis in multiple annual prevalence estimates, if they maintained a diagnosis over multiple years. This is a concern because it is not uncommon for active duty service members to retain a diagnosis of mental health disorder on their medical record after they achieved remission for the diagnosed disorder. The possibility for an active duty service member to carry a diagnosis of combined AUD over multiple years following remission could potentially impact the accuracy of the annual prevalence estimate of combined AUD diagnosis over time. An alternate approach, used in the current study, for understanding the changes in rates of combined AUD diagnosis over time would be to assess the annual incidence rate of initial diagnosis for combined AUD throughout the MHS.

Outside of branch of service, the DoD (19) report did not examine the relation of demographic and military characteristics to AUD prevalence rates. According to the DoD (19), US Army and US Marine Corps were consistently diagnosed with combined AUD at a higher rate than the other services over the 12-year period; US Air Force consistently reported the lowest rates of combined AUD diagnosis amongst the services. The existing

literature regarding prevalence of probable AUD based on surveys of US military samples is largely consistent with the DoD (19) findings related to branch of service (8; 9; 10; 12; 13; 14). However, the survey-based studies have not found similar rates of probable combined AUD in the US Army and US Marines Corps. In fact, the existing literature has consistently found lower rates of probable AUD in the US Army, when compared to the US Marine Corps (8; 9; 10; 12; 13; 14). Given the lack of research into the demographic correlates of AUD diagnoses within the MHS, it is important to conduct additional analyses of demographic (e.g., age, marital status, race, sex) and military characteristics (e.g., branch of service, military occupation, rank). Indeed, there may be differences in how these factors are related to active duty service members receiving diagnoses for combined AUD as compared to their relation to probable AUD based on self-reported alcohol use.

It is notable that the prevalence estimates for combined AUD diagnosis from the military medical records (i.e., 19) are significantly lower than earlier period prevalence estimates from studies that surveyed US military, veteran, and civilian populations. These differences across methodologies suggest service members are more likely to report probable AUD symptomology in a self-report survey than to receive an actual diagnosis of combined AUD in the MHS. This finding is consistent with other studies indicating mental health problems are significantly underdiagnosed among US military service members (21; 22). It is important to examine underdiagnoses of mental health disorders amongst active duty service members because there are likely a large number of active duty service members with probable AUD, who are not receiving the services they need.

Better understanding patterns or correlates of combined AUD diagnosis can offer better understanding of which service members are not receiving the necessary treatment.

It is important to highlight that each of the four branches of service in the DoD (19) report have similar reporting requirements as it relates to combined AUD diagnosis. According to O'Brien, Oster, and Moden's (23) book entitled, *Substance Use Disorders in the US Armed Forces*, the policies for reporting of combined AUD diagnosis are largely similar among the four branches of service due to strict policy guidelines that have been instituted throughout the DoD. These guidelines require military medical providers, including those involved in military substance abuse programs, to input diagnosis of SUD, including combined AUD, into the service member's electronic medical record following completion of a thorough clinical assessment. This includes clinical assessments where combined AUD symptomatology may have not been the initial presenting problem for seeking treatment.

However, it is often the case that a combined AUD diagnosis may not make it into a service member's medical record, even if it is diagnosed during a patient encounter. Indeed, there are multiple military occupational specialties that would require a service member to be placed on administrative restrictions for receiving a combined AUD diagnosis (e.g., aviation, intelligence, maintenance, special operations). Given the institutional consequences associated with combined AUD diagnosis, it is not uncommon for military medical providers to provide services for combined AUD, without recording a combined AUD diagnosis within the service member's electronic medical record. Given this, it is possible there is a percentage of service member's with a combined AUD diagnosis that may not have been counted within the DoD (19) report. The US Air Force

may be particularly susceptible to this practice, given a large number of their occupational specialties have restrictions related to combined AUD symptomology. If this is the case, this could help to explain the rates of underdiagnoses of combined AUD throughout the MHS and reinforce the literature pertaining to stigma and barriers to care for military service members (21; 22).

Stigma and Barriers to Care in Military Service Members

According to Sharp and colleagues (22), approximately 60% of service members with mental health issues chose not to seek mental health services, even if they might benefit from treatment. One hypothesis put forth to help elucidate the rates of under-use of mental health care among service members, is perceived stigma towards receiving a mental health diagnosis. According to Cerully, Acosta, and Sloan (24), stigma towards mental health disorders can be conceptualized in multiple domains, to include: 1) public stigma (i.e., public holding negative beliefs towards individuals with mental health issues), 2) self-stigma (i.e., individuals holding negative beliefs about mental health issues), 3) social stigma (i.e., family and friends holding negative beliefs about mental health issues), and 4) institutional stigma (i.e., policies or leadership guidance implying negative beliefs towards mental health issues). These domains of stigma have been identified as obstacles that make it very difficult for service members to feel comfortable seeking mental health services out of fear of repercussions from their social environment or military organizations.

Hom, Stanley, Schneider, and Joiner (25) conducted a systematic review of the literature in reference to domains of stigma towards mental health diagnosis in members of the US and international military communities. The authors concluded institutional

stigma was the most common and significant domain of stigma endorsed by service members. More specifically, the collection of studies included in the review found multiple service member samples endorsed beliefs they would be blamed for their mental health concerns (ranging from 7% to 31%) and be treated differently by their unit leadership (ranging from 16% to 60%), if they were to seek treatment for mental health symptomology. Further, service member samples endorsed beliefs they would be perceived as less competent by their unit leadership and/or peers (ranging from 12% to 52%), and feared seeking mental health services could lead to fewer career advancement or promotion opportunities (ranging from 12% to 46%). Additionally, service member samples endorsed negative beliefs towards documentation of mental health diagnoses (ranging from 21% to 43%) and were fearful of issues of confidentiality associated with their mental health records (ranging from 24% to 37%). Hom and colleagues (25) reported service member samples endorsed self-stigma, in the form of feelings of embarrassment (i.e., ranging from 9% to 35%) or weakness (i.e., ranging from 14% to 46%), that may have an impact on their beliefs towards institutional stigma. According to Hom and colleagues (25), it is clear there is significant stigma towards receiving a mental health diagnosis among military service members. However, what is still unclear is how stigma impacts the rate of treatment utilization in service members who would benefit from utilizing mental health services.

Reviews of research more directly examining the impact of stigma on mental health service utilization have not been able to determine if perceived stigma has a positive or negative effect on the likelihood of behavioral health treatment utilization (22; 24). Cerully and colleagues' (24), in a systematic review of the literature, could only find

two studies exploring the relationship between stigma and mental health treatment seeking behavior in US service members. Arbisi, Rusch, Polusny, Thuras, and Erbes (26) conducted a study examining mental health service utilization among National Guard service members returning from deployment. Their results indicated there was no relationship between a measure of self-stigma and whether or not the service members sought treatment for mental health concerns. Further, Kelley, Britt, Adler, and Bliese (27) conducted a study examining the role of organizational support and stigma on mental health service utilization in active duty service members returning from deployment. Their results indicated higher rates of perceived stigma were associated with higher rates of mental health symptomology, but found no evidence as to whether or not organizational support or stigma had an impact on a service member's likelihood of seeking mental health services.

Sharp and colleagues (22) also found limited support for a relationship between anticipated stigma and help seeking intentions among US service members. Based on their review of the literature, they suggest one potential reason for the weak association between anticipated stigma and help seeking intentions is that service members may fail to recognize their treatment needs, and therefore refrain from seeking help. This could lead to service members reporting that their stigma had no impact on whether or not they sought treatment. Pertinent to the present paper, Sharp and colleagues (22) highlighted multiple studies indicating service members with alcohol problems were significantly less likely to identify they needed to seek treatment for alcohol use, when compared to other mental health symptomology. For example, Sareen and colleagues (28), found that 63.4% of service members with self-reported alcohol dependence reported no need for mental

health services, the highest of all observed disorders within the study (e.g., depression, posttraumatic stress disorder). Similarly, Hines and colleagues (29) reported service members with alcohol related problems were the least likely to seek help, due to their beliefs that alcohol use had no functional impairment on their performance.

There have been other barriers to care besides stigma that have been shown to negatively impact the likelihood of service members seeking mental health services. Hoge and colleagues (30) reported 55% of service members with mental health issues indicated they would have a difficult time getting off of work to utilize their available behavioral health assets. Hom and colleagues (25) review of the international literature identified multiple service member samples that endorsed structural barriers (ranging from 3% to 41%) making it difficult for them to utilize medical services due to their military organization's operations tempo, especially when they are on deployment. Hom and colleagues (25) identified multiple service member samples in which participants endorsed other obstacles regarding the availability of behavioral health services (ranging from 9% to 29%). Earlier studies reported 44% of service members found it too difficult to schedule an appointment with a mental health provider (30). Further, Tanielian and colleagues (31) provided qualitative evidence of service members and providers indicating there are not enough resources throughout the MHS to address the needs of the population, making it difficult for many service members to receive effective behavioral health services.

Hom and colleagues (25), review of the literature found that service member from multiple samples endorsed poor interactions with providers leading to lasting beliefs among those service members that mental health services are ineffective (ranging from

4% to 17%). Further, these experiences influence service members to feel they are better suited to handle their mental health concerns through self-management (ranging from 52% to 64%). There is also evidence from qualitative studies that poor provider experience has a long-term impact on service members' likelihood of seeking behavioral health services (32).

AUD and Co-Occurring Mental Health Disorders

Another area that has been the focus of epidemiological research related to AUD is the determination of rates of co-occurring mental health disorders. According to Kessler, Chiu, Demler, and Walters (33), the 2001-2003 National Comorbidity Survey-Replication (NCS-R) indicated that probable combined AUD (i.e., alcohol abuse or dependence) within the US general population was significantly associated with co-occurring anxiety disorders, depressive disorders and posttraumatic stress disorder (PTSD). More specifically, individuals with probable alcohol abuse reported significantly high rates of co-occurring panic disorder (27%), social phobia (22%), generalized anxiety disorder (25%), obsessive-compulsive disorder (i.e., 31%), major depressive disorder (24%), dysthymia (33%), manic/hypomanic episode (37%), and PTSD (27%). Individuals with probable alcohol dependence reported significantly high rates of co-occurring specific phobia (21%), social phobia (31%), generalized anxiety disorder (31%), major depressive disorder (37%), dysthymia (38%), manic/hypomanic episode (41%), and PTSD (34%).

Lai, Cleary, Sitharthan, & Hunt (34), conducted a systematic review and meta-analysis of the international literature examining the association between various substance use disorders (SUD) and co-occurring anxiety and mood disorders. Lai and

colleagues (2015) found individuals with combined AUD were 2.1 times more likely to have any co-occurring anxiety disorder (i.e., anxiety disorder, obsessive compulsive disorder, PTSD), when compared to non-users. Individuals with combined AUD were also 2.5 times more likely to have a co-occurring major depressive disorder, when compared to non-users.

Additional reviews have provided further evidence indicating high levels of co-occurrence between combined AUD and other mental health disorders common among military service members (i.e., anxiety disorders, depressive disorders, insomnia, and PTSD). Smith and Randall (35) provided evidence from their review indicating there is significant association between co-occurring AUD and any anxiety disorder (i.e., agoraphobia, generalized anxiety disorder, obsessive compulsive disorder, panic disorder, simple phobia, social phobia). In fact, according to their analysis of four epidemiological surveys studying co-occurring disorders, individuals with an AUD were between 2.1 and 3.3 times more likely to report a co-occurring anxiety disorder, when compared to those without an AUD. Boden and Fergusson (36) indicated individuals with an AUD ranged from 2.0 to 2.09 times more likely to report a co-occurring depressive disorder (i.e., dysthymia, major depressive disorder), when compared to individuals without an AUD. Further, the literature focusing on co-occurring AUD and insomnia has indicated the mean prevalence of insomnia disorder in AUD populations is approximately 58.4% (i.e., 37), which is significantly higher than the US general population average of 25% (i.e., 38). This is important to highlight, because insomnia disorder is often not included in epidemiological research focusing on co-occurring mental health disorders. Lastly,

Berenz and colleagues (39), reported individuals with an existing AUD were 1.28 times more likely than those without an AUD to have a co-occurring diagnosis of PTSD.

It is clear that individuals with AUD are significantly more likely to have co-occurring common mental health disorders when compared to non-users (35; 36; 37; 39). A better understanding of co-occurring AUD and common mental health disorders is important because the literature has shown these co-occurring disorders have a significant negative impact on prognosis and treatment outcomes across a variety of patient populations (35; 36; 37; 39; 40; 41; 42). According to Smith and Randall (35), the literature indicates anxiety disorders increase the severity and longevity of AUD, and vice versa. Anxiety disorders have also been shown to be associated with higher likelihood of AUD relapse following treatment, which leads to higher lifetime AUD treatment usage (35). In addition, AUD negatively impacts the likelihood of treatment success for individuals with anxiety disorders, when compared to non-users (34).

Boden and Fergusson (36) reported treatment of co-occurring AUD and depressive disorders should be concurrent to ensure treatment success. Indeed, the authors indicated depressive disorders increase the severity and longevity of AUD, and vice versa. Failing to address either of the disorders has been shown to lead to negative treatment outcomes and relapse of the co-occurring disorders over time (36).

Miller and colleagues (41) indicate insomnia symptomatology is a prospective predictor of AUD. Further, insomnia symptomology has been shown to precede and predict relapse of alcohol use in individuals seeking treatment for AUD. Similar to Boden and Fergusson (36), the literature supports the use of concurrent treatment for AUD and insomnia to encourage alcohol abstinence and improve sleep quantity/quality (37; 41). In

addition, if you fail to address either of these disorders, the evidence suggests there is higher likelihood of negative treatment outcomes and relapse of these co-occurring disorders.

Berenz and colleagues (39), reported individuals with co-occurring AUD and PTSD had significantly more intense cravings for alcohol, when compared to individuals with only an AUD. Further, individuals with co-occurring AUD and PTSD have been shown to improve less during AUD treatment and have higher rates of relapse when compared to those without a PTSD diagnosis. Like the literature for depression and insomnia, concurrent treatment of co-occurring AUD and PTSD has recently been shown to lead to better treatment outcomes when compared to conducting treatment separately for the two disorders (43).

The vast majority of existing studies examining co-occurrence of AUD and other mental health disorders utilize self-report measures to determine the presence of symptomatology. There is currently no research assessing the rate at which AUD and common mental health disorders are co-diagnosed in a medical treatment system, regardless of the population. Given the literature indicating worse treatment outcomes associated with co-occurring AUD and common mental health disorders (i.e., 35; 36; 37; 39; 40; 41; 42), it is important to examine the presence of mental health diagnoses co-occurring with AUD because it may have an impact on AUD treatment outcomes within medical treatment facilities.

AUD and Co-Occurring Mental Health Disorders in US Military and US Veterans

US military and veteran samples have consistently endorsed higher rates of co-occurring AUD and mental health disorders, when compared to US general population

samples (11; 18; 30; 44; 45; 46). Consistent with the civilian literature, research indicates US military and veteran samples with co-occurring SUD and mental health disorders have significantly worse treatment outcomes, when compared to individuals with only a SUD or only a mental health disorder (47; 48; 49).

In terms of understanding the linkages between AUD and common mental health disorders, there are few studies within active duty US military samples that identify a group of service members with a combined AUD and assess for rates of co-occurring mental health disorders (i.e., 46). Instead, researchers typically identify a group of service members with another mental health disorder (i.e., anxiety disorder, depressive disorder, PTSD) and assess the likelihood of these groups having a co-occurring AUD (35; 39; 40; 42; 50). In contrast to the active duty military, there is a significant amount of research on the US veteran populations assessing rates of co-occurring mental health disorder in identified AUD and SUD samples (11; 49; 51; 52; 53).

In one of the few studies of active duty military personnel that began with an identified AUD sample, Stein and colleagues (46) found that new recruits entering the US Army with lifetime and current probable AUD endorsed higher rates of lifetime and current co-occurring mental health disorders, when compared to recruits with no lifetime alcohol misuse. The authors reported PTSD was found to be the most frequently co-occurring mental health disorder associated with probable AUD among new recruits. Significant current PTSD symptomatology was reported by approximately 23% and 27% of recruits with lifetime and current probable AUD, respectively. In addition, major depressive disorder symptomology was reported by approximately 13% and 16% of recruits with lifetime and current probable AUD, respectively. Panic disorder had the

lowest rate of co-occurrence among the examined disorders reported by approximately 6% and 7% of recruits with lifetime and current probable AUD, respectively. It is important to highlight this study only assessed rates of mental health disorders co-occurring with probable AUD in new recruits entering the US Army. Therefore, this study is likely not an accurate representation of the broader US military population.

According to Fuehrlein and colleagues (11), US veterans with lifetime and current probable AUD were significantly more likely than US veterans without a history of probable AUD to endorse a history of all lifetime and current mental health disorders (i.e., anxiety disorders, depressive disorders, PTSD). Indeed, veterans with a lifetime history of probable AUD were 2.76 times more likely to have current generalized anxiety disorder, 2.62 times more likely to have a current major depressive disorder, and 3.97 times more likely to have a current PTSD, when compared to veterans without a lifetime history of probable AUD. Further, with regard to lifetime mental health disorder, veterans with a lifetime history of probable AUD were 2.92 times more likely to have a history lifetime social anxiety disorder, 3.94 times more likely to have a history of lifetime major depressive disorder, and 4.08 times more likely to have a history of lifetime PTSD, when compared to veterans without a lifetime history of probable AUD. Among the disorders examined, US veterans with lifetime probable AUD were most likely to endorse of history of major depressive disorder, with rates of lifetime and current major depressive disorder at 26.6% and 11.6%. Lifetime and current rates of PTSD were 12.8% and 8.2%, in veterans with a history of probable AUD. US veterans with a history of probable AUD reported rates of lifetime social anxiety disorder at 14.4% and rates of current generalized anxiety disorder at 12.0%.

Norman and colleagues (52) utilized data from the National Health and Resilience in Veteran Study (NHRVS) to assess rates of probable AUD and PTSD in a US veteran sample. Their results indicated that, of the US veterans with probable AUD, 20.3% met criteria for probable PTSD. Similarly, Fuehrlein and colleagues (51) conducted a study utilizing the NHVRS examining alcohol consumption trends in US veterans. Results indicated lifetime major depressive disorder was linked to US veterans engaging in excessive drinking trajectories common to probable AUD.

Utilizing VA administrative data collected from patient's treated in VA healthcare facilities, Petrakis and colleagues (53) conducted a population-based analysis of mental health diagnoses associated with SUD diagnosis (including AUD diagnosis). Over a 12-month period from 2007 through 2008, the majority (i.e., 69.3%) of US veterans being treated in the VA healthcare system with a combined SUD diagnosis (i.e., substance abuse and dependence) had a dual diagnosis of a depressive disorder. Further, 41.4% of US veterans with a combined SUD diagnosis had a dual diagnosis of PTSD and 27.8% had a dual diagnosis of anxiety disorders. In comparison, US veterans without a SUD diagnosis had somewhat lower rates of other mental health diagnoses for depressive disorders at 60.8%, PTSD at 40.5%, and anxiety disorders at 25.9%, respectively. A study conducted by Trivedi and colleagues (49) utilized a similar population-based dataset from the Veterans Healthcare Administration patient centered care homes from 2010 to 2011, to better understand co-occurring mental health disorder diagnoses within the newly established primary-care department of the VA healthcare system. However, this study did not compare US veterans with and without combined SUD diagnosis. Their results indicated 37.8% of US veterans diagnosed with combined SUD had a co-

occurring diagnosis of depressive disorders. Further, 24.6% of US veterans with a combined SUD diagnosis had a co-occurring diagnosis of PTSD and 12.7% had a co-occurring diagnosis of anxiety disorders.

At the present time, there is no research assessing the rates of diagnosed (as opposed to self-report symptom assessments) mental health disorders co-occurring with SUD diagnosis in a US military population. Further, there has never been a study assessing the rates of diagnosed mental health disorders co-occurring with the specific diagnoses of combined AUD (as opposed to SUD), regardless of the population. However, the report commissioned through the DoD (19) included annual prevalence of mental health disorder diagnoses throughout the MHS. Although it is important to acknowledge the limitations discussed in earlier sections, this report provides some clues as to the relative likelihood of mental health disorder diagnosis co-occurring with AUD in active duty service members. According to the DoD (19), from FY2005 through FY2016, adjustment disorders were the most frequently diagnosed category of mental health disorders throughout the MHS, with the annual prevalence rate ranging from approximately 3.1% to 7.2%. Depressive disorders were the second most diagnosed category of MH disorders, with the annual prevalence rates ranging from approximately 3.3% to 5.2%. Anxiety disorders were the third most commonly diagnosed category of disorders, with the annual prevalence rates ranging from approximately 1.8% to 5.3%. Insomnia was the fourth most commonly diagnosed category of disorder, with annual prevalence rates ranging from approximately 1% to 5%. PTSD was the fifth most commonly diagnosed category of disorder, with annual prevalence rates ranging from approximately 0.7% to 2.8%.

There is no reason to expect the ranking for the rates of co-occurring common mental health disorders associated with combined AUD to differ from the DoD (19) report on the overall military population. Given the current rates of mental health disorder diagnoses identified by the DoD (19) report, it is likely adjustment disorders will be the most common co-occurring mental health disorder among active duty service members with combined AUD. Therefore, any analysis of co-occurring mental health disorder diagnoses throughout the MHS should include adjustment disorders in their analyses to account for its high levels of diagnosis in active duty service members. This is important to highlight because none of the studies assessing the rate at which mental health disorders co-occur with AUD include an analysis of adjustment disorders. The DoD (19) report and the veteran studies both indicate depressive disorders will be one of the most common co-occurring disorders associated with AUD (11; 49; 51; 52; 53). Further, it seems anxiety disorders will co-occur with AUD more frequently than PTSD, which is consistent with at least one study provided through the VA healthcare system (11). Lastly, insomnia, which is often excluded from epidemiological mental health disorder analysis, has been identified as a major co-occurring disorder often associated with combined AUD when the two categories of disorders are studied independently (37). Given rates of mental health disorder prevalence in the DoD (19) report, there is evidence insomnia will co-occur with combined AUD less frequently than anxiety disorders and more frequently than PTSD.

Causal Pathways for Co-Occurring AUD and Mental Health Disorders

According to Valderas, Starfield, Sibbald, Salisbury, and Roland (54), the study of comorbidity in the context of epidemiology and public health focuses on the rates of

co-occurring diseases in pursuit of estimated incidence and prevalence rates within a given population. In addition, epidemiological research into co-occurring diseases is used to help determine the chronology of the development of these co-occurring diseases. By understanding the chronology of co-occurring diseases, researchers are better able to determine if these diseases co-occur by chance, selection bias, or through one or more causal pathways. Valderas and colleagues (54) suggested by understanding the pathways of co-occurring disease, clinicians, researchers, and policy makers are better able to develop and effectively finance efficacious protocols in support of the treatment and prevention of co-occurring diseases.

Researchers have attempted to examine the chronology (i.e., order of onset) for the AUD and the common co-occurring mental health disorders (35; 36; 37; 39; 40; 41; 42; 55; 56; 57). Existing epidemiological surveys utilizing self-report measures have indicated prior mental health disorder symptomology predicts future AUD and SUD onset, and vice versa. (55; 56; 57).

Conway and colleagues (55) utilized the National Comorbidity Survey-Adolescent Supplement (NCS-A) to assess lifetime mental health disorders impact on subsequent alcohol and drug use. Adolescents with prior lifetime mental health disorder symptomatology reported high rates of probable alcohol and illicit drug abuse, at 10.3% and 14.9%, respectively. Rates of probable alcohol abuse and illicit drug abuse were highest among adolescents with prior anxiety disorder symptomology.

A 10-year follow-up study to the NCS indicated that, in the US general population, prior mental health disorder symptomatology was predictive of later probable AUD and SUD (57). According to Swendsen and colleagues (57), individuals with a

prior mood disorder were 4.1 times more likely to report new onset of combined probable AUD, when compared to those without a mood disorder. Further, individuals with a prior anxiety disorder were 3.2 times more likely to report new onset of combined probable AUD, when compared to those without an anxiety disorder. Individuals with PTSD symptomatology were 3.2 times more likely to report new onset of combined probable AUD, when compared to those without PTSD.

Falk, Yi, and Hilton (56), utilized Wave 1 of the 2001 to 2002 NESARC to assess the chronology of onset of combined AUD and comorbid anxiety and mood disorders in the US general population. In contrast to the articles reviewed above, these authors were able to identify combined AUD onset preceding onset of common mental health disorder symptomatology. Indeed, self-reported alcohol abuse was 4.6 times more likely to precede onset of generalized anxiety disorder, 3.4 times more likely to precede onset of panic disorder, 2.4 times more likely to precede onset of panic disorder with agoraphobia, 2.4 times more likely to precede onset of major depression disorder, and 2.2 times more likely to precede onset of dysthymia. Further, alcohol dependence was 2.7 times more likely to precede onset of panic disorder and 1.8 times more likely to precede onset of generalized anxiety disorder. Specific phobias and social phobia were both significantly more likely to precede onset of combined AUD.

With the epidemiological literature indicating AUD predicts future onset of common mental health disorder, and vice versa, reviews have attempted to examine potential causal pathways of development between the disorders (35; 36; 37; 39; 40; 42). Consistent with the approach outlined by Valderas and colleagues (54), Smith and Randall (35) reviewed the literature outlining potential models of causal pathways

associated with the development of co-occurring AUD and anxiety disorders. Further, they examined the literature supporting mutual maintenance of co-occurring AUD and anxiety disorders over time. The authors explored support for each of the three models commonly used to describe potential causal pathways for co-occurring AUD and mental health disorders. The common-factor model of co-occurrence assumes there is no causal relationship between two disorders. Instead this model hypothesizes third variables (e.g., genetic factors, anxiety sensitivity), common to both disorders account for high levels of co-occurrence. The second model discussed was the self-medication model, which suggests alcohol use is a form of self-medication to help alleviate symptomatology associated with anxiety disorders. The final model discussed was the substance-induced model, which suggests anxiety disorders are a consequence of long-term alcohol use. In this model, the biopsychosocial consequences of long-term alcohol use lead to increases in anxiety disorder symptomology over time. Consistent with the epidemiological surveys, the authors concluded that the existing literature supports causal pathways associated with the self-medication and substance-induced models for co-occurring AUD and anxiety disorders. There is currently limited support for the common-factors model for these co-occurring disorders.

Smith and Randall (35) indicated AUD and anxiety disorders mutually maintain one another once co-occurrence of the disorders is established. For example, AUD symptomology may have a negative impact on an anxious individual's interpersonal relationships, job performance, or physiological functioning (e.g., withdrawal symptomology). These negative consequences could lead to increases in anxiety

symptomatology as a reaction to future negative consequences, which leads to further alcohol use as a form of self-medication.

Boden and Fergusson (36) conducted a meta-analysis that examined causal pathways of co-occurring AUD and depressive disorders. The authors reported there was very little support from the literature for the common-factor model in relation to co-occurring AUD and depression. In fact, they stated there was overwhelming evidence from the literature for there being a causal relationship between the two disorders. Consistent with Falk and colleagues (56) findings, the current literature provides the most support for the substance-induced model, with AUD being shown to increase an individual's risk for depressive disorders, due to its impact on an individual's biopsychosocial functioning. For example, an AUD could negatively impact neurophysiological and metabolic health, leading to increases in depression symptomology. Further, there is the potential for an AUD to lead to negative consequences in an individual's social functioning (i.e., interpersonal relationships, job performance), which could increase depression symptomology. Co-occurring AUD and depressive disorders have also been shown to mutually maintain one another in similar ways to anxiety disorders, once co-occurrence is established (36).

Brower's (37) review did not provide support for the common-factors model of development for co-occurring AUD and insomnia. The literature indicates there is a strong bi-directional relationship between co-occurring AUD and insomnia (37). There is evidence to support a substance-induced relationship between AUD and insomnia. However, Brower (37) reported the highest rates of insomnia tend to occur during a period alcohol withdrawal, with multiple studies showing persistence of insomnia after

several months of alcohol abstinence. Further, Brower (37) reported the greatest predictor of combined AUD relapse is persistence of insomnia symptomology throughout alcohol abstinence, indicating a self-medication relationship exists between co-occurring AUD and insomnia. Given this, there is evidence to support that AUD and insomnia mutually maintain one another once co-occurrence is established.

There is limited research providing support for the common-factors model of development of co-occurring AUD and PTSD (39; 42). Vujanovic and colleagues (42) indicated there is very limited support for anxiety sensitivity (i.e., fear of anxiety and arousal related sensations) serving as a common factor between co-occurring AUD and PTSD (42). Additionally, Berenz and colleagues (39) suggested there is some evidence of similar genetic predispositions between individuals with AUD and PTSD. However, the strongest evidence of causal pathways for co-occurring AUD and PTSD is in support of the self-medication and substance-induced models of co-occurrence (39). Berenz and colleagues (39) indicated there is likely a bi-directional relationship between AUD and PTSD, meaning individuals are just as likely to report a prior AUD as they are to report new onset of AUD following trauma exposure. For example, Berenz and colleagues (39) provided evidence for pre-existing AUD being significantly associated with exposure to sexual trauma. It is also possible individuals with trauma exposure may be less likely to effectively process the traumatic event, due to prior and continued AUD symptomatology. Once individuals are exposed to a traumatic event (e.g., combat exposure), they are significantly more likely to use alcohol as a form of self-medication in response to PTSD symptomatology.

Similar to anxiety disorders, depressive disorders, and insomnia, AUD and PTSD have been shown to mutually maintain one another once co-occurrence is established (39). Given one of the primary diagnostic criteria of PTSD are symptoms associated with avoidance, individuals with co-occurring AUD and PTSD are likely to use alcohol as a way to avoid reminders and/or thoughts associated with their history of trauma exposure. Further, given alcohol is a depressant, individuals with co-occurring AUD and PTSD may use alcohol as a way to reduce the physiological responses of PTSD, such as physiological arousal and hypervigilance. The reductions in the individual's PTSD symptomology serve as a negative reinforcement for continued alcohol use. In support of this idea, individuals with co-occurring AUD and PTSD are likely to use alcohol as a coping mechanism to aid in the suppression of their PTSD symptomology over time (58; 59; 60; 61).

Utilizing the framework discussed by Valderas and colleagues (54), researchers have come a long way in establishing causal pathways in relation to the development of co-occurring AUD and common mental health disorders (i.e., anxiety disorder, depressive disorders, insomnia, PTSD). Indeed, there is significant evidence from the literature indicating AUD has a bi-directional causal relationship (i.e., self-medication, substance induced) with anxiety disorders, insomnia, and PTSD, and a substance-induced relationship with depressive disorders. Additionally, the literature indicates co-occurring AUD and common mental health disorders mutually maintain one another once co-occurrence is established.

Chronology of Diagnosis for Co-occurring AUD and Mental Health Disorder

The current literature regarding causal pathways indicate common mental health disorder (i.e., anxiety disorders, depressive disorders, insomnia, PTSD) symptomatology will sometimes precede and sometimes follow onset of combined AUD (35; 36; 37; 39; 40; 42). At the present time, it is unclear when and how individuals with these co-occurring disorder end up seeking care. It is possible these individuals would seek care for the initial disorder (i.e., either combined AUD or common mental health disorder) and receive additional care for the subsequent disorder at a later time. These individuals could also choose to seek care for both disorders when these disorders are co-occurring. In addition, these individuals might be more likely to only seek treatment for a combined AUD, even if they have a current common mental health disorder. Lastly, these individuals could also be more likely to only receive treatment for the common mental health disorder, even if they have a current combined AUD.

It can be expected that each of these strategies for entering treatment occur to some degree. Exploring these potential pathways for treatment seeking is important because it has been suggested that certain treatment approaches work more effectively for treating co-occurring combined AUD and common mental health disorders than others. Indeed, the current literature indicates that concurrent treatment of these disorders is the preferred approach (35; 36; 37; 43). Further, it has been suggested that if these disorders are treated separately, there are greater risks of negative treatment outcomes and relapse of the co-occurring symptomatology overtime (35; 36; 37; 43).

The studies reviewed above document the chronology of self-reported symptom onset. To our knowledge, there has yet to be a study that has specifically assessed the chronology of diagnosis (i.e., order in which the co-occurring diagnoses were made)

associated with common mental health disorders co-occurring with combined AUD. It is important to emphasize that chronology of diagnosis does not always equate to the order of onset for the co-occurring disorders. This is important to address because examining the chronology in which medical professionals diagnose these disorders gives us an initial window into how the healthcare system identifies and treats these common co-occurring disorders. Further, analyzing chronology of diagnosis is an important piece of information to begin analyzing if providers are providing the most effective assessment and treatment of these co-occurring disorders (e.g., concurrent, sequential).

Although we lack data that speak directly to questions about chronology of diagnosis, examining the literature regarding reasons why individuals seek treatment for combined AUD could provide some insight into the likely chronology of diagnosis associated with common mental health disorders co-occurring with combined AUD. Polcin, Korcha, Greenfield, Bond, and Kerr (62), utilized the four iterations of the National Alcohol Survey (NAS) from 1995 to 2010 to better understand why individuals seek treatment for combined AUD symptomology. Their results indicated that 74% of the sample had legal requirements or felt forced to seek treatment for combined AUD symptomatology from someone in their social environment. In addition, 58.6% wanted to seek treatment to improve relationships with their family and friends, and 56.6% reported seeking treatment to help with work and financial issues. It is important to note that, when asked to identify the primary reason for seeking treatment, 33.8% indicated legal requirements and feeling forced to seek treatment was the highest among the primary reasons observed for seeking help.

To our knowledge, there is currently no literature assessing why individuals decide to seek treatment for other common mental health disorders (i.e., adjustment disorders, anxiety disorders, depressive disorders, insomnia, PTSD). Snell and Tusaie (63) published a brief report including 27 veterans returning from Iraq and Afghanistan assessing reasons why they sought mental health services for varying psychiatric disorders. However, they did not specify differences in presenting symptomatology between the veteran participants. The authors indicated that 48% of the participants reported seeking mental health services due to disruptions in significant relationships. Further, 44% of the participants sought mental health services due to experiencing a disproportionate sense of anger and irritability following deployment.

Given, the paucity of the literature in reference to reasons for seeking mental health services in patients with other common mental health disorders, it's difficult to determine how experiencing symptomatology associated with other common mental health disorders could impact the timing of diagnosis if they were to co-occur with combined AUD. In US general population samples, individuals with combined AUD primarily seek out AUD treatment when their symptoms create problems within their social and institutional environments (62). As mentioned above, the DoD has focused a good deal of attention the problems associated with problematic alcohol use because of their impact on readiness. Therefore, it is likely that many US military service members seek treatment for combined AUD when it creates problems in their social and military institutional environments. This likely occurs prior to problems from common mental health disorders that tend to be associated with internal processes and are therefore more difficult for others to identify. However, this needs to be examined because there is

currently no literature examining the timing of diagnosis when AUD and common mental health diagnoses co-occur. It is possible US military service members will receive a diagnosis and begin treatment for their common mental health disorder, prior to their combined AUD. The MDR, that provided the diagnosis data used by the DoD (19), will be used in the current study to assess the chronology of diagnosis in active duty service members, utilizing TRICARE insurance claims data throughout the MHS.

Conclusion

In summary, there are significant gaps in the literature as it pertains to annual incidence rates of initial combined AUD diagnosis in active duty service members. In fact, there are currently no studies looking at the annual rate of initial combined AUD diagnosis, regardless of the population. This is important because identifying the annual rates of initial diagnosis (as opposed to annual prevalence) for combined AUD will allow us to gain a more accurate assessment of changes in rates of identification for diagnosis of combined AUD over time. This cannot be captured through the current annual period prevalence rates from the DoD (19), because their report includes active duty service members with new and existing diagnoses of combined AUD. Further, there is a large literature providing support for stable differences in demographic and military characteristics associated with prevalence estimates of probable combined AUD in US military samples. However, there is currently no information on how active duty service members' demographic and military characteristics are related to the rate of initial combined AUD diagnosis and possible patterns of change in these relationships over time.

Another major gap in the AUD literature is in reference to examining the rate at which common mental health disorder diagnoses co-occur with AUD in a US military population. To date, there are multiple US veteran population analyses assessing the rate at which mental health disorder diagnoses co-occur with combined SUD diagnoses. However, these analyses have never been specific to combined AUD. Further, the existing studies have relied largely on self-reported symptom measures rather than clinical diagnoses. The lack of research assessing rates of co-occurring diagnosis of common mental health disorders and combined AUD means that we currently do not have an accurate estimate of how many active duty services members may be susceptible to these clinical concerns.

Lastly, there are no studies examining the chronology of diagnosis in relation to common mental health disorders co-occurring with AUD, regardless of the population. Given this, we currently have no information assessing how healthcare systems are diagnosing and treating these co-occurring disorders. Examining the chronology of diagnosis for these co-occurring disorders would be an important first step in assessing how MHS providers are diagnosing and treating these co-occurring disorders, and how these decisions impact treatment outcomes in US military populations. Utilizing similar methods to the report published by the DoD (19), the MDR would help to address the gaps in the literature listed above.

Current Study

Utilizing the MDR direct care and purchased care (i.e., TRICARE insurance claims system) systems, the current study sought to better understand the relationship between combined AUD diagnosis and common mental health disorder diagnosis in an

active duty service member population. More specifically, the current study was the first to examine 8-year period prevalence rates (i.e., FY2008 through FY2015) of common mental health disorder (i.e., adjustment disorders, anxiety disorders, depressive disorders, insomnia, PTSD) diagnoses co-occurring with combined AUD diagnosis in active duty service members. Further, the current study was the first to assess co-occurring diagnosis outside of the categorization of within the past year. By limiting the definition of co-occurrence to within 90 days prior to or following a combined AUD diagnosis, to our knowledge, we were able to employ the most stringent analysis of co-occurrence related to diagnosed combined AUD and common mental health disorder using a population-based dataset. In addition, the analyses compared 8-year period prevalence rates of common mental health disorder diagnosis in active duty service members with and without a combined AUD diagnosis, which has yet to be done in an active duty service member population.

The current study was the first to examine the chronology of diagnosis between co-occurring initial AUD diagnosis and common mental health disorder diagnoses. Understanding the timing of diagnosis will allow us to get a glimpse at the possible ways in which the MHS is addressing the issue of co-occurring combined AUD and common mental health disorders. Lastly, the current study adds to the literature regarding annual rates of combined AUD diagnosis in an active duty service member population. More specifically, this study was the first to assess annual incidence rates of initial combined AUD diagnosis in active duty service members and their corresponding demographic and military characteristics, from FY2008 (i.e., October 1, 2007) through FY2015 (i.e., September 30, 2015).

CHAPTER 2: AIMS AND HYPOTHESES

Aim 1

Rationale for Specific Aim 1: There is currently no literature examining the annual incidence rates of initial AUD diagnosis in US military populations. In addition, there is currently no research examining demographic and military characteristics associated with active duty service members receiving a diagnosis of combined AUD. Determining the annual incidence rates of initial combined AUD diagnosis and the associated demographic and military characteristics for active duty service members within the MHS will help us identify which groups of active duty service members are at greatest risk for receiving an initial combined AUD diagnosis and thereby focus resources and intervention efforts.

Specific Aim 1: To determine the annual incidence rates of initial combined AUD diagnosis and the corresponding demographic/military characteristics of active duty service members receiving an initial combined AUD diagnosis within the MHS, from FY2008 through FY2015 (i.e., October 1, 2007 through September 30, 2015).

Hypothesis 1a: The annual incidence rate of initial combined AUD diagnosis throughout the MHS will remain stable over time.

Hypothesis 1b: Demographic (i.e., age, marital status, race, sex) and military characteristics (i.e., branch or service, military occupation, rank) of patients with an initial combined AUD diagnosis will be similar to existing US military prevalence estimate surveys. More specifically, the highest proportional rates for active duty service members with initial combined AUD diagnosis will be

reported in young, single, white, male, lower enlisted, assigned to combat specialties. Further, the highest proportional rates of initial combined AUD diagnosis will be reported in the US Army and US Marine Corps, with the lowest proportional rates in the US Air Force.

Hypothesis 1c: Demographic (i.e., age, marital status, race, sex) and military characteristics (i.e., branch or service, military occupation, rank) of patients with an initial combined AUD diagnosis will remain stable over time.

Aim 2

Rationale for Specific Aim 2: There is very limited literature in reference to prevalence rates of common mental health disorders (i.e., anxiety disorders, depressive disorders, insomnia, PTSD) co-occurring with combined AUD in US military populations. Further, adjustment disorders are typically excluded from analyses focusing on co-occurring disorders. Given this, it is likely the current prevalence rates (i.e., 46) of co-occurring common mental health disorder diagnosis are not reflective of what would be found among active duty service members diagnosed with a combined AUD in the MHS. Establishing an estimate of the period prevalence (i.e., 8-year period prevalence) and co-occurring prevalence (i.e., 90 days prior to or following a diagnosis) rates of combined AUD and common mental health disorder diagnosis (i.e., adjustment disorders, anxiety disorders, depressive disorders, insomnia, PTSD) among active duty service members diagnosed with combined AUD within the MHS is important, because co-occurring disorders significantly complicate treatment and impact prognosis. Including adjustment disorders, one of the most common mental health diagnoses among active duty service

members, will help to provide a more accurate impression of the magnitude of the problem of co-occurring diagnoses associated with combined AUD.

Specific Aim 2: To determine the period prevalence and co-occurring prevalence rates of common mental health disorder diagnosis (i.e., adjustment disorders, anxiety disorders, depressive disorders, insomnia, PTSD) with combined AUD diagnosis, in active duty service members diagnosed in the MHS, from FY2008 through FY2015.

Hypothesis 2a: The 8-year period prevalence rate of common mental health disorder diagnosis associated with combined AUD diagnosis in active duty service members will rank as follows: 1) adjustment disorders, 2) depressive disorders, 3) anxiety disorders, 4) insomnia, and 5) PTSD.

Hypothesis 2b: The 8-year period prevalence rate of common mental health disorder diagnosis co-occurring (i.e., 90 days prior to or following a diagnosis) with combined AUD diagnosis in active duty service members will rank as follows: 1) adjustment disorders, 2) depressive disorders, 3) anxiety disorders, 4) insomnia, and 5) PTSD.

Hypothesis 2c: There will be higher 8-year period prevalence rates of common mental health disorder diagnosis in active duty service members with a combined AUD diagnosis, when compared to the 8-year period prevalence rates of active duty service members without a combined AUD diagnosis.

Hypothesis 2d: There will be higher 8-year period prevalence rates of common mental health disorder diagnosis co-occurring (i.e., 90 days prior to or following a diagnosis) in active duty service members with combined AUD diagnosis, when

compared to the 8-year period prevalence rates active duty service members without an AUD diagnosis.

Aim 3

Rationale for Specific Aim 3: The current literature indicates there is a bidirectional relationship between onset of co-occurring combined AUD and common mental health disorders (35; 36; 37; 39; 40; 42). However, there is currently no literature assessing the chronology of diagnosis within a medical system, as opposed to self-reported onset of symptoms. Examining the chronology of diagnosis for AUD and common mental health disorders in active duty service members throughout the MHS is important because the chronology of diagnoses may significantly impact treatment considerations and delivery of care in clinical settings. Given there are worse treatment outcomes associated with common mental health disorder diagnoses co-occurring with combined AUD, examining the chronology of diagnosis would be the first step in developing insight into how diagnostic characteristics may be impacting treatment outcomes in active duty service member with these co-occurring disorders.

Specific Aim 3: To examine the chronology of diagnosis for co-occurring (i.e., 90 days prior to or following a diagnosis) common mental health disorders (i.e., adjustment disorders, anxiety disorders, depressive disorders, insomnia, PTSD) in active duty service members with combined AUD diagnosis throughout the MHS, from FY2008 through FY2015.

Hypothesis 3: Active duty service members who carry both combined AUD and common mental health disorder diagnosis will be more likely to have the initial

combined AUD diagnosis prior to receiving their mental health disorder diagnosis.

CHAPTER 3: METHODS

Study Design

The current study employed a retrospective data analyses utilizing the Military Health System (MHS) Data Repository (MDR) in relation to diagnosis of combined AUD in active duty service members throughout the MHS. This includes determining annual incidence rates for initial combined AUD diagnosis and the relation of demographic and military characteristics to annual incidence rates of initial combined AUD diagnosis. Further, the current study determined the 8-year period prevalence rates of common mental health disorders (i.e., adjustment disorders, anxiety disorders, depressive disorders, insomnia, PTSD) in active duty service members with and without a combined AUD diagnosis. In addition, the current study determined the 8-year period prevalence rates of common mental health disorder diagnosis co-occurring (i.e., 90 days prior to or following a diagnosis) in active duty service members with a combined AUD diagnosis. Lastly, the current study compared the chronology of initial diagnosis between combined AUD and common mental health disorders in active duty service members with an initial combined AUD from FY2008 through FY2015.

The current study's data was extracted from the MDR, which includes MHS direct and purchased care (TRICARE) claims data (64). The US Department of Defense (DoD) reports providing TRICARE insurance to approximately 9.5 million active duty personnel, military retirees, and their dependents (20). The MDR does not include healthcare claims records from combat zones or the US Veterans Administration

healthcare system. Currently, the MHS utilization consists of approximately 20% active duty personnel (65; 66).

The access to MDR was facilitated through the Low Value Care in the National Capitol Region (LVC)/Comparative Effectiveness and Provider Induced Demand Collaboration (EPIC) Project (66; 67). The LVC/EPIC Project is a partnership between the Uniformed Services University (USU) and the Brigham and Women's Hospital (BWH), with the intent of utilizing an interdisciplinary team approach towards conducting analyses of health services research (HSR). The LVC/EPIC Project emphasizes healthcare policy analysis, health economics, and developing collaboration with military treatment facility providers to conduct research of importance to the MHS (20).

The sample for the current study was queried from the MDR and included all active duty service members from FY2008 through FY2015 (i.e., October 1, 2007 and September 30, 2015). Variables of interest for the current study included demographic characteristics (i.e., age, marital status, race, sex), military characteristics (i.e., branch of service, occupational specialties, rank), and various mental health disorder diagnoses (i.e., combined AUD, adjustment disorders, anxiety disorders, depressive disorders, insomnia, PTSD).

Inclusion Criteria

Individuals were included in the study if they met the following criteria:

1. All Active Duty Air Force, Army, Navy, or Marine personnel, including activated National Guard (Air Force, Army) and Reserve (Air Force, Army, Navy, Marines) personnel.

Exclusion Criteria

Individuals were excluded from the study if they met any of the following criteria:

1. Active Duty Service Members under the age of 18.
2. Active Duty Coast Guard, National Oceanic and Atmospheric Administration, and Public Health Service personnel.
3. Non-activated National Guard and Reserve personnel.
4. US Military Retirees.
5. Dependents.

Variables of Interest

1. **Demographic and Military Characteristics.** The MDR has the capability of attaching the demographic and military characteristics of active duty service members to the direct and purchased care claim records with assistance from the Defense Enrollment Eligibility Reporting System (DEERS). The demographic characteristics for the current study include age, marital status, race, and sex. Age was separated into four categories to include 18 to 20 years old, 21 to 24 years old, 25 to 34 years old, and greater than or equal to 35 years old. Marital status was separated into five categories to include, married, prior marriage (i.e., annulled, divorced, widowed), separated, single, and unknown/missing. Race was separated into six categories to include White, Black, American Indian or Alaska Native, Asian American or Pacific Islander, other, or unknown/missing. Sex was separated into male or female categorizations.

   The military characteristics for the current study include active duty status, branch of service, occupational specialties, and rank. Service members who are on

active duty status, to include service members in active National Guard and Reserve positions, were included in the current study. Active National Guard and Reserve service members were combined with their respective parent organizations. For example, active Army National Guard service members were included with the Army active duty service members when conducting analyses. Branch of service was separated into four categories to include Air Force, Army, Marine and Navy. Occupational specialties were separated into 11 categories to include administration/support, aviation (i.e., pilot, aircrews), communications/intelligence, engineering/repair/maintenance, healthcare, motor transportation, naval transportation/operations, police/security, supply/logistics, warfighter/combat specialists, and other. Rank was separated into five categories to include lower enlisted (E-1 to E-5), senior enlisted (E-6 and above), warrant officer (W01 to CW5), junior officer (O1 to O3), and senior officer (O4 and above).

2. **Mental Health Disorder Diagnosis.** The MDR used the International Classification of Diseases-9 (ICD-9) during the study period to identify mental health diagnoses associated with direct and purchased care within the TRICARE insurance system. The current study utilized ICD-9 codes for mental health diagnoses of combined AUD (i.e., 3030 through 30303, 3039 through 30393, 3050 through 30503), adjustment disorders (i.e., 3090, 3091, 30924, 30928, 30929, 3093, 3094, 30982, 30983, 30989, 3099), anxiety disorders (i.e., 29384, 30000 through 30002, 30009, 30020 through 30023, 30029, 3003), depressive

disorders (i.e., 29383, 29620 through 29626, 29630 through 29636, 3004, 29682, 29690, 29699, 311), insomnia (i.e., 78051, 78052), and PTSD (i.e., 30981).

3. **Co-occurring AUD and Common Mental Health Disorder Diagnosis.** The current study defines co-occurring AUD and common mental health disorder diagnosis as having a diagnosis of adjustment disorder, anxiety disorder, depressive disorder, insomnia, and/or PTSD within 90 days prior to or following any combined AUD diagnosis from FY2008 through FY2015. If the active duty service member had a combined AUD diagnosis at any time during the study period, the diagnosis was isolated, and then examined for being in relation to a common mental health disorder diagnosis within a window of 90 days prior to or following the combined AUD diagnosis. In order to examine co-occurring disorders throughout the MHS, it was important to include both initial and subsequent diagnoses of combined AUD to capture all instances of co-occurrence. If an individual were to have a common mental health disorder diagnosis outside of the proposed window of time, they were not identified as having a common mental health disorder diagnosis co-occurring with combined AUD.

Data Analytic Plan

All analyses were conducted using SAS, version 9.4.

Specific Aim 1

Descriptive statistics regarding the rates of initial diagnosis and demographic information for active duty service members with a combined AUD diagnosis were gathered from TRICARE insurance claims data from FY2008 through FY2015 (i.e., October 1, 2007 through September 30, 2015). Active duty service members with a

diagnosis of combined AUD after October 1, 2005 and prior to October 1, 2007 were excluded in these analyses to ensure accurate measure of initial combined AUD diagnosis.

Hypothesis 1a

Frequency analyses were used to assess annual percentage changes in population incidence rates (i.e., per 1,000) of annual initial combined AUD diagnosis over time from FY2008 through FY2015. An annual change of 10% for initial combined AUD diagnosis incident rates was considered a clinically significant change, which would indicate the incidence rates were not consistent over time.

Hypothesis 1b

Multivariate logistic regressions were used to assess the impact of demographic (i.e., age, marital status, race, sex) and military characteristics (i.e., branch of service, occupational specialties, rank) on the active duty service member population annual incidence rates of initial combined AUD diagnosis. Multivariate logistic regressions were calculated after controlling for the demographic (i.e., age, marital status, race, sex) and military characteristics (i.e., branch of service, occupational specialties, rank) of the active duty service member population.

Hypothesis 1c

Frequency analyses were used to determine if the ranking of groups within demographic (i.e., age, marital status, race, sex) and military characteristics (i.e., branch of service, occupational specialties, rank) remained stable overtime.

Specific Aim 2

Descriptive statistics regarding rates of common mental health disorder (i.e., adjustment disorders, anxiety disorders, depressive disorders, insomnia, PTSD) diagnosis and demographic information (i.e., age, branch of service, marital status, race, sex) for active duty service members with a combined AUD diagnosis were gathered from TRICARE insurance claims data from FY2008 through FY2015. The active duty service member population without a history of combined AUD diagnosis was gathered from TRICARE insurance claims data from FY2008 through FY2015, to compare rates of common mental health disorder diagnosis in the non-AUD diagnosis population.

Hypothesis 2a

Frequency analyses were utilized to examine the prevalence of common mental health disorders in active duty service members with a combined AUD diagnosis throughout the MHS, from FY2008 through FY2015.

Hypothesis 2b

Frequency analyses were utilized to examine the prevalence of common mental health disorders co-occurring (i.e., 90 days prior to or following a diagnosis) in active duty service members with a combined AUD diagnosis throughout the MHS, from FY2008 through FY2015.

Hypothesis 2c

Multivariate logistic regressions were used to compare 8-year period prevalence rates of combined AUD and common mental health disorder diagnosis, to 8-year period prevalence rates of common mental health disorder diagnosis in active duty service members without a combined AUD diagnosis, while controlling for age, branch of service, marital status, race, and sex.

Hypothesis 2d

Bivariate analyses utilizing a Chi Square (X^2) test were used to compare 8-year period prevalence rates of combined AUD and co-occurring (i.e., 90 days prior to or following a diagnosis) common mental health disorder, to 8-year period prevalence rates of common mental health disorder diagnosis in active duty service members without a combined AUD diagnosis, to test for statistically significant differences between the two groups.

Specific Aim 3

Descriptive statistics regarding the rates of initial combined AUD diagnosis and rates of initial common mental health disorder (i.e., adjustment disorders, anxiety disorders, depressive disorders, insomnia, PTSD) diagnosis co-occurring (i.e., 90 days prior to or following a diagnosis) for active duty service members with a combined AUD diagnosis were gathered from TRICARE claims data from FY2008 through FY2015. Active duty service members with an initial combined AUD diagnosis after October 1, 2005 and prior to October 1, 2007 were excluded from these analyses to ensure accurate measure of initial combined AUD diagnoses.

Hypothesis 3

Bivariate analyses utilizing a one sample Chi Square (X^2) test were used to compare the chronology of diagnosis for initial combined AUD and initial common mental health disorder co-occurring (i.e., 90 days prior to or following a diagnosis) in active duty service members throughout the MHS, from FY2008 through FY2015. These

analyses tested against the null hypothesis that the disorders will be equally likely to be initially diagnosed. Cases of concurrent initial combined AUD and common mental health disorder diagnosis (i.e., diagnosed on the same patient encounter) were excluded from these analyses.

Sample Size Estimation

Given the data we analyzed in the MDR included all active duty service members within the MHS from FY2008 through FY2015, this will be a population-based sample, which requires no estimation of sample size.

CHAPTER 4: RESULTS

Results for the current study's aims and hypotheses are presented as follows: (1) annual incidence rates of combined AUD diagnosis from FY 2008 through FY 2015, (2) demographic and military characteristics of combined AUD diagnosis, (3) prevalence of common mental health disorders, (4) prevalence of co-occurring common mental health disorders, and (5) chronology of co-occurring diagnosis.

Aim 1

Hypothesis 1a. Table 4 and Figure 1 show the annual incidence rates of initial combined AUD diagnosis in active duty service members throughout the MHS. Contrary to original predications, the annual incidence rates did not remain stable overtime. Indeed, there was a decrease of 10.54% from FY2012 to FY2013 and an increase of 15.00% from FY2014 to FY2015, in annual incidence rates for initial combined AUD, respectively. More importantly, there were clinically significant declines (i.e., 24.18% overall decline) in annual initial combined AUD diagnosis from FY2009 through FY2014. This indicates there were clinically significant changes in annual incidence rates for combined AUD diagnosis over the study period.

Hypothesis 1b. Table 5 provides a summary of demographic characteristics and Table 7 describes incidence rates of demographic characteristics per 1,000 active duty service members for initial combined AUD diagnosis from FY2008 through FY2015. Table 6 provides a summary of military characteristics and Table 8 describes incidence rates of military characteristics per 1,000 active duty service members for initial combined AUD diagnosis from FY2008 through FY2015. Table 9 provides a breakdown

of the multivariate logistic regression, which was used to help determine which demographic and military groups were most likely to receive an initial combined AUD diagnosis from FY2008 through FY 2015, when controlling for the demographic and military characteristics of the active duty service member population.

The highest proportional rates of initial combined AUD diagnosis for the age category were found in the 21 to 24 age group, with the lowest rates alternating between the 18 to 20 and 35 and older age groups depending on the year (see Table 7). As expected, males had substantially higher rates of annual initial combined AUD diagnosis throughout the study period (see Table 7). The branch of service data was as predicted, with US Army and US Marine Corps having the highest annual incidence rates of initial combined AUD diagnosis and the US Air Force having the lowest rates over the study period (see Table 8).

However, the results for race, marital status, military occupational specialty, and rank were all inconsistent with original predictions. The highest proportional annual incidence rates of initial combined AUD diagnosis for a specific racial group were found American Indians and Alaska Natives active duty service members (see Table 7). Further, the results indicated that Black and White active duty service members had similar rates over the study period, with Asian and Pacific Islander active duty service members having the lowest rates. It is also important to mention the race category of other (e.g., mixed, clerical error) had substantially higher annual incidence rates of initial combined AUD diagnosis, when compared to all other racial groups within the study.

Active duty service members currently separated from their spouse had the highest annual incidence rates of initial combined AUD diagnosis (see Table 7). Single

active duty service members had the second highest rates. Active duty service members who were currently married or had a prior marriage (i.e., annulled, divorced, widowed) alternated between having the lowest rates over the study period.

It is important to highlight before presenting the results for military occupational specialty that over half of the initial combined AUD diagnoses over the study period were located within the other category (see Table 6). This means we did not have occupational data for these active duty service members. Given this, the results should be assessed with caution. Motor transportation personnel consistently had the highest annual incidence rates of initial combined AUD diagnosis over the study period (see Table 8). Warfighter personnel consistently had the second highest rates over the study period. The remaining military occupational specialties alternated in ranking throughout the duration of the study period.

Senior officers (O4 and above) had substantially higher annual incidence rates of initial combined AUD diagnosis, when compared to all other rank categories (see Table 8). Junior enlisted (E1 to E5) had the second highest rates over the study period. Senior enlisted (E6 and above) and warrant officer (WO1 through WO5) consistently had the lowest rates over the study period.

Multivariate logistic regression analyses examined the relation of initial combined AUD diagnosis to each demographic/military characteristic after controlling for the remaining demographic (i.e., age, marital status, race, sex) and military (i.e., branch of service, military occupational specialty, rank) characteristics of the active duty service member population from FY2008 through FY2015. These multivariate logistic regressions (see Table 9) indicated that, controlling for other characteristics, the groups

most likely to receive an initial combined AUD diagnosis were the same for most of the demographic characteristics (i.e., Other racial group, male, separated) and all of the military characteristic groups (i.e., motor transportation, senior officer, US Army and US Marine Corps).

When compared to male active duty service members, female active duty service members were 0.61 times as likely to receive an initial diagnosis of combined AUD over the study period, OR = 0.61, p = <.0001, 95% CI [0.60-0.62]. When compared to white active duty service members, service members from Other racial groups were 4.21 times more likely to receive an initial diagnosis of combined AUD over the study period, OR = 4.21, p = <.0001, 95% CI [4.13-4.28]. When compared to married active duty service members, active duty service members separated from their spouse were 6.99 times as likely to receive an initial combined AUD diagnosis over the study period, OR = 6.99, p = <.0001, 95% CI [6.39-7.64].

US Army personnel had the highest likelihood of receiving an initial combined AUD diagnosis over the study period (see Table 9). When compared to senior enlisted active duty service members, senior officers were 25.18 times as likely to receive an initial combined AUD diagnosis over the study period, OR = 25.18, p = <.0001, 95% CI [0.60-0.62]. When compared to engineer, maintenance, and repair personnel, motor transportation personnel were 1.34 times more likely to receive an initial diagnosis of combined AUD over the study period, OR = 1.34, p = <.0001, 95% CI [1.30-1.38].

However, the multivariate logistic regression indicated the group most likely to be diagnosed within in the Age category was 25 to 34 year old active duty service members.

Indeed, when compared to 21 to 24 year olds, 25 to 24 year olds were 1.06 times more likely to receive a combined AUD diagnosis, OR = 1.06, p = <.0001, 95% CI [1.05-1.08].

***Hypothesis 1c*.** The ranking of annual incidence rates for initial combined AUD diagnosis for the demographic and military characteristics of gender, marital status, and military rank remained consistent from FY2008 through FY2015 (see Table 7). Contrary to initial predictions, the ranking of the incidence rates for the demographic and military characteristics of age, race, branch of service, and military occupational specialty did not remain consistent from FY2008 through FY2015 (see Table 8).

Aim 2

***Hypothesis 2a*.** Analyses examining the eight-year period prevalence rates of common mental health disorder diagnosis in active duty service members with a combined AUD diagnosis confirmed the predicted ranking of the most common mental health disorders (see Table 10). Of the 203,453 active duty service members with a diagnosis of combined AUD from FY2008 through FY2015, their eight-year period prevalence rates for common mental health disorder diagnosis ranked as follows: 1) 42.22% had a history of adjustment disorder diagnosis, 2) 36.37% had a history of depressive disorder diagnosis, 3) 30.84% had a history of anxiety disorder diagnosis, 4) 23.87% had a history of insomnia diagnosis, and 5) 20.01% had a history of PTSD diagnosis.

***Hypothesis 2b*.** Analyses examining the eight-year period prevalence rates of co-occurring (i.e., diagnosed 90 days prior to or following a combined AUD diagnosis) common mental health disorder diagnosis in active duty service members with a combined AUD diagnosis were close to confirming the predicted ranking of the most

common co-occurring mental health disorders (see Table 10). Of the 203,453 active duty service members with a diagnosis of combined AUD from FY2008 through FY2015, the eight-year period prevalence rate for co-occurring common mental health disorder diagnosis ranked as follows: 1) 19.06% had a history of co-occurring adjustment disorder, 2) 18.55% had a history of co-occurring depressive disorder, 3) 12.15% had a history of co-occurring anxiety disorder, 4) 9.08% had a history of co-occurring PTSD, and 5) 7.21% had a history of co-occurring insomnia.

Hypothesis 2c. As expected, the eight-year period prevalence rates for all of the common mental health disorders in active duty service members with a history of combined AUD diagnosis were substantially higher than the rates found in active duty service members without a history of combined AUD diagnosis (see table 11). After controlling for age, marital status, race, sex, and service branch, the odds of an active duty service member with a combined AUD diagnosis having a history of common mental health disorder diagnosis, when compared to those without a history of combined AUD, were as follows: 1) adjustment disorders, OR = 8.48, p = <.0001, 95% CI [8.39-8.58], 2) anxiety disorders, OR = 8.49, p = <.0001, 95% CI [8.39-8.50], 3) depressive disorders, OR = 12.08, p = <.0001, 95% CI [11.93-12.23], 4) insomnia, OR = 6.99, p = <.0001, 95% CI [6.89-7.08], and 5) PTSD, OR = 14.17, p = <.0001, 95% CI [13.92-14.41].

Hypothesis 2d. The eight-year period prevalence rates for most of the co-occurring common mental health disorders in active duty service members with a history of combined AUD diagnosis, were higher than the eight-year period prevalence rates of common mental health disorder diagnosis in active duty service members without a

history of combined AUD diagnosis (see table 12). When compared to prevalence rates of those without a history of combined AUD diagnosis, active duty service members with a combined AUD diagnosis had higher prevalence rates of co-occurrence for the following mental health disorders: 1) adjustment disorders (19.0% vs. 11.7%), X^2 (1, N = 3,869,695) = 9,546.39, p = <.0001, 2) anxiety disorders (12.1% vs. 7.9%), X^2 (1, N = 3,869,695) = 4,483.53, p = <.0001, 3) depressive disorders (18.5% vs. 7.9%), X^2 (1, N = 3,869,695) = 28,217.18, p = <.0001, and 4) PTSD (9.0% vs. 3.5%), X^2 (1, N = 3,869,695) = 16,079.45, p = <.0001. When compared to the co-occurring prevalence rates of those with a history of combined AUD diagnosis, active duty service members without a history of combined AUD diagnosis had higher prevalence rates for insomnia (7.8% vs. 7.2%), X^2 (1, N = 3,869,695) = 97.74, p = <.0001.

Post Hoc Analyses. Exploratory analyses were conducted for the results associated with Hypothesis 2a to assess rate at which active service members with a history of combined AUD were given one or more common mental health disorder diagnoses over the study period. The exploratory analyses found that active duty service members with a history of combined AUD diagnosis were likely to receive more than one common mental health disorder diagnosis over the study period. The results were as follows: 1) 19.09% (n = 38,848) had a history of one common mental health disorder diagnosis, 2) 16.53% (n = 33,628) had a history of two common mental health disorder diagnoses, 3) 13.04% (n = 26,537) had a history of three common mental health disorder diagnoses, 4) 9.39% (n = 19,108) had a history of four common mental health disorder diagnoses, and 5) 5.09% (n = 10,365) had a history of five common mental health disorder diagnoses.

Aim 3

Hypothesis 3. The percentage of cases excluded from analysis due to co-occurring diagnosis of combined AUD and common mental health disorder on the same patient encounter can be found in Table 13. Analyses examining the chronology of diagnosis for co-occurring combined AUD and common mental health disorder in active duty service members from FY2008 through FY2015, indicated combined AUD was more likely to be diagnosed first when compared to most of the common mental health disorders (see Table 14), to include: 1) anxiety disorders (56.6% vs. 43.4%), X^2 (1, N = 3,869,695) = 119.1919, p = <.0001, 2) depressive disorders (53.3% vs. 46.7%), X^2 (1, N = 3,869,695) = 340.5686, p = <.0001, 3) insomnia (58.4% vs. 41.6%), X^2 (1, N = 3,869,695) = 365.3142, p = <.0001, and 4) PTSD (56.1% vs. 43.9%), X^2 (1, N = 3,869,695) = 202.1658, p = <.0001. Adjustment disorders (50.3% vs. 49.7%), X^2 (1, N = 3,869,695) = 0.9657, p = .3258, failed to reject the null and was just as likely to be diagnosed prior to and following a combined AUD diagnosis.

CHAPTER 5: DISCUSSION

Results from Aim 1 showed there was clinically significant declines (i.e., 24.18% overall decline) in annual incidence rates for initial combined AUD diagnosis from FY2009 through FY2014. However, there was a clinically significant increase in initial combined AUD diagnosis of 15.0% from FY 2014 through FY2015, which brought the levels closer to the incidence rates that were reported from FY2011 through FY2012. Further study is needed to help better understand what factors might contribute to these fluctuations in annual incidence rates for initial combined AUD diagnosis.

As predicted by the current military prevalence estimates survey's, 21 to 24 year old active duty service members, male active duty service members, and those in the US Army and US Marine Corps were the most likely to receive an initial combined AUD diagnosis over the study period. Contrary to original predictions, active duty service members in Other racial groups, active duty service members currently involved in a marital separation, motor transportation active duty service members, and senior officers (O4 and above) were the most likely to receive an initial combined AUD diagnosis over the study period. After controlling for the demographic (i.e., age, marital status, race, sex) and military characteristics (i.e., motor transportation, senior officer, US Army and US Marine Corps) of the active duty service member population, these trends largely remained the same, with the exception of Age. Indeed, after controlling for the characteristics of the active duty service member population, the age group of 25 to 34 year olds ended up being the most likely to receive an initial combined AUD diagnosis over the study period.

As expected, results from Aim 2 showed active duty service members with a combined AUD were substantially more likely to report a history of each of the common mental health disorder diagnoses (i.e., adjustment disorders, anxiety disorders, depressive disorders, insomnia, PTSD), when compared to those without a combined AUD diagnosis. In addition, when compared to period prevalence rates of those without a history of combined AUD, active duty service members had significantly higher rates of co-occurring combined AUD and common mental health disorder diagnoses for each of the disorders, with the exception of insomnia. Lastly, results from Aim 3 indicated when comparing chronology of diagnosis for co-occurring combined AUD and common mental health disorder diagnoses, combined AUD was significantly more likely to be diagnosed first within a medical treatment facility for each of the common mental health disorders assessed in the current study, except adjustment disorders.

The above findings have clinical and policy implications, as well as suggesting future research directions that will be discussed below.

Annual Incidence of Initial Combined AUD Diagnosis

It is important to highlight that the decline in annual incidence of initial combined AUD diagnosis coincided with a reduction of 383,614 personnel positions (i.e., 18.7% reduction) within the active duty service member population from FY2009 through FY2015. During that time period, the national security strategy included a reduction in the total number of active duty forces. This reduction included increases in the number of military personnel separations that occurred from the existing active duty service member population. Additionally, there were reductions in the percentage of promotional opportunities throughout the active duty branches of service and reductions in the number

of new officer and enlisted accessions permitted on an annual basis. It is possible that a strategic reduction in active duty service member populations could result in the observed reduction in the annual incidence rates of initial combined AUD diagnosis throughout the MHS.

Since the DoD was reducing the number of new officer and enlisted accessions into the active duty service member population, the recruitment commands of their respective service branches began to implement more stringent accession requirements for individuals attempting to enter active duty service. This could have led to reductions in the number of new recruits who were at high risk for developing future combined AUD diagnosis. According to the demographic analysis for age, there was approximately a 50% decline in annual incidence rates for initial combined AUD diagnosis within the age group of 18 to 20 year olds between FY2008 through FY2015. Since new enlisted recruits are the most likely to be between the ages of 18 to 20 and make up a substantial portion of the active duty service member population, this finding provides support for the DoD being more selective with their new enlisted recruits. This could have led to reductions in initial combined AUD diagnosis throughout the active duty service member population.

Another possibility is the decline could be attributable to increases in the number of military separations throughout the DoD over the study period. If there was a push from the DoD to increase the number of administrative separations, it would make sense for units to begin engaging in stricter enforcement of negative alcohol related incidents. This would initially lead to an increase in identifying and diagnosing combined AUD symptomology throughout the active duty service member population. Indeed, the annual

incidence rates for initial combined AUD diagnosis were highest at the beginning of the implementation of the administration's policy directives. However, it is likely the annual incidence rates of initial combined AUD diagnosis related to administrative separations would reduce overtime because the active duty service members with combined AUD symptomology would be administratively separated at a higher rate than those without combined AUD.

A third possibility is the strict enforcement of administrative separations could have led to declines in negative alcohol related incidents across the DoD. Indeed, active duty service members may have been more careful with their drinking habits because the military was paying closer attention to negative alcohol related incidents. This would have led to declines in annual incidence rates of initial combined AUD diagnosis across the active duty service member population. If administrative separations did have an impact on the decline in annual incidence rates for initial combined AUD diagnosis, it is likely that both increased administrative separations and reductions in alcohol related incidents played a role. Indeed, it is reasonable to assume active duty service members who were more careful with their combined AUD symptomology were able to continue serving and those who were more irresponsible were either administratively separated or encouraged to resign.

Also, it is possible when the DoD began to implement a reduction in the total number of active duty forces, active duty service members began to reduce their willingness to seek services for combined AUD. Reducing the number of active duty service members could have led to an increase in job insecurity amongst the active duty service member population. This increase in job insecurity could have influenced active

duty service members to develop an increased sense of risk associated with receiving alcohol abuse treatment, if they believed treatment would put their careers in jeopardy. Indeed, one of the most common reasons military service members experience stigma towards mental health treatment is because they fear they will experience negative repercussions from their military unit organizations (21; 22). Given this, it is not outside the realm of possibility that stigma towards receiving alcohol abuse treatment could have contributed to the decline in annual incidence rates for initial combined AUD diagnosis from FY2009 through FY2014.

The 15% increase in annual incident rates for initial combined AUD diagnosis from FY2014 to FY2015 was a significant change in direction to the declining trend that occurred from FY2009 through FY2014. It is unclear why there was an increase during this time period. The annual incidence rates of initial combined AUD diagnosis from FY2014 to FY2015 may be a statistical artifact. Indeed, this increase could be attributable to a regression to the mean (i.e., FY2011 to FY2012) after several years of consistent decline. Further, the increase could be attributed to a natural variation in annual incidence rates for initial combined AUD diagnosis and may not be attributable to any factors which could instigate clinically significant change.

It is also possible that a large portion of active duty service members were able to carefully conceal their combined AUD symptomatology for several years until their problems became such that it required treatment. If it were the case that a reduction in total number of active duty service members led to decreases in willingness to seek out services for combined AUD symptomology, it is unlikely this trend would continue

consistently overtime. It is reasonable to expect that eventually there would be an increase in initial combined AUD diagnosis and treatment at some point in the future.

In addition, one might suggest that the observed increase resulted from the DoD making a more concerted effort to help reduce the stigma and barriers to care for service members in need of mental health and/or substance abuse treatment during this time. It is possible active duty service members took advantage of the opportunity to begin receiving alcohol abuse services. However, it is difficult to make this case because SUD treatment programs are command directed. This means the respective units which house the SUD treatment programs have significant influence over how the programs are managed. Indeed, the level of enforcement towards the regulations and policies to reduce stigma are not consistent between locations. Given this, further research is needed to fully understand why this change occurred over the study period.

If it were the case that annual incidence rates of initial combined AUD diagnosis rise and fall as a result of policy decisions that impact the number of personnel within the active duty service member population, then there are some clinical implications that need to be addressed. If increasing the active duty service member population led to higher annual incidence rates of initial combined AUD diagnosis, resources for SUD treatment facilities would need to be increased throughout the DoD to meet the demand of individuals who require services for combined AUD symptomatology.

Further, if reductions led to decreases in combined AUD diagnosis, then it may be the case stricter recruitment practices and stricter enforcement of rules/regulations related to negative alcohol related events may contribute to reductions in combined AUD symptomatology across the active duty service member population. This would allow for

SUD treatment centers to scale down their available resources to help fund other aspects of the mission to support medical readiness. Or the clinics would be better able to utilize their resources more effectively, which would lead to higher levels of readiness amongst the active duty service member population.

However, reducing the active duty service member population may also reduce willingness for active duty service members to seek services for combined AUD diagnosis. If this were the case, policy administrators specializing in the area of active duty service member public health should develop strategies to help mitigate against stigma associated with treating combined AUD symptomatology during a reduction in the number of active duty service members. If this were to occur, it is possible the annual incidence rates of initial combined AUD diagnosis would remain stable on an annual basis.

The current data does not provide sufficient detail pertaining to factors that impact the annual incidence rates for initial combined AUD diagnosis and requires further research. Indeed, a thorough analysis of enactment of policies and research into the diagnosis and treatment of combined AUD in active duty service members will help to determine if a connection exists between the two. One way to begin examining this connection is to conduct a more thorough analysis of the MDR from past years and into the future. If it were possible to gain access to these records, we would be better able to examine if the mechanisms discussed above had an impact on the historical mean associated with active duty service member population annual incidence rates for initial combined AUD diagnosis. In addition, it would be beneficial to conduct a thorough evaluation of the policy changes associated with the increase and reduction of the active

duty service member population from FY2001 through FY2015. This would help determine if these policy changes (e.g., less restrictive recruitment, more restrictive recruitment) are associated with annual incidence rates of initial combined AUD diagnosis. Another area of policy that would be important to examine is whether or not policy directives were implemented during the study period to help reduce stigma and barriers to care for active duty service members who require alcohol abuse treatment.

Demographic and Military Characteristics of Initial Combined AUD Diagnosis

As predicted by the existing military prevalence estimate survey's, male active duty service members and those in the US Army and US Marine Corps had the highest annual incidence rates of initial combined AUD diagnosis over the study period. Further, the US Air Force had the lowest annual incidence rates of initial combined AUD diagnosis over the study period. This was the case even after controlling for the demographic (i.e., age, marital status, race, sex) and military characteristics (i.e., branch of service, military occupational specialty, rank) of the active duty service member population.

When looking at the other demographic and military characteristics individually, 21 to 24 year old active duty service members had the highest annual incidence rates of initial combined AUD diagnosis on an annual basis. However, after controlling for the characteristics of active duty service member population, 25 to 34 year old active duty service members were the most likely to receive an initial combined AUD diagnosis over the study period. It is difficult to identify what caused the change in likelihood between the two categories after controlling for the active duty service member population. However, the 25 to 34 year olds were only 1.06 times more likely than 21 to 24 years to

receive an initial combined AUD diagnosis over the study period. This indicates there's very little difference between the two categories when assessing likelihood to receive an initial combined AUD diagnosis.

For the remaining demographic (i.e., marital status, race) and military characteristics (i.e., military occupation specialty, rank), the individual and controlled analyses both indicated the relation of initial combined AUD diagnosis within these characteristics were inconsistent to what has been suggested in the current military prevalence estimates surveys.

Marital Status

It was expected that single active duty service members would receive the highest rates of combined AUD diagnosis. Indeed, the military prevalence studies had previously indicated single active duty service members were the most likely to report combined AUD symptomatology over a similar time period (8; 9; 12; 13; 14). Current results indicated the highest incidence rates of initial combined AUD diagnosis were found in active duty service members who were separated from their spouse. This was followed by single active duty service members and the lowest rates were associated with the married and prior marriage (i.e., annulled, divorced, widowed) groups. After controlling for demographic and military characteristics of the active duty service member population, the ranking continued to indicate those who were separated from their spouse were significantly more likely to be diagnosed with an initial combined AUD, when compared to single active duty service members.

There is some support within the veteran and international literature indicating there could be higher rates of combined AUD diagnosis within separated and divorced

communities. Indeed, it has been reported in veteran samples that being never married or divorced was independently associated with increases in AUD diagnosis within the VA healthcare system (18). International population based studies out of Sweden have also indicated being recently divorced was strongly associated with new onset of AUD diagnosis in both males and females (68).

Given these results are based on actual combined AUD diagnosis (i.e., not self-report data), it is possible active duty service members separated from their spouse may be uniquely motivated to seek treatment for combined AUD symptomatology, which leads to higher rates of combined AUD diagnosis. It is important to highlight that individuals who seek treatment for combined AUD report relationship distress and feeling forced to get help are their primary motivations for seeking alcohol abuse treatment (62). Indeed, it is possible alcohol use problems could have been a primary contributing factor for an active duty service member's marital problems. The spouse may have insisted the active duty service member receive treatment for combined AUD symptomatology as a pre-requisite for reconciliation.

In addition, active duty service members who are separated from their spouse may begin to engage in higher levels of alcohol use due to higher levels of guilt or shame associated with the marital separation. Further, there may be higher levels of alcohol use because the active duty service member lost a significant portion of their support system. Feelings of guilt and shame, and a loss of a stable support system are all predictors for onset of depressive disorders. Indeed, according to Boden and Fergusson (36), both depression and combined AUD symptomatology increase the severity of the other disorder once co-occurrence is established. This could lead to higher likelihood of

receiving treatment for combined AUD and/or common mental health disorders, which would lead to higher rates of initial combined AUD diagnosis. If the mechanisms described above are accurate, it seems active duty service members who are currently involved in a marital separation may be more motivated than single active duty service members to seek treatment for their combined AUD symptomatology due to the possibility of multiple negative life circumstances. This sequence of events would ultimately lead to higher likelihood of receiving an initial combined AUD diagnosis.

It is important that military medical providers conduct a thorough assessment of combined AUD symptomatology for active duty service members who are recently separated from their spouse. It is possible that increases in AUD symptomatology in active duty service members who are separated are more likely to lead them towards seeking help within a medical treatment facility for their alcohol use problems. Policy makers should continue to develop supportive resources for active duty service members involved in marital separation to encourage treatment for an existing combined AUD symptomatology and to help prevent acute combined AUD symptomatology following a marital separation. Indeed, it would also be important for researchers to examine if the situations described above make active duty service members who are separated more likely than other marital status groups to receive an initial combined AUD diagnosis.

Race

It was expected that white active duty service members would have the highest rates of initial combined AUD diagnosis from FY2008 through FY2015. The results indicated the Other racial group (i.e., mixed race, coding error) had the highest incidence rates of initial combined AUD, when compared to all other racial groups. Further, Native

American and Alaska Native active duty service members had the second highest incidence rates of initial combined AUD over the study period. White active duty service members had slightly higher rates of initial combined AUD diagnosis when compared to Black active duty service members. Lastly, Asian and Pacific Islander active duty service members had the lowest rates of initial combined AUD diagnosis over the study period.

After controlling for the demographic and military characteristics of the population, Native American and Alaska Native active duty service members were approximately 1.64 times more likely than White active duty service members to receive an initial combined AUD diagnosis over the study period. It was also found that Black active duty service members were just as likely as White active duty service members to have an initial combined AUD diagnosis over the study period. Further, the Other group continued to be the most likely to receive an initial combined AUD diagnosis and Asian and Pacific Islander active duty service members continued to be the least likely to receive an initial combined AUD diagnosis.

According to the 2018 National Survey on Drug Use and Health (NSDUH; Substance Abuse and Mental Health Services Administration [SAMSHA], 69), Native Americans reported the highest rates of combined AUD within the US general population from 2017 through 2018. Given the information provided by the current study and SAMSHA (69), Native Americans and Alaska Natives are more likely to be diagnosed with a combined AUD in both civilian and military populations. This is not surprising when considering the context of the epidemiology of alcohol use within the Native American and Alaska Native communities (i.e., 70). Indeed, Native American and Alaska Native communities have long been impacted by the historical traumas associated with

European colonialism and continue to experience high levels of poverty within Native American and Alaska Native reservations (70). Given this cultural context, the Native American and Alaska Native communities are particularly at risk for alcohol and substance abuse issues (70). Further, the scientific literature provides ample evidence of biological risk factors within Native American and Alaska Native communities that make these groups particularly at risk for developing a combined AUD (70). However, this finding was not the predicted outcome because the current military prevalence estimate surveys did not include the category of Native American and Alaska Native within their classifications for race (e.g., 12; 14). Further, the Other racial group, which includes Mixed Race (i.e., one more racial classifications) and coding errors (i.e., other is put down when race is unknown), reported the highest rates of initial combined AUD diagnosis over the study period. However, since Other is a combination of multiple racial categorizations, we are unable to decipher which groups within this categorization were at highest risk for an initial combined AUD diagnosis. These findings highlight the importance of including additional racial group classifications in future prevalence estimates studies

According to Chartier and Caetano (71) analysis of the 2007 NSDUH, White and Native Americans have higher rates of AUD relative to other ethnic groups. However, once alcohol dependence is established, the authors indicated that Black and Hispanic racial groups experience higher rates of recurrent or persistent alcohol dependence, when compared to White racial groups. Further, the authors highlighted that Native American, Black, and Hispanic racial groups all experience significantly greater negative consequences associated with their alcohol dependence. There is also some support from

the VA literature indicating Black and Hispanic veterans had higher rates of initiation of treatment for combined AUD than White veterans (72). Further, Black veterans had higher odds of engaging in treatment for combined AUD, when compared to White veterans (72). Provided this context, it is possible that these racial groups are being diagnosed at a disproportionate rate to White and Asian active duty service members, due to the severity of their combined AUD symptomatology. Further, these racial groups may be more willing to initiate and engage in treatment for combined AUD, which would lead to higher rates of initial combined AUD diagnosis.

It is also possible that race may have an impact on a military medical provider's decision making when providing an initial combined AUD diagnosis. According to Dehon and colleagues (73) systematic review of racial bias in the context of clinical decision making, the literature indicates medical providers have an implicit preference towards white patients. This could influence them to be more lenient on White active duty service members to ensure a combined AUD diagnosis does not have a negative impact on their military career. However, the authors indicated provider implicit bias does not have a significant impact on their clinical decision making (73). However, the above study did not assess clinical decision making in the area of substance use and more research is required to determine if racial background impacts diagnostic decision making in the area of combined AUD. Further, it may be the case that military unit organizations provide harsher consequences for negative alcohol related incidents for minority racial groups. If this were to occur, racial minorities would certainly be more likely to receive an initial combined AUD diagnosis when a negative alcohol related incident occurs.

Given these findings, it essential for future research to focus on better understanding how race impacts a military medical provider's decision making for providing an initial combined AUD diagnosis. Similar to the vignette studies analyzed by Dehon and colleagues (73), research should be done within military medical treatment facilities across the MHS to assess if there are differences in the way providers diagnose combined AUD across different racial groups. It would also be important to conduct an analysis of the relationship between race and severity of unit related consequences associated with negative alcohol related incidents. A similar study could be done using vignettes at the military unit level to assess if administrative consequences are enacted differently across racial group. Further, there should be a more thorough analysis of the relationship between race and drinking severity throughout the active duty service member population. Indeed, having this information would allow policy makers to allocate more resources to these at risk groups. This information could also be used to assist in developing clinical guidelines aimed at reducing the likelihood of racial bias impacting decisions made by military medical providers related to combined AUD diagnosis and negative alcohol related consequences at the unit level.

Military Occupational Specialty

It is important to highlight before discussing these results that the majority of active duty service members with an initial combined AUD diagnosis over the study period were in the military occupational specialty of other. This means we did not have their military occupational specialty information when conducting the analyses. Given this, the interpretations of the results offered in this section should be viewed with caution.

The current prevalence studies for combined AUD indicate warfighting positions are most likely to engage in combined AUD symptomatology (8; 9; 10; 12; 13; 14). Therefore, it was expected that in the current study active duty service members within warfighting positions would have the highest annual incidence rates of initial combined AUD diagnosis from FY2008 through FY2015. Further, when compared to other occupational specialties, warfighters have shown significantly higher rates of PTSD and combat related stress (i.e., 74), that would make them more susceptible to combined AUD symptomatology. However, motor transportation personnel had higher annual incidence rates of combined AUD diagnosis than warfighting personnel throughout the study period. Further, after controlling for the demographic and military characteristics of the active duty service member population, motorized transportation personnel and logistics/supply personnel were the groups most likely to have an initial combined AUD diagnosis over the study period, with warfighters being the third most likely. Further, naval transportation/operations and engineering/maintenance personnel were just as likely as warfighting personnel to receive an initial combined AUD diagnosis over the study period.

It is possible that warfighters may be more likely to report alcohol use on an anonymous self-report survey and less likely to seek care and, thereby, receive a combined AUD diagnosis. For example, warfighting communities may be more accepting of combined AUD symptomatology because it is understood to be a stereotypical behavior within warfighting communities. Further, given the high rates of combat related stress within warfighting communities, combined AUD symptomology

may be considered an acceptable coping mechanism to reduce stress within the warfighting community and, perhaps, by their supporting military medical providers.

For transportation (i.e., motor, naval) and logistical support (i.e., supply, maintenance) personnel, there seem to be reasons unique to their occupations that make them more likely or just as likely as warfighting personnel to receive an initial combined AUD diagnosis. Given that transportation and logistics are often involved in resupply missions associated with convoy operations, if deployed, personnel in these job areas are susceptible to combat exposure associated with improvised explosive devices, enemy ambushes, and naval operations. According to Wilk and colleagues (75), US Army soldiers within a brigade combat team who were exposed to combat situations which could cause death or life-threating injuries were significantly more likely to screen positive for alcohol abuse. Therefore, it is not surprising that military personnel in non-warfighting occupations that are often exposed to life threatening situations would also exhibit high rates of AUD.

One reason why these occupational specialties may receive higher rates of initial combined AUD diagnosis is because these positions often require active duty service members to operate and repair very expensive military transportation vehicles/vessels and/or heavy machinery. Having combined AUD symptomatology within these occupational specialties is a major liability towards personnel safety. These types of military units are very strict in their enforcement of negative alcohol related events and attempt to get their personnel help before their combined AUD symptomatology impacts their ability to operate heavy equipment. Given this, it is possible transportation and logistical support personnel may be more likely to receive a combined AUD diagnosis

than warfighting personnel because of their command climate surrounding combined AUD symptomatology.

To our knowledge, no prior research indicates why these military occupational categories would be at higher or similar risk to warfighting personnel to receive an initial combined AUD diagnosis. Future research should focus on identifying how units associated with different military occupational specialties target combined AUD symptomatology within their organizations. This would help to determine if the rates of initial combined AUD diagnosis are disproportional to the rates of combined AUD symptomatology throughout the various military occupational specialties. It would also be beneficial to analyze how having a certain military occupational specialty impacts the likelihood of an active duty service member receiving an initial combined AUD diagnosis from a military medical provider. It may be the case that military medical providers are more likely to give a diagnosis of combined AUD to a transportation and logistical support personnel, when compared to a warfighter personnel. To address such possibilities, policy makers and military medical providers should focus on policy directives/clinical guidelines that would promote an equal enforcement of standards as it relates to diagnosis of combined AUD.

Rank

The pattern of risk associated with rank category did not follow the expected pattern. Senior officer's (O4 and above) had substantially higher annual incidence rates of initial combined AUD diagnosis, when compared to all other rank categories. Junior enlisted ended up being a distant second for annual incidence rates of initial combined AUD diagnosis over the study period. This finding was surprising, given the information

provided in the military prevalence estimate surveys. In fact, after controlling for the demographic and military characteristics of the active duty service member population, senior officers were approximately 25 times more likely to receive an initial combined AUD diagnosis, when compared to junior enlisted soldiers. Further, after controlling for the characteristics of the active duty service member population, the second group most likely to receive an initial combined AUD diagnosis were actually junior officers. Indeed, junior officers were approximately 1.118 times as likely to receive an initial combined AUD diagnosis, when compared to the junior enlisted group.

It is important to examine the civilian literature to assess how individuals within the US general population in similar positions are impacted by combined AUD. Bush and Lipari (76) conducted an analysis of the NSDUH between the years of 2008 through 2012, assessing for rates of past month heavy alcohol use, past month illicit substance use, and past year substance use disorder (SUD) among 19 different occupational categories within the US general population. Their result indicated that management positions have historically been high on the list of self-reported SUD by category (76). Given senior officers are largely in administrative and/or leadership positions throughout their military careers, management seems like the occupational category most likely to serve as a comparison to civilian literature. Indeed, Bush and Lapari (76) reported 12.1% of management personnel engaged in illicit substance within the past month, which was the third highest group of the 19 industries surveyed. In addition, 9.9% of management personnel engaged in heavy alcohol use within the past month, which was the seventh highest group out of the 19 industries surveyed. Lastly, 11.4% of management personnel

were identified as having a substance use disorder over the past year, which was the sixth highest group out of 19 industries between the years of 2008 through 2012.

What the civilian literature indicates is that management personnel are at higher risk of reporting past month illicit drug use, past month heavy alcohol use, and past year SUD, when compared to most occupational categories within the US General population. It is important to highlight that there are significantly lower rates of illicit substance use in active duty service member population because the DoD has specific language in its Uniformed Code of Military Justice (UCMJ), indicating that if a service member were caught engaging in illicit substance use, there are grounds for an immediate separation from service. The DoD's stance on illicit substance use has made alcohol the substance of choice within the military and is largely responsible for the significant levels of combined AUD symptomology reported in the military prevalence estimates surveys (8; 9; 10; 12; 13; 14). Given this, there is an argument that we could expect higher rates of heavy alcohol use and combined AUD diagnosis in management personnel within active duty service member populations. Further, with their being high rates of substance use and SUD in management categories throughout the US general population, one could argue that rates of initial combined AUD diagnosis within senior officers ranks should have been projected to be higher than originally anticipated.

However, if the findings were due to the managerial aspects of the officer positions, then we would have expected rates of initial combined AUD diagnosis for junior officers (O1-O3), senior enlisted (E6 and above), and warrant officers (WO1-WO5) to be similar to those of senior officers. These classifications of rank are also commonly associated with management and/or leadership positions within the active duty

service member population. However, what the results tell us is senior officers were at least 22 times as likely to receive an initial combined AUD diagnosis, when compared to every other rank categorization throughout DoD during the study period. This implies there is a fundamental difference associated with the experience of being a senior officer that makes them significantly more likely to receive an initial combined AUD diagnosis.

Junior and senior officers are often assigned to leadership roles that require a higher level of competence, more responsibility, and higher levels of visibility throughout the unit organization. Responsibility and visibility could be associated with higher levels of stress, which could lead to increases in combined AUD symptomatology. It is possible the officer corps accepts combined AUD symptomatology as long as officers are able to successfully complete their roles and responsibilities. Further, officers may have higher levels of competence when compared to other rank categories, which makes them better suited to conceal their combined AUD symptomatology, as long as they are effectively executing mission related tasks.

It could also be the case that senior officers are similar to warfighting personnel. Indeed, the officer corps may be more willing to overlook combined AUD symptomatology in junior/senior officers and less willing to overlook similar symptomatology in enlisted personnel. Being stricter with junior enlisted would serve as a screening mechanism whereby enlisted personnel with combined AUD symptomatology are discharged from the military. This could lead to lower rates of combined AUD diagnosis in senior enlisted personnel.

However, after engaging in combined AUD symptomatology over a long military career, there is likely a point where officers make the decision to receive treatment for

their combine AUD symptomatology. If it were the case that the majority of officers decided to engage in alcohol abuse treatment before retirement, it is likely you would see the highest rates of initial combined AUD within senior officers. Given the size of their community is much smaller than most rank categories (e.g., junior enlisted, junior officer, senior enlisted), this could help explain the substantially high annual incidence rates for initial combined AUD diagnosis over the study period.

Future research should examine potential mechanism underlying the current findings to see if there is something to be done to reduce the alcohol problems amongst officers. Indeed, it would be beneficial to conduct a longitudinal analysis of alcohol use trajectories between the various rank groupings to help identify what mechanisms make active duty officers better able to conceal their combined AUD symptomatology over the course of their military careers. Indeed it is possible there are more stringent consequences for combined AUD symptomatology within the junior enlisted ranks, which serves as a screening mechanism before they advance to the ranks of senior enlisted, warrant officer, or junior officer. With there being a high turnover associated with the junior enlisted ranks, it is likely their annual incidence rates for initial combined AUD diagnosis will continue to be lower than the senior officer's overtime. Once we can establish a trend of combined AUD symptomatology within the officer corps over time, policy makers and military medical providers can begin to develop policy directives and clinical guidelines to help assist this at risk community. Indeed, this would help to reduce the longitudinal impact of combined AUD symptomatology, leading to negative outcomes associated with health and social functioning (1).

Combined AUD and Common Mental Health Disorder Diagnosis

When compared to active duty service members without a diagnosis of combined AUD, active duty service members with combined AUD diagnosis were at significantly higher risk of being diagnosed with other common mental health disorders (i.e., adjustment disorders, anxiety disorders, depressive disorders, insomnia, PTSD) at some point over the eight-year study period. Indeed, active duty service members with a history of combined AUD diagnosis were: 1) 8.48 times more likely to be diagnosed with an adjustment disorder, 2) 8.49 times more likely to be diagnosed with an anxiety disorder, 3) 12.08 times more likely to be diagnosed with a depressive disorder, 4) 6.99 times more likely to be diagnosed with insomnia, and 5) 14.17 times more likely to be diagnosed with PTSD.

The odds of having a history a common mental health disorder diagnosis over the study period are substantially higher in active duty service members with combined AUD, when compared to the previously outlined epidemiological surveys focusing on rates of self-reported AUD and common mental health disorder symptomatology in civilian samples (i.e., 35; 36; 37; 39). For example, according to Smith & Randall (35), individuals with combined AUD symptomatology were 2.1 to 3.3 times more likely to report anxiety disorder symptomatology. The current study indicates active duty service members with a history of combined AUD diagnosis are 8.49 times as likely to receive an anxiety disorder diagnosis. This trend remains consistent for the other common mental health disorders assessed in the current study (see Table 11).

It is important to highlight that the eight-year period prevalence rates of common mental health disorder diagnosis in active duty service members with combined AUD were similar to the prevalence rates reported in civilian and veteran samples (11; 33; 52).

Further, when compared to the civilian and veteran samples, the eight-year period prevalence rates of common mental health disorder diagnosis were substantially lower in active duty service members without combined AUD diagnosis. One explanation that would account for the large gap in diagnosis between the two groups is there are historically lower rates of mental health disorder diagnosis reported throughout the MHS (i.e., 19), when compared to the civilian and veteran epidemiological studies (i.e., 11; 18; 33; 52). There are a few possibilities to help account for these low rates of common mental health disorder diagnosis for active duty service members without a combined AUD diagnosis.

There are some protective factors associated with active duty service member populations that may make them less likely to require services for common mental health disorder symptomatology. For example, the large majority of active duty service members are young, physically fit, healthy, and are well taken care of in the areas of healthcare and finances. These are all factors that would help deter against developing symptoms and then seeking services for common mental health disorder symptomatology. Further, there are built in support structures within military units to help active duty service members that may be at risk for needing services for common mental health disorder symptomatology. However, as we have seen with the military and veteran prevalence data (i.e., 11; 18; 30; 44; 45), active duty service members and veterans discharged from service have higher rates of combined AUD and common mental health disorder symptomatology when compared to the US general population.

Protective factors associated with military service could reduce the perceived need for combined AUD and common mental health disorder treatment, which would

reduce rates of combined AUD and common mental health disorder diagnosis across the active duty military population. It is also possible that active duty service members were less likely to seek out services for their symptomatology due to stigma and barriers to care (i.e., 21, 22). Given this, receiving a combined AUD diagnosis within the active duty service member population may serve as a gateway for some to begin treatment of common mental health disorder symptomatology. Indeed, it could be the case that common mental health disorder diagnosis serves as a gateway for combined AUD. The current study assessed the above possibilities and it will be discussed in a later section.

It is clear that when individuals with combined AUD seek treatment and receive a diagnosis of combined AUD, they have substantially higher rates of common mental health disorder diagnosis. It is possible that active duty service members with combined AUD are a uniquely unhealthy population. It is true that active duty service members are often assigned to more stress inducing occupational positions and are exposed to combat and relationship related traumas. Active duty service members diagnosed with combined AUD may have a disproportionate number of psychosocial stressors that could make them more susceptible to common mental health disorder symptomatology.

The current study could not examine differences between the groups outside of demographic, military, and diagnostic characteristics of the active duty service member population. This makes it difficult to assess why there was such a substantial gap in prevalence of common mental health disorders between the two groups over the study period. Future research should focus on conducting a longitudinal assessment of common mental health disorder symptomatology in active duty service members with and without a history of combined AUD diagnosis. Conducting this type of analysis would help to

confirm if the gap in prevalence rates for common mental health disorder diagnosis is representative of the common mental health disorder symptomatology being experienced throughout the active duty service member population. It could be that active duty service members without combined AUD diagnosis have much higher rates of common mental health disorder symptomatology then is currently being diagnosed. If this were true, then military public health officials would need to begin trying to better understand the underlying mechanisms that are influencing these active duty service members to not seek out mental health services (i.e., protective factors, stigma, barriers to care).

In addition, future research should assess the MDR to examine how seeking treatment for substance use and mental health disorders impacts the likelihood of having a history of other substance use and mental health disorders. If it were the case that having a diagnosis of any kind made active duty service members more susceptible to receive other substance use and mental health disorder diagnoses, then it might be the case that the primary reason for the large gap in prevalence rates is related to service utilization throughout the MHS.

Co-Occurring Combined AUD and Common Mental Health Disorder Diagnosis

The present study utilized medical record diagnoses enabling us to look at the co-occurrence of combined AUD common mental health disorder diagnosis. By limiting the definition of co-occurrence to within 90 days prior to or following a combined AUD diagnosis, we were able to employ the most stringent analysis of co-occurrence in a population based study related to diagnosed combined AUD and common mental health disorder. Using medical provider diagnosis as a way to establish co-occurrence is novel and it allowed us to receive a better estimate of when active duty service members were

experiencing co-occurring symptomatology. What we found is active duty service members had high rates of common mental health disorder diagnoses co-occurring within 90 days prior to or following a combined AUD diagnosis over the study period. In fact, with the exception of insomnia, when compared to the eight-year period prevalence rates of common mental health disorder diagnosis in those without combined AUD, active duty service members with a combined AUD diagnosis had much higher rates of co-occurring adjustment disorder, anxiety disorder, depressive disorder, and PTSD diagnoses.

These findings indicate active duty service members with a combined AUD are diagnosed with a co-occurring common mental health disorder at a higher rate than those without combined AUD. These results provide several clinical implications that could impact how military medicine addresses assessment and treatment of co-occurring combined AUD and common mental health disorders. To begin, 39.42% of active duty service members with a combined AUD diagnosis received a diagnosis of co-occurring common mental health disorder at some point over the study period (see Table 10). This is concerning because the literature indicates having a history of these co-occurring disorders negatively impacts prognosis, treatment outcomes, and relapse of combined AUD across populations (35; 36; 37; 39; 40; 41; 42).

It appears from the present results that those with combined AUD diagnosis are at high risk for having a situation where they are being treated for two disorders in a similar time period. Given that these are diagnoses from military medical providers, there is high likelihood that active duty service members with a combined AUD diagnosis are experiencing high rates of co-occurring common mental health disorder symptomatology

at some point over the study period. This would provide support for the notion that active duty service members with combined AUD diagnosis are a uniquely unhealthy population and are at risk for the treatment outcomes associated with co-occurring combined AUD and common mental health disorder.

In the future, when active duty service members are assessed and meet the criteria for our current conceptualization of AUD (i.e., 3), it is important that they undergo a thorough psychodiagnostic assessment to identify if they have a history of lifetime or current common mental health disorder symptomology. Further, the clinical resources used to address the problem of co-occurring combined AUD and common mental health disorders should begin accounting for these high rates within their available treatments options. Indeed, the current literature into these co-occurring disorders have suggested that concurrent treatment would be preferable to help mitigate against the previously outlined poor treatment outcomes (35; 36; 37; 39; 40; 41; 42). Indeed, researchers have already begun assessing the efficacy of conducting concurrent treatment and will be discussed at length in a later section of this manuscript.

With there being low rates of mental health disorder diagnosis throughout the MHS (i.e., 19), it is possible that receiving a diagnosis and/or treatment for combined AUD removes the stigma and barriers towards mental healthcare, which leads to the higher rates of period and co-occurring prevalence of common mental health disorder diagnosis. In order to examine this further, it is important to assess the chronology of diagnosis between the co-occurring disorders, to examine if a diagnosis for combined AUD serves as an entry point to begin receiving mental health services for common mental health disorders, or vice versa.

Chronology of Diagnosis

The DoD (19) report indicated there were low rates of mental health disorder diagnosis throughout the MHS. Underdiagnoses of mental health disorders in active duty service member populations have been attributed to resistance or stigma towards seeking treatment for their mental health concerns (i.e., 21; 22). However, the current study indicates active duty service members with combined AUD diagnosis have high rates of co-occurring common mental health disorders. Given this, it is possible that receiving a combined AUD diagnosis removes the stigma and barriers towards receiving mental health services within the active duty service member population. As discussed in previous chapters, given the high rates of co-occurring mental health disorders in AUD populations, we hypothesized that active duty service members would likely be diagnosed with a combined AUD prior to their co-occurring mental health disorder, due to environmental factors encouraging/forcing them to seek treatment for their AUD symptomatology.

With the exception of adjustment disorders, active duty service members with co-occurring combined AUD and common mental health disorders (i.e., anxiety disorders, depressive disorders, insomnia, PTSD) were significantly more likely to be diagnosed with a combined AUD first. The findings provide some support for the argument that combined AUD may serve as gateway for active duty service members to begin receiving services for common mental health disorder symptomatology. However, the results also indicated a large percentage of active duty service members receive an initial common mental health disorder diagnosis prior to their initial combined AUD diagnosis. In

addition, a large percentage of active duty service members receive their initial diagnosis for both disorders on the same patient encounter.

It is possible the group who is diagnosed with combined AUD first may have more severe combined AUD symptomatology, which would make them more likely to target their combined AUD first. It is also possible that a portion of active duty members disclose they have combined AUD symptomatology after they feel more comfortable receiving services for common mental health disorder. Further, active duty service members who are diagnosed with co-occurring combined AUD and common mental health disorder on the same patient encounter may be more likely to attribute their combined AUD symptomatology to psychosocial stressors, which could instigate a co-occurring diagnosis from the military medical provider. Any speculation on why these patterns occur would only be based on assumptions and not evidence. Future research should focus on the underlying mechanisms behind the ways active duty service members enter treatment and are diagnosed with different co-occurring disorders.

Adjustment disorder is the most commonly diagnosed mental health disorder throughout the MHS (19). Given this, it is not surprising medical providers, including those throughout the MHS, often use adjustment disorder as a default diagnosis, due to its vague diagnostic criterion (77). This allows the medical provider to provide semi-accurate diagnostic information in the military health record, while allowing the provider to continue to gain diagnostic clarity as they complete their clinical assessment. Indeed, if you were to conduct an analysis of the *DSM-IV* (2) diagnostic criterion for adjustment disorder, you would see evidence of symptom overlap with anxiety disorders, depressive disorders, insomnia, and PTSD.

Since adjustment disorder has been identified as a default diagnosis (i.e., 77), it is possible active duty service members who were diagnosed with co-occurring combined AUD and adjustment disorder on the same patient encounter were more likely to be entering treatment for combined AUD during their initial patient encounter. Further, military medical providers may have been more willing to use adjustment disorder as an initial diagnosis so they could further assess combined AUD symptomatology. It could also be the case that military medical providers frequently use adjustment disorders as a diagnosis because they see it as less detrimental to their military careers. Indeed, when an active duty service member is given an adjustment disorder diagnosis within the MHS, it is often seen as less severe than disorders such as anxiety disorder, depressive disorder, or PTSD, and does not raise as many red flags when military mental health records are included in various military occupational assessments (e.g., leadership assessment, security clearance assessments, special operations recruitment). Lastly, it is possible some active duty service members were more likely to discuss psychosocial stressors in the initial patient encounter and neglect to discuss their combined AUD symptomatology. Future research should examine the factors that providers consider when diagnosing adjustment disorder in relation to combined AUD symptomatology.

Additional Clinical and Policy Implications Supporting Concurrent Treatment

With there being high rates of co-occurring combined AUD and common mental health disorders, the clinical implications suggest we need to start assessing how we treat these disorders throughout the MHS. Leadership within the Defense Health Agency (DHA) has an opportunity to transform substance abuse treatment programs throughout the MHS to help account for the high rates of co-occurring common mental health

disorder associated with combined AUD. The research suggests that by addressing combined AUD and common mental health disorders concurrently, military mental health providers would be better able to manage symptomatology and mitigate against the negative treatment outcomes associated with these co-occurring disorders (35; 36; 37; 39; 40; 41; 42).

To provide an example from recent literature, researchers are currently in the process of developing treatment protocols to address SUD and PTSD symptomatology concurrently. Indeed, Roberts, Roberts, Jones, and Bisson (78) conducted an initial review of the literature looking at interventions for individuals with co-occurring PTSD and SUD. Their results indicated patients saw clinically significant declines in PTSD severity and drug/alcohol use when they received trauma focused cognitive-behavioral interventions at the same time as SUD interventions. Other researchers have attempted to make a single treatment protocol to provide concurrent care for SUD and PTSD. For example, Back and colleagues (43) recently conducted a random control trial using a treatment program called COPE (i.e., concurrent treatment of PTSD and SUD using prolonged exposure), to help address co-occurring PTSD and SUD in military veterans. When compared to a relapse prevention group, COPE was significantly more likely to reduce PTSD severity and produce similar reductions to relapse prevention for SUD severity. Further, the military veterans who were assigned to COPE reported significantly lower drinks per drinking day, when compared to the relapse prevention group.

Additional reviews have indicated concurrent treatment protocols are beginning to show efficacy for combined AUD and other common mental health disorders (37; 79; 80). McHugh (79) reported that the current pilot studies designed to deliver concurrent

treatment of co-occurring anxiety and SUD have been very promising. McHugh and Weiss (80) reported similar trends in concurrent treatment of depression and combined AUD, indicating the pilot studies are beginning to show progress. However, the concurrent treatments being developed for co-occurring SUD and common mental health disorders are still in the early stages of development and require further research to establish efficacy. Given the high rates of co-occurring combined AUD and common mental health disorder throughout the MHS, the DHA has an opportunity to play a big role in developing these types of programs to help meet the treatment needs of the active duty service member population.

Indeed, this treatment approach of creating a single treatment protocol to provide concurrent care would be an improvement upon the existing structure of behavioral services within the MHS. The SUD clinics, behavioral health clinics, and medication management clinics are separated from one another in the MHS. Since these clinics have separate leadership structures, clinical guidelines, provider treatment preferences, and policy procedures, it is difficult for the clinics to provide evidenced based treatment for co-occurring combined AUD and common mental health disorder symptomatology in an effective manner. With the current structure in place, it would be nearly impossible to deliver effective concurrent treatment for co-occurring disorders if the treatment was being delivered in two separate clinics. Indeed, the treatment between the clinics would be largely inconsistent between patients and the demand in both systems would make it very difficult for two providers to effectively coordinate concurrent care.

There would also likely be resistance from an administrative stand point to deliver separate treatment protocols for combined AUD and common mental health disorders

within a SUD clinic. If they were to adopt this approach, they would have a very difficult time with resource allocation due to the time it would take to deliver each protocol between patients. If the current structure of a military SUD treatment facility were to transition to addressing SUD and common mental health disorders within single evidenced based treatment protocols (e.g., 43), it is possible they would be better prepared to address the problems associated with co-occurring combined AUD and common mental health disorder symptomatology throughout the active duty service member population.

Concurrent treatments are still in the early stages of development and have a long way before they will implemented on a large scale to address the high rates of co-occurring common mental health disorder in active duty service members with combined AUD. Indeed, further research is needed to understand which strategies would be most effective to address the issue of co-occurring combined AUD and common mental health disorder symptomatology. However, given the current study's findings, it is important for DHA policy makers to begin thinking about how the MHS could play a role in developing concurrent treatment to help address the problem of co-occurring combined AUD and common mental health disorders. Indeed, the current literature suggests concurrent treatment would be the most effective approach to address the negative outcomes associated with co-occurring SUD and common mental health disorders (35; 36; 37; 39; 40; 41; 42; 78; 79; 80). However, before we can begin assessing the efficacy of concurrent treatments, it is essential for clinical researchers to begin examining how these disorders are currently being diagnosed and treated throughout the MHS. This will ultimately assist in establishing a baseline for outcome measures that can be used to

assess the efficacy of implementing programs that promote concurrent treatment of these disorders.

Limitations, Strengths, and Future Directions

The current study utilized the MDR, which would indicate these results may not be generalizable outside of the MHS. With this study being designed to utilize TRICARE medical health records throughout the active duty service member population, we used provider diagnoses within the MDR to perform all of our analyses. Given this, there are limits to making assessments based on diagnostic information alone. These limitations include: 1) there was a lack of information about the context of the patient encounter, 2) we were not able to assess the objective and subjective information used to understand why the provider decided to give a particular set of diagnoses, 3) there was no information regarding the presenting symptomatology and the severity of the symptoms, 4) there was no information regarding the validity of a diagnosis, 5) there is no information regarding onset of symptomatology for combined AUD or other common mental health disorders, and 6) there was no information about which treatments were being utilized for any of the disorders. Further, the chronology of diagnosis could have been dependent on which provider was seen first. It is possible that chronology of diagnosis was impacted by availability of medical providers that specialize in treating combined AUD and/or co-occurring common mental health disorders. In addition, since this is a population based assessment of the MHS over the study period, there is at least a percentage of these diagnoses that may have been impacted by coding errors within the medical records. These limitations make it difficult to give concrete assessments of the clinical practices associated with the diagnostic information being examined.

However, there are also many strengths to using MDR diagnostic information. Given that a medical provider gave the diagnosis, you can at least assume the active duty service member has some of the symptoms common to the specific diagnosis. Further, it allows you to receive a better estimate of the time frame when the active duty service member was experiencing symptoms similar to the diagnosis. Indeed, oftentimes epidemiological surveys rely on a participant's memory to determine the timeline of onset and co-occurrence, which could be impacted by cognitive issues that are commonly associated with combined AUD and common mental health disorders. Having a medical record of diagnosis helps to give researchers a better estimate of when there was co-occurrence and the amount of treatment sessions they were receiving for the co-occurring disorders.

In addition, having access to military medical provider diagnosis provided us an opportunity to receive one of the most thorough analyses of combined AUD, regardless of the population. Even with the limitations regarding diagnosis described above, this was a study that utilized the entire active duty service member population to assess actual military medical records within the direct and purchased care systems (i.e., TRICARE) from FY 2008 through FY2015. With this information we were able to create a complete analysis over multiple fiscal years of diagnostic characteristics associated with combined AUD within the active duty service member population, to include: 1) annual incidence rate of initial diagnosis, 2) demographic (i.e., age, marital status, race, sex) and military characteristics (i.e., branch of service, military occupation specialty, rank) of initial diagnosis, 3) co-occurring common mental health disorders, and 4) chronology of co-occurring diagnoses. Indeed, there has never been a more complete analysis of combined

AUD diagnosis using medical records in any population. Having this information provides the clinical, policy, and research community with implications and future directions to help address the limitation described above.

Conclusion

The current study suggests the strategic reduction in number of active duty personnel may have had an impact on the annual incidence rates of initial combined AUD diagnosis. Future research should focus on determining how policy decisions used to determine the size of the active duty service member population impact annual incidence rates of initial combined AUD throughout the MHS. In addition, the current prevalence estimate studies have failed to identify some of the demographic and military groups most likely to receive an initial combined AUD diagnosis over the study period. Of particular note is the apparently high rate at which senior officer received an initial combined AUD diagnosis. It would be valuable for researchers and policy-makers to carefully assess and examine demographic (i.e., age, marital status, race, sex) and military (i.e., branch of service, military occupational specialty, rank) characteristics associated with initial combined AUD diagnosis. The present results suggest that a more fine-grained analysis of demographic/military characteristics could better identify high-risk groups.

It is also clear that active duty service members with combined AUD diagnosis are more likely to have a history of common mental health disorder diagnosis and high rates of co-occurring common mental health disorder. The comparative risk associated with combined AUD diagnosis were even higher than what the current epidemiological studies predicted. However, there was a suggestion that this resulted, at least in part, from

somewhat lower than expected rates of common mental health diagnoses among personnel without a combined AUD diagnosis. Researchers should examine if there are higher rates of common mental health disorder that remain undiagnosed among those without a combined AUD diagnosis. Indeed, it may be the case that this population is less likely to report their common mental health disorder symptomatology.

Finally, active duty service members with co-occurring combined AUD and common mental health disorder diagnosis have a few different ways in which they receive their co-occurring diagnoses. Future research should focus on understanding the factors that influence how active duty service members receive their co-occurring diagnoses and enter treatment. Further, researchers should assess treatment outcomes associated with the current treatment strategies used to address these co-occurring diagnoses. This research could serve as a baseline to begin examining if concurrent treatment of co-occurring combined AUD and common mental health disorders would be effective at addressing the problem of these co-occurring disorders throughout the MHS.

Table 1

DSM-IV (APA, 1994) Alcohol Abuse Criterion

A maladaptive pattern of alcohol abuse leading to clinically significant impairment or distress, as manifested by one or more of the following, occurring within a 12-month period:
Recurrent alcohol use resulting in failure to fulfil major role obligations at work, school, or home.
Recurrent alcohol use in situations in which it is physically hazardous.
Recurrent alcohol-related legal problems.*
Continued alcohol use despite persistent or recurrent social or interpersonal problems caused or exacerbated by the effects of the alcohol.

Note. *Not included in the *DSM-5*; These symptoms must never have met the criteria for alcohol dependence.

Table 2

DSM-IV (APA, 1994) Alcohol Dependence Criterion

A maladaptive pattern of alcohol use, leading to clinically significant impairment or distress, as manifested by three or more of the following seven criteria, occurring at any time in the same 12-month period:

Tolerance, as defined by either of the following:

1. A need for markedly increased amounts of alcohol to achieve intoxication or desired effect.
2. Markedly diminished effect with continued use of the same amount of alcohol.

Withdrawal, as defined by either of the following:

1. The characteristic withdrawal syndrome for alcohol.
2. Alcohol is taken to relieve or avoid withdrawal symptoms.

Alcohol is often taken in larger amounts or over a longer period than was intended.

There is a persistent desire or there are unsuccessful efforts to cut down or control alcohol use.

A great deal of time is spent in activities necessary to obtain alcohol, use alcohol or recover from its effects.

Important social, occupational, or recreational activities are given up or reduced because of alcohol use.

Alcohol use is continued despite knowledge of having a persistent or recurrent physical or psychological problem that is likely to have been caused or exacerbated by the alcohol.

Table 3

DSM-5 (APA, 2013) Alcohol Use Disorder (AUD) Criterion

A maladaptive pattern of alcohol use, leading to clinically significant impairment or distress, as manifested by two or more of the following 11 criteria, occurring at any time in the same 12-month period:
Alcohol is often taken in larger amounts or over a longer period than was intended.
There is a persistent desire or there are unsuccessful efforts to cut down or control alcohol use.
A great deal of time is spent in activities necessary to obtain alcohol, use alcohol or recover from its effects.
Craving, or a strong desire or urge to use alcohol.*
Recurrent alcohol use resulting in failure to fulfil major role obligations at work, school, or home.
Continued alcohol use despite persistent or recurrent social or interpersonal problems caused or exacerbated by the effects of the alcohol.
Important social, occupational, or recreational activities are given up or reduced because of alcohol use.
Recurrent alcohol use in situations in which it is physically hazardous.
Alcohol use is continued despite knowledge of having a persistent or recurrent physical or psychological problem that is likely to have been caused or exacerbated by the alcohol.
Tolerance, as defined by either of the following: 1. A need for markedly increased amounts of alcohol to achieve intoxication or desired effect. 2. Markedly diminished effect with continued use of the same amount of alcohol.
Withdrawal, as defined by either of the following: 1. The characteristic withdrawal syndrome for alcohol. 2. Alcohol is taken to relieve or avoid withdrawal symptoms.

Note. *New to the *DSM-5*; Severity of AUD is defined as Mild (2 or 3), Moderate (4 or 5), and Severe (6 or more).

Table 4

Annual Incidence Rates of Initial Combined AUD Diagnosis in Active Duty Service Members from FY2008 through FY2015

Fiscal Year	Incidence	Total *N*	Incidence Rate per 1,000	% Change from Previous FY
2008	27,462	1,976,116	13.90	--
2009	29,466	2,034,344	14.48	4.23
2010	26,940	2,031,631	13.26	-8.45
2011	24,265	1,871,840	12.96	-2.24
2012	24,228	1,824,969	13.28	2.41
2013	21,319	1,795,071	11.88	-10.54*
2014	19,971	1,712,047	11.66	-1.78
2015	22,167	1,652,504	13.41	15.00*

Note. *clinically significant change of more than 10% between fiscal years.

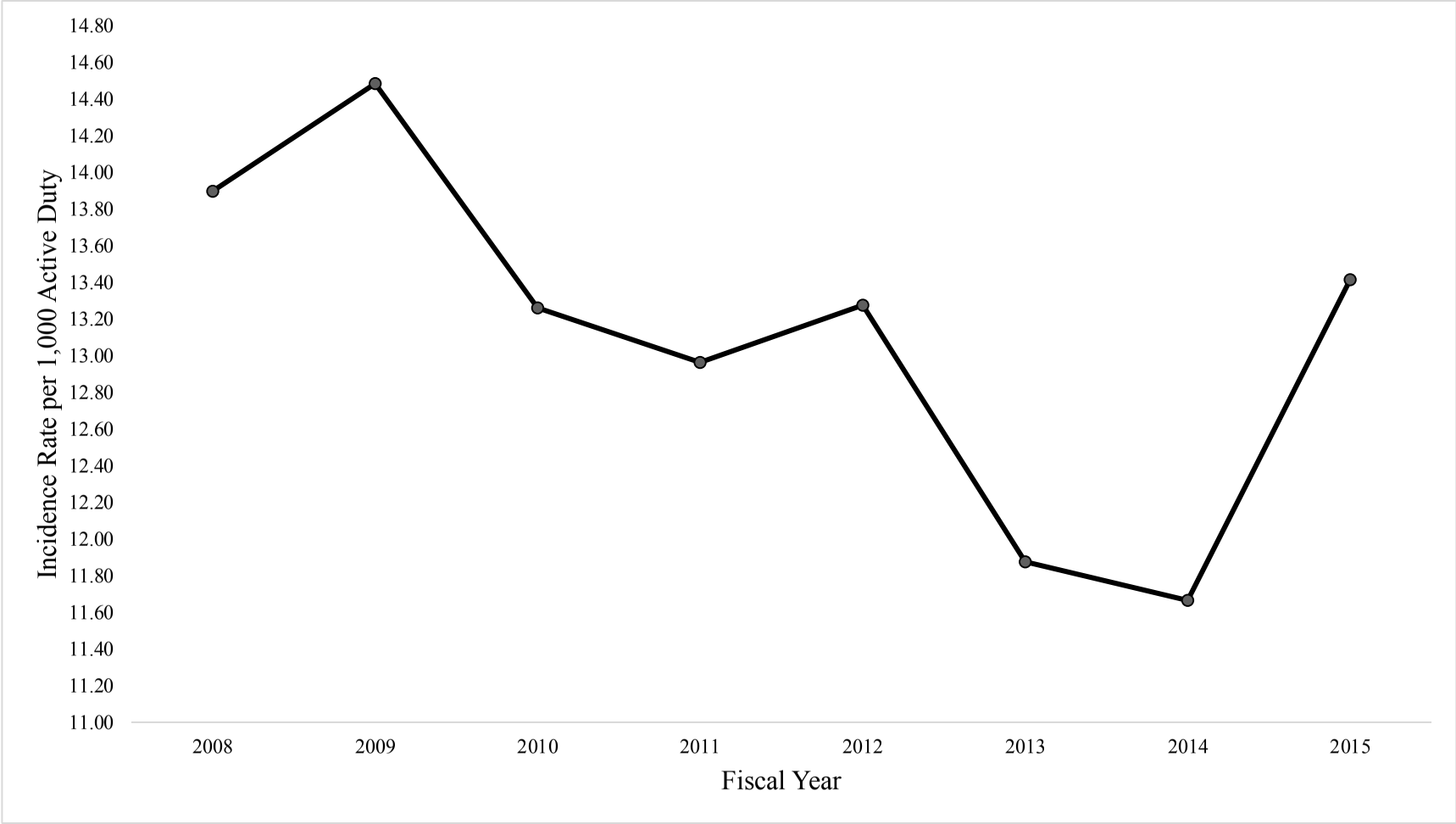

Figure 1. Annual incidence rates per 1,000 active duty service members for initial combined AUD diagnosis from FY2008 through FY2015.

Table 5.

Demographic Characteristics of Initial Combined AUD Diagnosis from FY2008 through FY2015

	2008 27,462	2009 29,466	2010 26,940	2011 24,265	2012 24,228	2013 21,319	2014 19,971	2015 22,167
Age Group (years)								
18-20	5123 (1.43)	5101 (1.40)	3722 (1.08)	2794 (0.90)	2517 (0.85)	2189 (0.71)	2026 (0.67)	2140 (0.71)
21-24	12043 (2.44)	12634 (2.50)	11432 (2.25)	10453 (2.25)	10490 (2.33)	8916 (2.06)	8163 (2.02)	8569 (2.21)
25-34	7793 (1.20)	8953 (1.31)	8989 (1.28)	8404 (1.28)	8540 (1.30)	7534 (1.16)	7071 (1.14)	7814 (1.32)
35+	2503 (0.53)	2778 (0.58)	2797 (0.58)	2614 (0.60)	2681 (0.64)	2680 (0.66)	2711 (0.70)	3644 (0.98)
Sex								
Male	24649 (1.47)	26627 (1.54)	24284 (1.41)	21868 (1.38)	21731 (1.41)	19069 (1.26)	17826 (1.24)	19488 (1.41)
Female	2813 (0.95)	2839 (0.93)	2656 (0.87)	2397 (0.85)	2497 (0.89)	2250 (0.80)	2145 (0.78)	2679 (1.00)
Race								
White	19729 (1.42)	20843 (1.53)	16455 (1.22)	16727 (1.30)	16255 (1.24)	14225 (1.11)	13070 (1.07)	14448 (1.23)
Black	3506 (1.10)	3829 (1.13)	3710 (1.10)	3321 (1.08)	3480 (1.15)	3207 (1.05)	3233 (1.10)	4081 (1.42)
AA/PI	1232 (0.96)	1371 (0.67)	1217 (0.59)	623 (0.42)	642 (0.95)	574 (0.59)	619 (0.66)	763 (0.83)
NA/AN	647 (2.35)	628 (2.00)	537 (1.72)	479 (1.68)	423 (1.75)	316 (1.26)	326 (1.45)	347 (1.67)
Other	1847 (3.56)	2221 (2.70)	2435 (2.80)	2661 (3.15)	2972 (3.01)	2649 (3.95)	2409 (3.68)	2256 (3.64)
Unknown/Missing	501 (0.89)	574 (3.37)	552 (2.93)	454 (2.77)	456 (2.63)	386 (2.20)	314 (1.69)	272 (1.45)
Marital Status								
Married	8335 (0.83)	8787 (0.86)	8310 (0.80)	7351 (0.76)	7141 (0.76)	6522 (0.72)	6267 (0.72)	7462 (0.90)
Prior Marriage	822 (0.79)	782 (0.73)	722 (0.66)	564 (0.56)	557 (0.57)	530 (0.56)	468 (0.53)	565 (0.69)
Separated	111 (4.77)	118 (4.98)	104 (4.93)	119 (6.13)	72 (4.43)	79 (5.73)	57 (4.76)	70 (6.84)
Single	18127 (2.10)	19715 (2.21)	17753 (2.03)	16189 (2.02)	16420 (2.10)	14154 (1.81)	13140 (1.75)	14021 (1.90)
Unknown/Missing	67 (1.28)	64 (1.30)	51 (1.44)	42 (2.18)	38 (1.45)	34 (1.05)	39 (1.24)	49 (1.80)

Note. () = percentage of active duty service members with an initial combined AUD within the demographic group's total N for that given FY; AA/PI = Asian American and Pacific Islander, NA/AN = Native American and Alaska Native, Other = Mixed Race, other race; Prior Marriage = Annulled, Divorced, Widowed.

Table 6.

Military Characteristics of Initial Combined AUD Diagnosis from FY2008 through FY2015

	2008 27,462	2009 29,466	2010 26,940	2011 24,265	2012 24,228	2013 21,319	2014 19,971	2015 22,167
Branch of Service								
US Air Force	2757 (0.64)	2675 (0.62)	2682 (0.61)	2560 (0.64)	2635 (0.67)	2442 (0.62)	2286 (0.60)	2256 (0.61)
US Army	15154 (1.69)	16939 (1.79)	14871 (1.57)	12855 (1.49)	13129 (1.57)	11106 (1.37)	10111 (1.34)	11753 (1.66)
US Marine Corps	4151 (1.68)	4534 (1.76)	4580 (1.80)	4375 (1.80)	4149 (1.75)	3676 (1.58)	3231 (1.46)	2051 (0.96)
US Navy	5400 (1.34)	5318 (1.34)	4807 (1.23)	4475 (1.23)	4315 (1.20)	4095 (1.14)	4343 (1.23)	5207 (1.46)
Rank								
Junior Enlisted	17169 (1.80)	18265 (1.85)	16410 (1.67)	14479 (1.60)	14499 (1.65)	12603 (1.45)	11348 (1.39)	12272 (1.56)
Senior Enlisted	4916 (0.68)	5151 (0.70)	4172 (0.56)	3400 (0.51)	3295 (0.51)	3213 (0.51)	3195 (0.52)	4292 (0.74)
Junior Officer	2274 (1.06)	2494 (1.13)	2412 (1.08)	2349 (1.08)	2218 (1.02)	1817 (0.84)	1917 (0.91)	1925 (0.93)
Senior Officer	3004 (5.19)	3446 (5.73)	3823 (6.21)	3944 (6.82)	4106 (7.24)	3580 (6.53)	3392 (6.39)	3523 (6.88)
Warrant Officer	50 (0.22)	70 (2.82)	74 (0.29)	64 (0.26)	70 (0.28)	80 (0.32)	91 (0.38)	132 (0.56)
Unknown/Missing	49 (74.24)	40 (57.14)	<11	11 (61.11)	14 (60.87)	<11	<11	<11
MOS								
Administration/Support	2999 (0.86)	3130 (0.87)	2846 (0.80)	2351 (0.72)	2467 (0.79)	2154 (0.71)	1969 (0.69)	2413 (0.93)
Aviation	1037 (0.70)	906 (0.60)	803 (0.53)	826 (0.55)	888 (0.59)	917 (0.61)	1039 (0.72)	1062 (0.63)
Communications/Intel	1594 (0.91)	1570 (0.86)	1372 (0.74)	1316 (0.75)	1198 (0.68)	1090 (0.63)	1043 (0.61)	1162 (0.67)
ERM	1384 (0.98)	1228 (0.85)	1188 (0.79)	1021 (0.74)	913 (0.66)	816 (0.60)	753 (0.59)	954 (0.87)
Healthcare	1330 (1.01)	1302 (0.97)	1178 (0.88)	960 (0.77)	998 (0.79)	902 (0.72)	837 (0.68)	974 (0.79)
Motor Transportation	2075 (1.64)	2137 (1.58)	1810 (1.33)	1513 (1.24)	1538 (1.33)	1274 (1.18)	1090 (1.15)	1318 (1.52)
Naval Transport/Ops	328 (1.04)	306 (0.96)	247 (0.80)	188 (0.64)	163 (0.58)	146 (0.54)	175 (0.49)	346 (0.83)
Police/Security	423 (0.74)	523 (0.85)	526 (0.64)	463 (0.60)	419 (0.53)	354 (0.45)	344 (0.48)	415 (0.65)
Supply/Logistics	1242 (1.23)	1233 (1.19)	1069 (1.03)	872 (0.93)	936 (1.03)	733 (0.85)	638 (0.78)	771 (0.98)
Warfighter/Combat	2017 (1.24)	2138 (1.28)	2039 (1.19)	1914 (1.19)	2001 (1.30)	1607 (1.07)	1212 (0.84)	1343 (0.70)
Other	13033 (2.37)	14993 (2.67)	13862 (2.61)	12841 (2.72)	12707 (2.81)	11326 (2.50)	10871 (2.50)	11409 (3.19)

Note. () = percentage of active duty service members with an initial combined AUD within the military group's total N for that given FY; MOS = Military Occupational Specialty, Intel = Intelligence, ERM = Engineering, Repair, Maintenance, Ops = Operations.

Table 7.

Active Duty Service Member Annual Incidence Rates per 1,000: Demographic Characteristics from FY2008 through FY2015

	2008	2009	2010	2011	2012	2013	2014	2015
Age Group								
18-20	14.31	13.97	10.80	8.99	8.51	7.11	6.70	7.06
21-24	24.36	24.90	22.53	22.50	23.33	20.60	20.16	22.07
25-34	11.99	13.14	12.84	12.76	12.95	11.60	11.41	13.22
35+	5.28	5.78	5.83	5.97	6.38	6.62	7.03	9.84
Sex								
Male	14.68	15.40	14.06	13.77	14.06	12.58	12.39	14.09
Female	9.48	9.31	8.71	8.46	8.94	8.04	7.84	9.95
Race								
White	14.17	15.32	12.18	13.01	12.36	11.09	10.73	12.32
Black	10.97	11.27	10.99	10.78	11.54	10.51	11.03	14.23
AA/PI	9.57	6.74	5.91	4.20	9.47	5.88	6.60	8.29
NA/AN	23.53	20.03	17.22	16.83	17.51	12.61	14.52	16.74
Other	35.63	27.01	27.96	31.46	30.12	39.46	36.84	36.42
Marital Status								
Married	8.32	8.55	7.98	7.63	7.58	7.15	7.23	9.00
Prior Marriage	7.94	7.25	6.58	5.57	5.66	5.56	5.26	6.87
Separated	47.66	49.81	49.31	61.31	44.33	57.33	47.62	68.36
Single	21.00	22.11	20.30	20.16	21.04	18.07	17.49	19.01

Note. Active duty service members with unknown/missing observations were removed from this analysis (i.e., approximately 2%); AA/PI = Asian American and Pacific Islander, NA/AN = Native American and Alaska Native, Other = Mixed Race, other race; Prior Marriage = Annulled, Divorced, Widowed.

Table 8.

Active Duty Service Member Annual Incidence Rates per 1,000: Military Characteristics from FY2008 through FY2015

	2008	2009	2010	2011	2012	2013	2014	2015
Branch of Service								
US Air Force	6.42	6.18	6.09	6.43	6.67	6.24	5.96	6.08
US Army	16.91	17.91	15.74	14.86	15.74	13.68	13.40	16.55
US Marine Corps	16.83	17.56	17.97	18.00	17.47	15.76	14.63	9.59
US Navy	13.36	13.39	12.26	12.25	12.04	11.43	12.31	14.56
Rank								
Junior Enlisted	17.99	18.47	16.74	16.02	16.47	14.48	13.93	15.58
Senior Enlisted	6.78	6.96	5.64	5.09	5.11	5.11	5.24	7.35
Junior Officer	10.56	11.28	10.77	10.81	10.21	8.42	9.10	9.34
Senior Officer	51.91	57.27	62.06	68.22	72.38	65.27	63.88	68.81
Warrant Officer	2.15	2.82	2.86	2.57	2.77	3.20	3.78	5.63
MOS								
Admin/Support	8.56	8.72	7.99	7.22	7.86	7.06	6.93	9.32
Aviation	6.96	6.02	5.34	5.53	5.92	6.05	7.23	6.34
Comms/Intel	9.10	8.59	7.37	7.51	6.79	6.25	6.07	6.72
ERM	9.80	8.46	7.94	7.36	6.64	6.04	5.91	8.73
Healthcare	10.13	9.69	8.79	7.67	7.88	7.15	6.79	7.86
Motor Transport	16.39	15.79	13.26	12.35	13.30	11.78	11.45	15.23
Naval T/O	10.39	9.64	7.98	6.43	5.76	5.35	4.87	8.33
Police/Security	7.43	8.51	6.39	5.95	5.32	4.50	4.79	6.47
Supply/Logistics	12.30	11.85	10.33	9.29	10.33	8.47	7.83	9.78
Warfighter	12.41	12.77	11.90	11.88	12.97	10.74	8.44	7.02
Other	23.68	26.66	26.13	27.15	28.06	25.04	25.04	31.90

Note. Active duty service members with unknown/missing observations were removed from this analysis (i.e., approximately 2%); MOS = Military Occupational Specialty, Admin = Administration, Comms/Intel = Communications/Intelligence, ERM = Engineering, Repair, Maintenance, T/O = Transportation/Operations.

Table 9.

Multivariate Logistic Regression of Demographic and Military Characteristics for Initial Combined AUD Diagnosis from FY2008 through FY2015

Demographic Characteristics	OR (95% CI)	*p*-value	Military Characteristics	OR (95% CI)	*p*-value
Age Group			**Branch of Service**		
18-20	0.19 (0.18-0.19)	<0.0001	US Air Force	0.32 (0.31-0.32)	<0.0001
21-24	-	-	US Army	-	-
25-34	1.06 (1.05-1.08)	<0.0001	US Marine Corps	0.90 (0.89-0.92)	<0.0001
35+	0.28 (0.27-0.28)	<0.0001	US Navy	0.63 (0.63-0.64)	<0.0001
Sex			**Rank**		
Male	-	-	Junior Enlisted	1.01 (1.00-1.03)	0.0695
Female	0.61 (0.60-0.62)	<0.0001	Senior Enlisted	-	-
Race			Junior Officer	1.13 (1.10-1.15)	<0.0001
White	-	-	Senior Officer	25.18 (24.61-25.77)	<0.0001
Black	1.01 (0.99-1.02)	0.1658	Warrant Officer	0.71 (0.66-0.77)	<0.0001
AA/PI	0.41 (0.40-0.42)	<0.0001	**MOS**		
NA/AN	1.64 (1.58-1.70)	<0.0001	Admin/Support	0.97 (0.95-1.00)	0.0518
Other	4.21 (4.13-4.28)	<0.0001	Aviation	0.92 (0.89-0.95)	<0.0001
Marital Status			Comms/Intel	0.91 (0.88-0.94)	<0.0001
Married	-	-	ERM	-	-
Prior Marriage	1.02 (0.99-1.06)	0.1299	Healthcare	0.93 (0.90-0.96)	<0.0001
Separated	6.99 (6.39-7.64)	<0.0001	Motor Transport	1.34 (1.30-1.38)	<0.0001
Single	1.76 (1.74-1.78)	<0.0001	Naval T/O	1.04 (0.99-1.10)	0.1269
			Police/Security	0.80 (0.77-0.84)	<0.0001
			Supply/Logistics	1.11 (1.07-1.14)	<0.0001
			Warfighter	1.01 (0.98-1.04)	0.6071
			Other	1.92 (1.87-1.97)	<0.0001

Note. OR's were calculated after controlling for the demographic (i.e., age group, sex, race, marital status) and military (i.e., branch of service, rank, MOS) characteristics of the active duty service member population from FY2008 through FY2015; Active duty service members with unknown/missing observations were removed from this analysis (i.e., approximately 2%); AA/PI = Asian American and Pacific Islander, NA/AN = Native American and Alaska Native, Other = Mixed Race, other race; Prior Marriage = Annulled, Divorced, Widowed; MOS = Military Occupational Specialty, Admin = Administration, Comms/Intel = Communications/Intelligence, ERM = Engineering, Repair, Maintenance, T/O = Transportation/Operations.

Table 10.

Eight-year Period Prevalence Rates and Co-occurring Prevalence Rates of Common Mental Health Disorder Diagnosis in Active Duty Service Members With and Without a History of Combined AUD Diagnosis from FY2008 through FY2015

Common Mental Health Disorder Diagnoses	Prevalence with Combined AUD (N=203,453)	Prevalence Rate per 1,000	Prevalence Co-Occurring with Combined AUD (N=203,453)	Prevalence Rate per 1,000	Prevalence Without Combined AUD (N=3,666,242)	Prevalence Rate per 1,000
Adjustment	85,906	422.24	38,787	190.64	432,188	117.88
Anxiety	62,754	308.44	24,723	121.52	292,189	79.70
Depressive	76,028	373.69	37,752	185.56	289,820	79.05
Insomnia	48,560	238.68	14,675	72.13	286,564	78.16
PTSD	40,724	200.16	18,488	90.87	129,849	35.42
No History	74,967	368.47	123,253	605.81	-	-

Note. Eight-year period prevalence rates of common mental health disorder diagnosis were calculated after separating active duty service members into two groups based on having a history of combined AUD diagnosis over the study period. The two groups were then assessed for rates of common mental health disorder diagnosis over the study period; eight-year period prevalence rates of co-occurring combined AUD and common mental health disorder were calculated after determining which active duty service members with a history of combined AUD had a diagnosis of common mental health disorder 90 days prior to or following any combined AUD diagnosis over the study period.

Table 11.

Likelihood of Receiving a Common Mental Health Disorder Diagnosis in Active Duty Service Members With and Without a History of Combined AUD Diagnosis from FY2008 through FY2015

	Adjustment Disorder		Anxiety Disorders		Depressive Disorders		Insomnia		PTSD	
	OR (95%CI)	*p*-value	OR (95%CI)	*p*-value	OR (95%CI)	*p*-value	OR (95%CI)	*p*-value	OR (95%CI)	*p*-value
Combined AUD*										
Yes	8.48 (8.39-8.58)	<0.0001	8.49 (8.39-8.50)	<0.0001	12.08 (11.93-12.23)	<0.0001	6.99 (6.89-7.08)	<0.0001	14.17 (13.92-14.41)	<0.0001
No	-	-	-	-	-	-	-	-	-	-

Note. *Adjusted for age, marital status, race, sex, and branch of service.

Table 12.

A Comparison of Co-Occurring Common Mental Health Disorder Diagnosis in Active Duty Service Members With and Without Combined AUD Diagnosis from FY2008 through FY2015

Common Mental Health Disorder Diagnoses	Prevalence Co-Occurring with Combined AUD (N=203,453)	Prevalence Rate per 1,000	Prevalence Without Combined AUD (N=3,666,242)	Prevalence Rate per 1,000	Chi Square	*p*-value
Adjustment	38,787	190.64	432,188	117.88	9546.39	<0.0001
Anxiety	24,723	121.52	292,189	79.70	4483.53	<0.0001
Depressive	37,752	185.56	289,820	79.05	28217.18	<0.0001
Insomnia*	14,675	72.13	286,564	78.16	97.74	<0.0001
PTSD	18,488	90.87	129,849	35.42	16079.45	<0.0001
No History	123,253	605.81	-	-	-	-

Note. *Insomnia disorder was the only common mental health disorder that had higher rates of diagnosis in active duty service members without a history of combined AUD over the study period.

Table 13.

Chronology of Diagnosis in Active Duty Service Members with Co-occurring Combined AUD and Common Mental Health Disorder Diagnosis from FY2008 through FY2015

Common Mental Health Disorder Diagnoses	Diagnosed Same Day	Diagnosed Before Combined AUD	Diagnosed After Combined AUD	Total
Adjustment	8859 (22.84)	14879 (38.36)	15049 (38.80)	38,787
Anxiety	10661 (28.24)	12647 (33.50)	14444 (38.26)	37,752
Depressive	5117 (20.70)	8511 (34.43)	11095 (44.88)	24,723
Insomnia	5005 (27.07)	5916 (32.00)	7567 (40.93)	18,488
PTSD	1785 (12.16)	5360 (36.52)	7530 (51.31)	14,675

Note. () = % of the row total; Percentages may not total 100% due to rounding.

Table 14.

Comparison of Chronology of Diagnosis between Co-occurring Combined AUD and Common Mental Health Disorder Diagnosis from FY2008 through FY2015

	Before Combined AUD	Actual %	Test %	After Combined AUD	Actual %	Test %	Chi Square	p-value
Adjustment (*n* = 29,928)	14879	49.72	50	15049	50.28	50	0.9657	0.3258
Depressive (*n* = 27,091)	12647	46.68	50	14444	53.32	50	119.1986	<0.0001
Anxiety (*n* = 19,606)	8511	43.41	50	11095	56.59	50	340.5619	<0.0001
PTSD (*n* = 13,483)	5916	43.88	50	7567	56.12	50	202.1658	<0.0001
Insomnia (*n* = 12,890)	5360	41.58	50	7530	58.42	50	365.3142	<0.0001

Note. Those with same day diagnoses were removed from these analyses.

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