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THESIS

DEPLOYMENT RELATED RISK OF INCIDENT MENTAL HEALTH CONDITIONS AMONG AEROMEDICAL EVACUATION CREWMEMBERS

by

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September 2015

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13. ABSTRACT (maximum 200 words)

Post-deployment mental health (PDMH) diagnoses have increased in the military community since the start of Operation Iraqi Freedom and Operation Enduring Freedom. To date, only one study has focused on the United States Air Force (USAF) medical community. In 2014, the USAF Surgeon General requested additional research on the entire USAF medical community to explore the assumption that continuous exposure to combat wounds increases the medical community's risk of having certain mental health conditions. In support of the 711th Human Performance Wing, this study aims to analyze the PDMH of the Aeromedical Evacuation (AE) community.

This study found that (1) the AE population had a lower diagnosis rate than the non-AE population, (2) lower experience levels did not contribute to an increased diagnosis rate, (3) the diagnosis rate was not dependent on number of deployments completed, (4) the diagnosis rate for both female and male AE crewmembers was essentially the same, (5) of participants with a pre-existing condition, only 10% more sought medical attention for more mental health conditions post-deployment than they did pre-deployment, and (6) participants diagnosed with a PDMH condition had a higher Holmes-Rahe Life Stress score than their undiagnosed counterparts.

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DEPLOYMENT-RELATED RISK OF INCIDENT MENTAL HEALTH CONDITIONS AMONG AEROMEDICAL EVACUATION CREWMEMBERS

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Submitted in partial fulfillment of the
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ABSTRACT

Post-deployment mental health (PDMH) diagnoses have increased in the military community since the start of Operation Iraqi Freedom and Operation Enduring Freedom. To date, only one study has focused on the United States Air Force (USAF) medical community. In 2014, the USAF Surgeon General requested additional research on the entire USAF medical community to explore the assumption that continuous exposure to combat wounds increases the medical community's risk of having certain mental health conditions. In support of the 711th Human Performance Wing, this study aims to analyze the PDMH of the Aeromedical Evacuation (AE) community.

This study found that (1) the AE population had a lower diagnosis rate than the non-AE population, (2) lower experience levels did not contribute to an increased diagnosis rate, (3) the diagnosis rate was not dependent on number of deployments completed, (4) the diagnosis rate for both female and male AE crewmembers was essentially the same, (5) of participants with a pre-existing condition, only 10% more sought medical attention for more mental health conditions post-deployment than they did pre-deployment, and (6) participants diagnosed with a PDMH condition had a higher Holmes-Rahe Life Stress score than their undiagnosed counterparts.

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TABLE OF CONTENTS

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LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS AND ABBREVIATIONS

AE	Aeromedical Evacuation
AET	Aeromedical Evacuation Technician
AFB	Air Force Base
AFSC	Air Force Specialty Code
CCATT	Critical Care Air Transport Team
DSM	Diagnostic and Statistical Manual of Mental Disorders
HPW	Human Performance Wing
HIS	Human System Integration
IRB	Institutional Review Board
OEF	Operation Enduring Freedom
OIF	Operation Iraqi Freedom
MOPP	Mission-Orientated Protective Posture
NCO	Non-commissioned Officer
PCM	Primary Care Manager
PDHA	Post-Deployment Health Assessment
PDMH	Post-Deployment Mental Health
PHA	Physical Health Assessment
PTSD	Post-Traumatic Stress Disorder
USAF	United States Air Force

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EXECUTIVE SUMMARY

The military medical community serves on the front lines of every conflict, tending to the uniquely gruesome injuries that accompany combat. While every branch of service has a medical cadre that provides casualty care to injured service members, the USAF has the unique mission of providing medical care to casualties from all service members who are en route to receive further treatment at better equipped medical facilities. The AE community combines the time-sensitive care of an emergency room and the critical sustainment care of a general medical floor.

Post-deployment related mental health (PDMH) diagnoses have increased in the military community as a whole since the start of Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF). Still, to date, only one study has focused on the United States Air Force (USAF) medical community. In 2014, the USAF Surgeon General requested additional research on the entire USAF medical community to further explore the assumption that continuous exposure to combat wounds increases the medical community's risk of having certain mental health conditions. In support of the 711th Human Performance Wing (HPW), this study aims to analyze the PDMH of the Aeromedical Evacuation (AE) community.

This study tested four hypotheses: (1) AE crewmembers have a higher diagnosis rate of PDMH conditions compared to non-AE nurses and technicians; (2) AE crewmembers with less than one year experience in the career field have a higher diagnosis rate of PDMH conditions compared to more experienced AE crewmembers; (3) AE crewmembers with two or more deployments have a higher diagnosis rate of PDMH conditions compared to AE crewmembers who have completed one deployment; and (4) female AE crewmembers have a higher diagnosis rate of PDMH conditions compared to their male counterparts. There were opportunities to explore two additional questions of interest: (1) AE crewmembers with pre-existing conditions prior to their first deployment have their mental health conditions exacerbated by future deployments; and, (2) AE crewmembers diagnosed with a PDMH condition have a higher Homes-Rahe Life Stress Score compared to their non-diagnosed counterparts.

The study was conducted in two phases. Phase one followed the analytical method used in a previous study conducted by the 711th HPW. Phase two used wider inclusionary criteria and smaller binning for statistical analysis; further, it employed survival analysis of the diagnosed population, analysis of the pre-existing mental health condition population, and analysis of the Holmes-Rahe Life Stress scores of the diagnosed population. Comparison of the percentage of diagnosed population by sub-population, Pearson's chi-square tests, and multiple regression were used collectively to analyze the results.

The AE population had a lower diagnosis rate than the non-AE population; hence, hypothesis one was not supported. Hypothesis two was not supported because lower experience levels did not contribute to an increase in the diagnosis rate for a PDMH condition. The youngest age group, lower ranks, and one completed deployment—the three factors proxy for inexperience in the study—did not have the highest diagnosis rate within each of their respective sub-populations. For AE crewmembers, the diagnosis rate did not depend on the number of completed deployments; therefore, hypothesis three was not supported. Hypothesis four was not supported because the diagnosis rate for both female and male AE crewmembers was essentially the same. Exploratory question one found that only 10% of participants with a pre-existing condition sought medical attention for more mental health conditions post-deployment than they had prior to deployment. Finally, exploratory question number two found that participants diagnosed with a PDMH condition, on average, had a higher Holmes-Rahe Life Stress score than those participants that were not diagnosed.

The study's findings led to three recommendations for policy changes within the AE community: (1) increased frequency of screening for PDMH conditions for the AE technicians, divorced Airmen, and those on active duty; populations identified in the study as having a higher diagnosis rate, (2) creation of an USAF specific measure similar to the Holmes-Rahe Life Stress Scale to identify at risk sub-populations, and (3) required resilience training in the six months leading up to a deployment.

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I. INTRODUCTION

A. PROBLEM STATEMENT

Post-deployment mental health (PDMH) diagnoses have increased for the military community as a whole since the start of Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF). Only one study, however, has specifically focused on the United States Air Force (USAF) medical community. That study focused on the Critical Care Air Transport Team (CCATT) community and found that the CCATT community did not have a higher incidence of deployment-related mental stress compared to its ground-based counterparts (Tvaryanas & Maupin, 2014). Actually, the study found the CCATT community's diagnosis rate was on par with its ground-based counterparts. Utilizing the Post-Deployment Health Assessment (PDHA) DD Form 796 responses for the participants, the CCATT study was able to identify populations at a higher risk of certain PDMH conditions. Within the CCATT community, the study found that nurses and critical care technicians were at a higher risk compared to the physician population. Additionally, professionals who have been exposed to dead bodies or people killed/wounded, exposed to sand/dust or lasers, experienced a vehicular accident in the past, or have had to utilize mission-orientated protective posture (MOPP) gear were at a higher risk of a post-deployment mental health condition (Tvaryanas & Maupin, 2014).

After presented with the CCATT study, the USAF Surgeon General expressed surprise that deployments did not result in increased risk to mental health compared to their ground-based counterparts, despite CCATT crews being continually exposed to gruesome combat wounds. The USAF Surgeon General requested additional research on the USAF medical community as a whole to explore how continuous exposure to horrific combat wounds increases the medical community's risk of certain mental health conditions. This supposition is supported by dozens of studies that found a correlation between exposure to dead or wounded troops and PDMH conditions. In support of the 711th Human Performance Wing (HPW)—the lead agency appointed by the USAF Surgeon General—this thesis aims to analyze the PDMH of a smaller portion of the USAF medical community, specifically the Aeromedical Evacuation (AE) community.

B. PROBLEM IMPORTANCE

The military medical community serves on the front lines of every conflict, tending to the uniquely gruesome injuries that accompany combat. The types of injuries the AE medical professionals may encounter range from benign hernias, to horrific multiple amputations, to mental health patients requiring restraints and sedation. While dozens of studies have measured combat's effect on soldiers' mental health, there are few studies examining the mental health of the medical professionals providing care to wounded soldiers.

While every branch of service has a medical cadre to provide casualty care to its service members injured on the front lines, the USAF has the unique mission of providing medical care to casualties from all service members who are air lifted to better equipped medical facilities for further treatment. This unique community, the AE community, combines the time sensitive care of an emergency room and the critical sustainment care of a general medical floor. Per AFI 11-2AEV3, the mission of the AE Operations "is to provide time-sensitive en route care of regulated casualties to and between medical treatment facilities using organic and/or contracted aircraft with medical aircrew trained explicitly for this mission."(Department of the Air Force, 2014, pg.11) This mission includes providing medical care to military members, their dependents, civilian government employees, civilian contractors, and even local civilians in a humanitarian aid capacity. An AE crew may respond to casualties ranging from the battlefield to a humanitarian crisis to overseas service members needing transport stateside for routine medical care. The AE medical professionals perform their mission all over the globe, to include forward deployed locations. They provide wounded warriors the necessary care during their flight to Walter Reed Military Medical Center, Maryland and San Antonio Military Medical Center, Texas, where they receive specialty life-saving treatment.

AE crews consist of flight nurses, (46F Air Force Specialty Code [AFSC]), and aeromedical evacuation technicians (AET) (4N0X1F AFSC). The flight nurse is the senior medical member on an AE mission. Flight nurses are responsible for coordinating with the pilot on any medical issues that may affect the flight, such as determining proper patient positioning on the aircraft, organizing and providing in-flight patient care, and briefing the gaining medical facilities on patient condition. The AET is a subset of the Aerospace Medical Service (4N0X1 AFSC) career field. AETs are responsible for boarding and deplaning patients and their luggage, preparing patients and medical equipment for flight, and providing in-flight medical care.

These medical professionals are trained to address medical conditions in the stressful environment of air travel, which can extend up to 16 hours. Aside from the military's duty to mitigate and treat the health problems that arise from service members' military service, it is in the USAF's best interest to ensure the AE community, in particular, has its deployment-related mental health risk minimized to keep these highly trained personnel in an operational status. There is no other military capability that can rapidly evacuate casualties to life-saving medical care that could replace the AE mission. Therefore, it is essential to the USAF and to the Department of Defense to keep the AE community resilient so it can execute its vital mission.

C. HUMAN SYSTEMS INTEGRATION

This study addresses the Human Systems Integration (HSI) domains of occupational health, safety, manpower, personnel, and training. Occupational health and safety are the primary foci of this thesis. The findings of this thesis can inform policy makers and establish procedures on post-deployment related healthcare for the at-risk sub-populations identified in the study.

Secondly, the PDMH diagnosis rate may be lowered if the findings of this thesis support changes to AE manpower allocations, personnel requirements, and training programs. To ensure crew members have a higher experience level before their first deployment, the rank and/or skill level requirements may need to be modified. The findings of this thesis could lead to an optimized solution for personnel requirements. And finally, remaining risk factors that may increase the diagnosis rate for a PDMH condition could be addressed through modifications to the training.

Per the request of the USAF Surgeon General, this thesis aims to determine if there are any sub-populations within the AE community that are at a higher risk of

PDMH conditions. A review of the current research on PDMH conditions for health professionals, specifically from OIF, OEF, and Vietnam, indicate that, historically, there are certain sub-populations at a higher risk.

The methods of study chosen to analyze the entire AE population from 2003 to 2013 were sub-population percentage comparison, Pearson's chi-square tests, and multiple regression modeling. Sub-populations within the AE community were compared along with non-AE nurses and technicians. Any significant findings were used to make recommendations on the deployment tempo, deployment related healthcare, manpower allocations, personnel requirements, and/or training programs for the AE community.

D. OBJECTIVE AND RESEARCH QUESTIONS

The objective of this thesis was to gain insight into the PDMH conditions of the USAF's AE crewmembers. Aside from evaluating the AE community's overall health, the numerous subpopulations were analyzed to determine if any specific groups were at a higher risk for PDMH conditions. There were three specific research questions this study aimed to answer.

1. What is the PDMH diagnosis rate for AE crewmembers?
2. Do USAF AE crewmembers have a higher diagnosis rate for PDMH incidents compared to USAF non-AE nurses and technicians?
3. With PDHA DD 2796 data in mind, which subpopulations within the AE community and/or environmental/occupational factors contribute to a higher risk of PDMH conditions?

E. CHAPTER OUTLINE

The remainder of this thesis is organized as follows. Chapter II explores the history and current research of the AE career field and PDMH risks to both military personnel in general, and specifically, medical health professionals. Chapter III discusses the data collection and methodology chosen to analyze the approximately 25,000 medical records of nurses and aerospace medical technicians who served from 2003 to 2013. Chapter IV presents the results of the analysis described in Chapter II. Chapter V discusses the results from Chapter IV. Chapter VI provides a conclusion of the study's findings and recommendations for future research.

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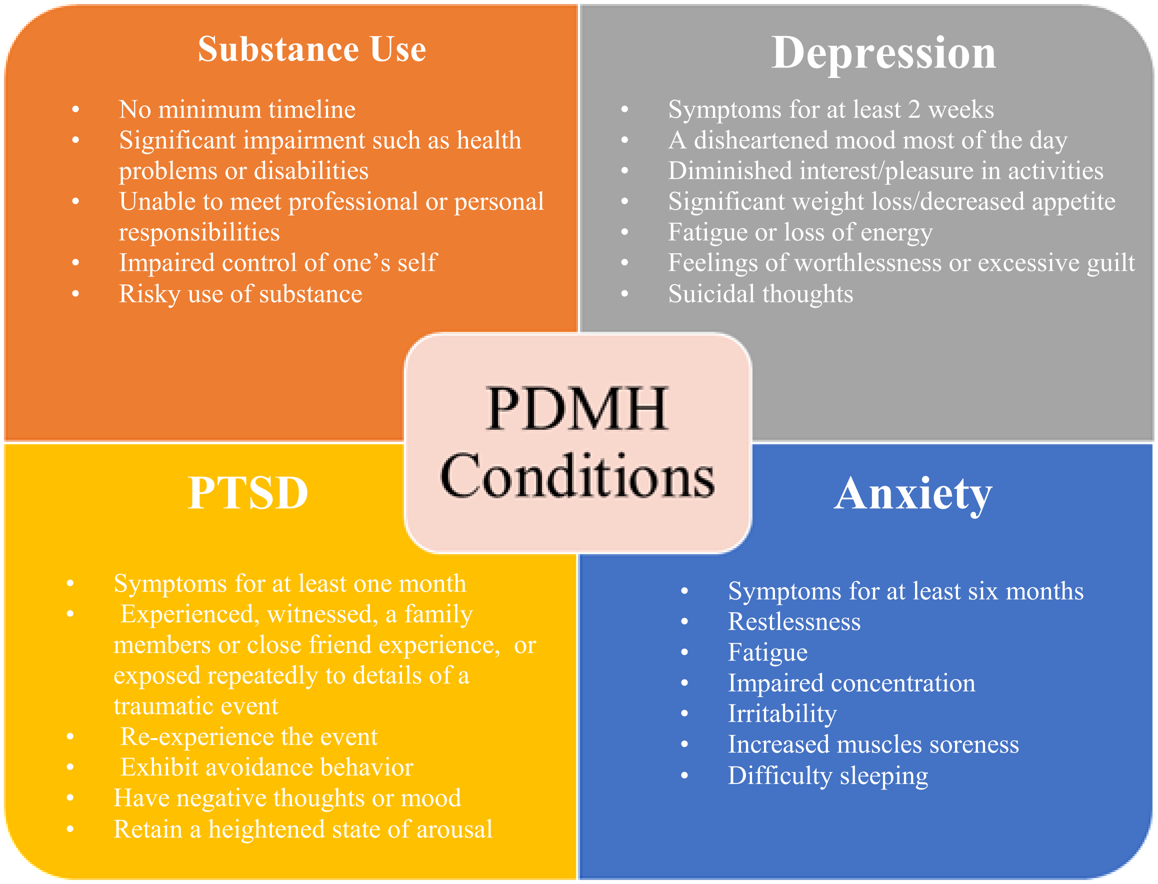
II. LITERATURE REVIEW

> A soldier who is brave one day may well be a psychological basket case the next. [Richard A.] Gabriel states flatly, "There is no statistical difference in the rates of psychiatric breakdown among inexperienced troops and battle-hardened veterans." When all is said and done, all normal men are at risk in war.
>
> —Steve Bentley, "A Short History of PTSD"

A. POST-DEPLOYMENT RELATED MENTAL HEALTH

This thesis focuses on four post-deployment related mental health (PDMH) conditions: substance abuse, depression, anxiety, and post-traumatic stress disorder (PTSD). The comorbidity of PDMH conditions can make it hard to discriminate between PTSD, depression, and anxiety symptoms. Hence, they are commonly diagnosed concurrently. In one study, 88% of men and 79% of women with PTSD also met the criteria for depression (O'Donnell, Creamer, & Pattison, 2004). In another study focused on healthcare professionals returning from Iraq and Afghanistan, all participants who were diagnosed with PTSD also met the criteria for depression (Grieger, Kolkow, Spira, & Morse, 2007). To date, the majority of research and funding has focused on PTSD among military members. Still, in the literature, all four conditions have demonstrated negative psychological effects on military personnel. As a result, this chapter will review each PDMH condition. Figure 1 provides an overview of the common symptoms and diagnosis timeline required for the four PDMH conditions utilized in this study.

Figure 1. Symptoms and Diagnosis Timeline for PDMH Conditions



After American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: Author.

1. Substance Use Disorders

Substance use disorders, for the purposes of this study, involve self-medication to handle negative emotions or thoughts through the use of alcohol or tobacco. While substance use disorders include illegal narcotics, the USAF requires all members to be randomly drug tested. Symptoms of alcohol use disorder include: continuing to drink despite trying to stop, being unable to control the amount of alcohol consumed, alcohol intolerance, and having withdrawal symptoms when not drinking (Diagnostic and Statistical Manual of Mental Disorders [DSM]-V, American Psychological Association, 2013). Symptoms for tobacco use disorder are similar to alcohol use disorder to include: continuing to smoke after trying to quit, being unable to control the number of tobacco products consumed, and exhibiting withdrawal symptoms when not smoking (DSM-V, American Psychological Association, 2013)

2. Depression

Symptoms of depression, as defined by the DSM-V, include: a prolonged disheartened mood, markedly reduced interest or pleasure in most activities, significant weight loss and/or decreased appetite, insomnia or hypersomnia, psychomotor agitation or retardation, fatigue, feelings of unimportance or unwarranted guilt, diminished ability to concentrate, and/or suicidal thoughts (American Psychological Association, 2013). If a person is experiencing five or more of these symptoms for two or more weeks, he or she may be diagnosed with depression.

3. Anxiety

While depression can be diagnosed after two weeks of constant symptoms, anxiety takes significantly longer to diagnose. DSM-V defines anxiety as excessive worry that lasts for at least six months (American Psychological Association, 2013). Excessive worry is defined as worrying when nothing is wrong or threatening or when the amount of worrying is disproportionate to the risk. A person must exhibit at least three of following symptoms to be diagnosed: restlessness, fatigue, impaired concentration, irritability, increased muscles soreness, or difficulty sleeping (American Psychological Association, 2013).

4. PTSD

PTSD is a fairly new term, only making its first appearance in the psychological community in 1980 in DSM-III (American Psychological Association, 1980). Per the DSM-V, it is a trauma and stress-related disorder (American Psychological Association, 2013). DSM-V states a diagnosis requires a person to have experienced a traumatic event, witnessed or learned of a traumatic event that occurred to a close family member or friend, and/or have been exposed repeatedly to details of a traumatic event. A person with PTSD will continue to re-experience an event, exhibit avoidance behavior, have negative thoughts or mood, and/or retain a heightened state of arousal. A person must exhibit at least one of the above symptoms for more than a month to be diagnosed with PTSD (American Psychological Association, 2013).

What is now called PTSD is not a new condition for military personnel. As far back as the Egyptian, Roman, and Greek empires, Soldiers have recounted stories of fellow Soldiers exhibiting physical and psychological symptoms after witnessing gruesome scenes of war. A Swiss military physician in 1678 was the first to identify a condition he called "nostalgia," which was characterized by melancholy, homesickness, insomnia, and anxiety (Bentley, 2005).

Bentley (2005) noted that during the Civil War, military physicians observed that seemingly healthy Soldiers who exhibited no symptoms prior to going on leave would be stricken with a psychological illness once they arrived home. The military physicians were at a loss as to the treatment of these patients. It may seem callous by today's standards, but many patients were put on trains with the name of their hometown pinned to their shirts or left to wander the countryside until they fell victim to exposure. Field commanders pleaded with the War Department to implement a screening process to reduce the number of recruits predisposed to "nostalgia" (Bentley, 2005).

At the time, psychiatric patients were seen as either cowardly or as having ulterior motives. Even the Assistant Surgeon General, in 1864, is quoted as saying, "it is by lack of discipline, confidence, and respect that many a young soldier has become discouraged and made to feel the bitter pangs of homesickness, which is usually the precursor of more serious ailments" (Bentley, 2005).

Bentley (2005) notes that the first national military to conclude there was a direct relationship between some psychological conditions and the stress of war was the Russian Army, in 1905. The Russian Army physicians tried to treat its psychological patients close to the battlefield, in the hope they could return to duty. Only 20% of diagnosed patients were returned to combat (Bentley, 2005).

During World War I, American Soldiers experiencing a psychological collapse were said to have "shell shock." It was believed at the time that the use of the latest large-caliber artillery caused a concussion that unsettled the physiology of the brain. As with the Civil War, it became apparent that the screening process for draftees needed to be more restrictive to exclude those more susceptible to psychological conditions (Bentley, 2005).

Finally, during World War II, with approximately 38% of Soldiers in direct combat diagnosed with a serious psychiatric disorder, it was clear that patients were not just those who were "weak" in character (Bentley, 2005). The U.S. Army estimated half a million Soldiers were discharged due to psychiatric reasons, with another 1.4 million incapacitated for some period of time (Bentley, 2005). The widely differing approaches to diagnosing and treating combat related psychiatric disorders led to the Veteran's Association creating the first diagnostic manual. These actions led the American Psychiatric Association to develop its own manual, the DSM-I, in 1952 ((American Psychological Association, 1952). In the DSM-I, combat related psychiatric disorders were grouped under the diagnosis "gross stress reaction."

Andreasen (2010) notes that with the relatively peaceful period between World War II and Vietnam, the DSM-II omitted "gross stress reaction" (American Psychological Association, 1968). The Vietnam War reignited the attention to combat-related stress disorders. Dozens of studies have been conducted on combat-related psychological stress disorders; of note many have focused on the diagnosis rate of nurses who served during the Vietnam War. With over 6,000 nurse veterans from the Vietnam War, there are still nurses suffering PTSD and depression associated with their service.

DSM-III (American Psychological Association, 1980) was updated in 1980, with the first appearance of the term PTSD (Andreasen, 2010). With the increase in psychological diagnoses post-Vietnam, the need to formally name the condition was identified. DSM-III also incorporated more non-combat related causes of PTSD such as vehicle accident, rape, and childhood abuse (American Psychological Association, 1980). PTSD, which was originally assumed to be rare during peacetime, started to make a more frequent appearance in stress diagnoses for non-combat related cases (Andreasen, 2010).

DSM-IV was published in 1994, once again during a time of peace (American Psychological Association, 2013). The definition was broadened further to include the threat of physical harm to the patient or others. This is a significant change from the previous criteria of experiencing the trauma firsthand (Andreasen, 2010).

The DSM-V was published in 2013, after September 11, 2001, and the start of OIF/OEF. As with World War II and Vietnam, there was a significant rise in the number of Soldiers being diagnosed with PTSD. The repetitive exposure to a traumatic event, for example through the media, was added as a possible source of PTSD symptoms. This raised questions about the scope of the definition of PTSD, since a patient needed to only see traumatic events in the news to meet the criteria. An Institute of Medicine study, at the request of the Department of Veterans Affairs, supported the legitimacy of the diagnosis criteria and increased the need for mental health services for military veterans (Andreasen, 2010). While PTSD is not unique to military members or health professionals, it is imperative to understand the roots of PTSD and the diagnosis criteria to understand the psychological risks military health professionals face in completing their missions.

B. AEROMEDICAL EVACUATION COMMUNITY

> I will be faithful to my training and to the wisdom handed down to me by those who have gone before me.
>
> —Original Flight Nurses Creed

The AE community is comprised of two types of health professionals: the flight nurse and the AET. A flight nurse is a licensed nurse who has graduated with a four-year degree, and is a commissioned officer. A flight nurse also must complete a flight nurse training course and aircrew certification. An AET is an enlisted member who has graduated from an aerospace medical service technical school. An AET is also required to complete an operational medical technician course and aircrew certification.

There was, and continues to be, a significant lack of literature on the history of the AET community and the operational challenges it faces. Conversely, there was a dearth of literature on the flight nurse profession. The author has made a reasonable assumption that, while the career field requirements for a flight nurse and an AET are different, the operational conditions each endures are similar. Hence, many of the same challenges are faced by both career fields.

A historical review of wars and major global conflicts chronicles the progression of the military nursing profession. Even from the conception of the United States, the first "nurses" during the Revolutionary War were the wives and female relations of the Soldiers. As is still seen today, the majority of the nursing field was comprised of female health professionals. World War II heralded a significant change to the field of nursing with the creation of the AE mission for the U.S. Army Air Forces. The need to bring home wounded troops from the war fronts in Europe and the Pacific produced this new military nursing profession to ensure the patients were provided the requisite medical attention on their journeys home.

Many World War II AE nurses faced harsh conditions, both professionally and personally, during the war. It was common for flight nurses to lack the necessary medical supplies and use their ingenuity to repurpose materials to fit their needs. Barger (2013) notes in interviews with flight nurses highlight their role in uplifting the morale of the patients at the expense of their own comfort. Nurses had to deal with long flight hours, lack of crew rest, lack of restroom and sleeping accommodations for females on-board aircrafts and at most frontline bases, and a lack of basic personal hygiene supplies. To cope with these tough living and working conditions, flight nurses relied on their strong sense of faith, sense of patriotism, morale support from co-workers and family back home, and the ability to see the humor in most situations. Many flight nurses admitted to volunteering due to a sense of patriotism and obligation to do their part for the war effort (Barger, 2013).

The Vietnam War has been one of the most psychologically researched conflicts in American history. Carson et al. (2000) states that while not unique to Vietnam, operational stressors faced by Soldiers included the long duty hours, few opportunities for relaxation, the intense heat, poor facilities, the severity of the injuries, and the young age of the patients. The Vietnam era saw a leap in weaponry and tactics, ushering in particularly gruesome injuries from the use of landmines, napalm, and guerilla warfare tactics. Carson et al. (2000) discusses that the decreased time from battlefield to a field hospital due to improved transportation capabilities during the Vietnam War contributed to the increased severity of the wounds nurses encountered in comparison to nurses in any previous wars.

Paul (1985) reports that 58% of Vietnam nurses were between the ages of 20 and 24. The similarity in age to their patients fostered their feelings of survivor's guilt and remorse for not providing care to the most severely injured when triaging patients during mass casualties situations. Also, 60% of nurses had less than six months of active duty experience before deploying to Vietnam. This inexperience exacerbated the previously mentioned negative psychological effects that impacted many of the nurses (Paul, 1985; Carson et al., 2000).

There has been a lack of research conducted on health professionals involved in the Persian Gulf War due to how recently it occurred and its short duration. Conversely, there have been dozens of studies conducted on the mental health of military personnel, in general and, specifically within the healthcare professions, serving in Iraq and Afghanistan. With the length of the OIF/OEF conflict and the unique weaponry employed and tactics military personnel have experienced, specific research conducted on this latest conflict is essential to understanding PDMH conditions currently afflicting military personnel.

C. MENTAL HEALTH CONDITION OF MILITARY PERSONNEL IN OIF/OEF

Current estimates of psychological injury diagnosis for OIF/OEF are equivalent, if not higher, than those of the Vietnam War era (Williamson & Mulhall, 2009). While military physicians always observed their patients, Williamson and Mulhall note that Vietnam was the first conflict with significant scientific research conducted on the psychological effects on veterans. Although the nature of the conflict is different and medical technology has changed in the 50 years since the start of the Vietnam War, there are many lessons that can be applied to the current psychological diagnosis and treatment of OIF/OEF veterans.

Dozens of studies have been conducted on the mental health status of returning Soldiers from OIF and OEF. The majority of studies have been conducted on the military services as a whole with a focus on Army and Marine members, since they constituted the majority of ground forces during OIF and OEF. An estimated six to nine percent of the military members were struggling with a mental health condition prior to deployment (Hoge et al., 2004). The exposure to a combat environment only increased the risk of mental health diagnoses for those already predisposed to mental health conditions (Hoge et al., 2004; Hoge, Auchterlonie, & Milliken, 2006; Thomas et al., 2010). Military health professionals have identified certain risk factors for PDMH conditions from returned Army and Marine Soldiers.

Soldiers returning from Iraq were more likely to be screened for, and diagnosed with, a PDMH condition compared to those deployed to Afghanistan or elsewhere (Hoge et al., 2004; Hoge et al., 2006). This was most likely due to Iraq's combat environment leading Soldiers to feel more imminent danger to their lives and the increased exposure to dead/wounded bodies compared to Afghanistan (Hoge et al., 2004).

Other studies also found a significant difference in the diagnosis rate of PDMH conditions between active duty members compared to Guard and Reserve members (Milliken, Auchterloinie, & Hoge, 2007). Guard members were almost twice as likely as active duty members (11% compared to 6%) to meet the most stringent qualifications of functional impairment associated with PTSD (Thomas et al., 2010). In another study, 18.4% of active duty members were screened for a possible PDMH condition upon return from a deployment, compared to the Guard and Reserve members at 21.0% and 20.8%, respectively (Office of the Surgeon General United States Army Medical Command, 2008). When Soldiers were reevaluated 12 months post-deployment, it was found that there was a larger increase in PTSD diagnoses for Guard members than active duty members (Thomas et al., 2010). Thomas et al. (2010) postulates that the higher Guard percentage may be due to a lack of follow-up health care. Other reasons for the higher percentage may be due to Guard members returning to their civilian profession after only receiving six months of post-deployment healthcare and the lack of morale support and unit cohesion found in the active duty military environment (Thomas et al., 2010).

Studies focused on the timing of PDMH assessments have indicated that tests administered immediately upon return from a deployment should not be the only time members are screened for mental health conditions. Thomas et al. (2010) found a one to six percent increase in the number of PTSD and/or depression diagnoses 12 months post-deployment compared to three months post deployment. The study also found that the number of PTSD diagnoses increased while the number of depression diagnoses remained steady from the third to twelfth month post-deployment for active duty members. This supports other studies that have stated that 12 months may not be a long enough recuperation time between deployments for patients with a mental health diagnosis (Thomas et al., 2010; Milliken et al., 2007; Office of the Surgeon General United States Army Medical Command, 2008).

In a study comparing Soldiers in 2006 to 2007, the Office of the Surgeon General United States Army Medical Command (2008) found that those on their third or fourth deployment were at the highest risk of PDMH conditions. Soldiers returning from their second deployment had the lowest rate of incident mental health diagnoses. It was theorized that the members on their second deployment were over the initial fear of their first deployment and not yet burnt out from subsequent deployments (Office of the Surgeon General United States Army Medical Command, 2008). While it was found that additional deployments would increase a service member's risk of mental health diagnosis, it was hard to attribute the diagnosis to any specific deployment since PDMH conditions can manifest themselves years after a deployment. Even though a member completed numerous deployments prior to being diagnosed, it is impossible to determine if the mental health condition is related to the first deployment or the culmination of numerous deployments.

Another sub-population at a higher risk of PDMH conditions are females. Four studies found that females, among the general military population and healthcare providers, were more likely to be diagnosed for a possible mental health condition than their male counterparts (Hoge et al., 2006; Ben-Ezra, Palgi, Wolf, & Shrira, 2011; Gibbons, Hickling, & Watts, 2011; Gibbons, Hickling, Barnett, Herbig-Wall & Watts, 2012).

Much research has been conducted on the relationship between combat experience and the diagnosis of PDMH conditions. Research has demonstrated that stress makes physical changes within the brain. But a person's life experience, particularly in early life, can support healthy brain development to better cope with the changes created by stress (McEwen, Grey, & Nasca, 2015).

The ability for a person to rebound from a stressful event, to include a deployment, is commonly referred to as "resilience". Or, more formally, when resilient individuals experience a disruption to their emotional or physical well-being, their reaction is brief and usually doesn't disrupt their ability to function normally (Bonanno, Galea, Bucciarelli, & Vlahov, 2007). The Army has recognized that it is imperative to support and foster Soldiers' resilience to maintain a healthy and operational fighting force. In 2011, the Army launched the Comprehensive Soldier Fitness (CSF) program. In a special issue of *American Psychologist*, Gen. George Casey, U.S. Army Chief of Staff, highlighted the need for the Army to change its approach from "treatment-centric" to one that focuses on the prevention of PDMH conditions and the improvement of psychological strength of all Soldiers. The Army requires Soldiers to participate in the CSF Program, but it also includes support programs for dependents. The CSF Program is tailored to each Soldier's needs. Because of this, there are several goals of the CSF program, to include reducing the risk of negative mental health conditions, increasing Soldiers' and dependents' psychological strength for everyday life, and decreasing the stigma associated with a diagnosis of a mental health condition.

The Holmes-Rehe Stress Scale is commonly used to assess a person's stress level. Scores are provided for a wide range of stressful life events, ranging from the experiencing death of a spouse to adopting new responsibilities at work to taking a vacation. This underscores the idea that that everyday life events can cause a significant amount of stress that may eventually lead to a diagnosis of a negative mental health condition. A deployment is a traumatic event in and of itself. Matthews (2014) highlights that a deployment that doesn't include direct combat is still considered a traumatic event since a Soldier is in an unfamiliar and stressful environment away from family and friends. Bonanno et al. (2007) has reported that there is a cumulative effect of stress on a person. Research has also shown a link between increased risk of PTSD with increased life stress prior to or immediately following a traumatic event (Bonanno et al., 2007) So, it is imperative to take into account the possible stress a Soldier is facing every day, not just on a deployment.

A confounding factor in trying to predict how life stress or a traumatic event will affect a Soldier is that everyone's reaction to stress is unique. For example, two individuals of the same age, gender, marital status, occupation, and socio-economic class experience the same traumatic event. One person may have difficulty dealing with the after effects of the event and be diagnosed with a negative mental health condition; conversely, the other person may be only briefly affected. A study conducted by Bonanno et al. (2007) on New York City residents who were directly impacted by the events of September 11, 2001, found that a person's resilience was affected by both personal traits and sociocontextual variables. A person's personality and disposition played a significant role in predicting a person's resiliency, as did the interaction with their family and community (Bonanno et al., 2007).

Matthews (2014) highlights that a brief period of depression, anxiety, sleep disruption, etc., after a traumatic event is a healthy and normal reaction. In a study he conducted with West Point cadets, the majority of participants reported they felt they would be diagnosed with a PDMH condition after a future deployment. Soldiers need to be educated that having a healthy reaction to a traumatic event doesn't necessarily lead to a PDMH condition.

Health professionals have experienced many of the same risk factors of threat of life, exposure to wounded or dead bodies, and have completed multiple deployments (Gibbons et al., 2011; Jones et al., 2008; Milliken et al., 2007; Shen, Arkes & Pilgrim, 2009). But it is also imperative to highlight the research conducted specifically on health professionals since they have unique risk factors other combatants may never experience.

D. PDMH CONDITION DIAGNOSIS OF HEALTH CARE PROFESSIONALS

Soldiers who were in direct combat were two to three times more likely to be diagnosed than Soldiers not in combat (Thomas et al., 2010). This may also be the case with medical personnel. A psychophysiological assessment of Vietnam veteran nurses as they recalled their most fearful experiences during the war found that many still suffered from PTSD decades after their deployment experience (Carson et al., 2000). Moreover, other studies show that medical professionals exposed to a life-threatening situation or in direct combat had a higher mental health diagnosis rate compared to those not exposed (Ben-Ezra, Palgi, Wolf, & Shrira, 2011; Grieger et al., 2007; Tvaryanas & Maupin, 2014).

The author interviewed a cadre member of the Flight Nurse Formal Training Course, which provided insights that revealed that AE crewmembers were exposed to life threatening situations, particularly in the early stages of OIF/OEF. Like all aircrew at a deployed location, AE crewmembers wore an M9 pistol for emergency situations. Emergency unscheduled flights were conducted at the needs of the patient, night or day, at secured or unsecured locations. AE flights required to land at unsecure locations necessitated security force escorts to secure the area while patients were loaded. In these situations, the aircraft engines remained running, making it impossible to gain a sufficient transfer of patient information while loading the patient. Finally, if the flight was at night the AE crewmembers completely relied on the flight crew, which had night vision goggles, to escort them to patients and assist with loading.

While exposure to direct combat may add to a service member's risk of a mental health condition, three studies have found that medical professionals were more likely to claim that the care of their patients still haunted them, specifically, the type of wounds, youth of the patients, and the volume of casualties treated (Carson et al., 2000; Jones et al., 2008; Gibbons et al., 2012). Svan (2013) estimated that AE professionals have increased the survival rate of combat injuries up to 98%, evacuating at least 150,000 patients since the start of OIF/OEF. Although AE technology and personnel have increased Soldier survivability, it has also increased the exposure of medical professionals to gruesome wounds (Svan, 2013).

In the interview, the AE cadre member relayed that a lack of information, a lack of supplies, and a lack of experience all contributed to additional stress felt by AE crewmembers. It was common practice for crews to arrive at their pick-up location with initial situation reports that were incomplete or inaccurate. Hence, the AE crew had to be mentally flexible at all times. It was not unusual for there to be more patients at the pick-up location than originally reported. AE crewmembers would need to quickly reconfigure the aircraft to accommodate all the patients. Also, AE crew members had to be innovative to ensure there was enough medical support equipment or medication to support all the new patients. The unknown patient requirements added to the stress level of the AE crewmembers.

Another aspect of AE transport that the AE cadre member highlighted was the increased stress levels due to the lack of documented condition histories of some patients. This was most common with NATO forces, whose primary language was not English. Some nationalities, even after being provided USAF medical forms, continued to provide patient records in their native languages. Essentially, AE crewmembers were given patients without any documented medical history, so they had to make educated guesses about patients' precise ailments and ensure they didn't overmedicate their patients.

In line with the lack of medical history at hand-off is the humanitarian medical aid mission. During humanitarian disasters, AE crews are deployed to provide additional medical care to affected civilians. Humanitarian aid missions are acutely stressful compared to more routine combat medical missions. During humanitarian deployments, strained ground medical personnel provide a cursory diagnosis and approval for AE transport. Since no patient history is provided, the flight nurses and AETs need to be extra vigilant of a patient's condition during flight in the case of an unknown pre-existing condition. For example, a patient may have an unknown pre-existing cardiac condition that doesn't present itself till midflight. The extra vigilance required during humanitarian flights can be tiring and add extra stress.

Another unique aspect of the humanitarian medical aid mission is the age range of the patients. AE crewmembers typically treat military members between the ages of 18 and 50 years, but patients during a humanitarian mission can range from a one-month old to a geriatric patient. Flight nurses and AET may not have experience treating pediatric or geriatric patients, which adds to their stress levels. This is mitigated, when possible, by assigning flight nurses and AETs with pediatric and geriatric experience to AE crews providing humanitarian aid. Despite experience, the wide range of patients and their injury types are unique from the typical AE mission, causing additional stress and risk for a PDMH condition.

In a study on mental health risk differences between males and females in the military healthcare profession, Gibbons et al. (2012) found that younger members were at an increased risk for PDMH conditions. This was supported by a study conducted by the Surgeon General Army Medical Command (2008) that found members who were in the ranks of E1 through E4, the four lowest enlisted rankings, were in the highest diagnosed group of returning Soldiers. Also, in review of numerous studies on Vietnam Nurse Veterans, Carson et al. (2000) found that age and the number of years of military service prior to deployment were significant predictive factors for PDMH conditions. This was supported by Gibbons et al. (2011) who found that rank and time in service prior to deployment were factors for PTSD diagnoses in military healthcare professionals.

The previous section highlighted that the number of deployments was a risk factor for PDMH conditions. Four of the AE squadrons are fully manned by active duty personnel, two stateside and two overseas. One of the overseas squadrons is at Kadena AFB Okinawa, Japan, and the other is at Ramstein AFB, Germany. The two overseas squadrons deploy at a one to four dwell rate, which is the overall USAF dwell rate goal. A one to four dwell rate is when a member deploys for six months and will then have at least eighteen months at home station before deploying again. Conversely, since both of the stateside squadrons are larger than the overseas squadrons, they are currently undermanned at approximately 70%. Hence their dwell rate is at a one to one, meaning six months deployed followed by six months at home before deploying again. This increased dwell rate means that personnel assigned to a stateside squadron may have deployed up to four times in one tour.

One mental condition that is unique to career fields that provide care to patients is compassion fatigue. Compassion fatigue may be misdiagnosed as PTSD or depression, since compassion fatigue is the withdrawal of a care provider after repeated exposure to the trauma relayed to them through their patients (Tyson, 2007). The risk for compassion fatigue may be exacerbated by healthcare professionals treating patients with combat-related injuries since these wounds are usually more gruesome compared to the wounds encountered at home station (Tyson, 2007).

A study conducted to determine the difference in PTSD diagnosis between emergency room nurses, intensive care unit nurses, and general floor nurses found that emergency room and general floor nurses were both at a higher risk of PTSD, depression, and anxiety (Kerasiotis & Motta, 2004). While it may not be surprising that emergency room nurses are at a higher risk, general floor nurses were hypothesized to have the least risk. The study found that the general floor nurses were at a higher risk because of the close relationship the nurses developed with their patients. This has implications in the AE community since these medical personnel fulfill roles similar to both an emergency room and general floor nurse. Flight nurses and AET have to operate as an emergency room nurses if a patient's condition deteriorates en route. They are also tasked with keeping patients comfortable as they are transported from a deployed location to more established medical facilities stateside. This can take numerous days depending on the start and end locations. This allows time for AE crewmembers to get to know their patients while creating a relationship similar to that maintained by a general floor nurse.

Research specifically conducted on the job satisfaction of civilian flight nurses found that they did not have any increased risk of depression or occupational stress (Whitley, Benson, Allison, & Revicki, 1990). The study found that flight nurses who responded that their job was highly stressful had a higher risk of depression compared to those who did not find their job stressful (Whitley, Benson, Allison, & Revicki, 1990). The study's primary finding that flight nurses were not at a higher risk of depression or occupational stress countered other results that nursing was consistently in the top 40 most stressful occupations in the United States (Bourbonnais, Comeau, Vezina, & Dion, 1998; Whitley, Benson, Allison, & Revicki, 1990).

A factor that was absent from the literature was the effect of jet lag on a healthcare professional's risk of being diagnosed with a mental health condition. Katz, Knobler, Laibel, Stauss, & Durst (2002) found a positive correlation between a relapse of an existing psychotic or affective disorder with jet lag. Vendatramanujam et al. (2010) found an increased risk of depression (westbound) and mania (eastbound) in patients who crossed seven or more time zones. While these studies were not conducted on military members or healthcare professionals, it does suggest a possible factor that may contribute to an increased risk in diagnosis of a PDMH conditions for the AE community, particularly those crews who continually fly from an overseas location to Andrews AFB, Maryland or Lackland AFB, Texas, the two largest military medical facilities in the United States.

AE crewmembers are considered aircrew, so they are provided the same duration of crew rest given to the aviators (Department of the Air Force, 2014). The typical deployment schedule for OIF/OEF consisted of one day of scheduled flights and the rest of week being on stand-by. While crew rest is established per regulations, an emergency flight may arise at any time. AE crewmembers are expected to perform their mission despite being fatigued.

A crucial factor to consider with this study is the stigma related to receiving a mental health diagnosis. While the Office of the Surgeon General, United States Army Medical Command (2008) found a decrease in the negative connotation associated with a mental health diagnosis in 2007 compared to 2006, studies have shown that Soldiers who were identified as having a PDMH condition were twice as likely to feel stigmatized than those who were not identified (Hoge et al., 2004). Hoge et al. (2004) also found that only 38–45% of those members identified on their post-deployment health assessment screening with a possible PDMH condition actually sought medical attention.

Even more disturbing, Williamson and Mulhall (2009) suggested that many discharges due to a “personality disorder” or for misconduct may actually have been untreated cases of PTSD. It was found that service members felt pressured by their commanders and peers to take the administrative discharge instead of fighting for a medical discharge (Williamson & Mulhall, 2009). Many service members may have chosen to not pursue a PDMH diagnosis due to the career implications. The National

Alliance on Mental Illness estimates that up to 33% of qualified individuals are turned down for a job due to a psychiatric label (Williamson & Mulhall, 2009).

With the sensitivities surrounding mental healthcare in general, there is the added complication of flight status for AE crewmembers. Flight status holds a more stringent medical requirement than normal military duty. Certain diagnoses and the use of certain medications can ground an aircrew member. This may skew the study results slightly, but at-risk sub-populations can still be identified for further policy and program adjustments.

While the presence of mental health conditions during times of war have been documented for thousands of years, the sustained nature of OIF/OEF has presented its own concerns about the mental health of combatants. Significant progress has been made since the Vietnam War to research, identify, and treat PDMH conditions such as PTSD. PDMH conditions are not unique to the medical community, but these professionals' increased exposure to dead and wounded soldiers and civilians is distinguishing from the general military population. Identifying the sub-populations at a greater risk of being diagnosed with a PDMH condition, ensuring they are being identified, and receiving adequate assistance should remain the focus of military leadership.

E. ALTERNATIVE HYPOTHESES

1. The AE crewmembers will have a higher diagnosis rate of PDMH conditions compared to the non-AE nurses and technicians.
2. AE crewmembers with less than one year experience in the career field will have a higher diagnosis rate of PDMH conditions compared to more experienced AE crewmembers.
3. AE crewmembers with two or more deployments will have a higher diagnosis rate of PDMH conditions compared to AE crewmembers who have completed one deployment.
4. Female AE crewmembers will have a higher diagnosis rate of PDMH conditions compared to their male counterparts.

III. METHOD

This thesis relied on the analysis of pre-collected medical and personnel data to address the hypotheses posted in the previous chapter. In preparing for the analysis the author travelled to Wright-Patterson Air Force Base, Dayton, Ohio to learn more about the data. The author interviewed three personnel who managed the data and also spoke with an AE crewmember. A complete list of the interview questions can be found in Appendix A.

A. INSTITUTIONAL REVIEW AND DATA COLLECTION

The data were collected and de-identified by the 711th HPW. The 711th HPW was the organization that conducted the foundational study on the CCATT community and the organization the Surgeon General appointed to conduct a broader study for the entire USAF medical community. The 711th HPW Institutional Review Board (IRB) human-use protocol was extended to include this study.

This study was approved by the Naval Postgraduate School IRB under a human-use protocol. The protocol did not require informed consent of participants since the study used existing personnel and medical data that were collected for archival purposes.

Although the data were provided by the 711th HPW electronically, the author still traveled to Wright-Patterson AFB, Ohio for interviews with the researchers of the original CCATT study, the epidemiologist who provided the data, and an AE flight nurse currently teaching at the formal training course. The primary purpose of meeting with the authors of the original CCATT study was to clarify the inclusion/exclusion criteria. This was to ensure that phase one of this thesis replicated the original CCATT study as much as possible. The criteria used included the number of deployments, number of diagnoses pre- and post-deployment, dates of deployment compared to date of diagnosis, and the demographics used for regression analysis. Secondly, interviewing the epidemiologist, who was also a member of the CCATT study research team, clarified the data field variables since a variable key did not exist. Finally, meeting with the flight nurse cadre member provided insights that guided the literature review and data analysis. A complete list of interview questions can be found in Appendix A. The questions were focused on the operational conditions, deployment dwell rate changes over the study timeframe, training constraints, and patient information.

B. PARTICIPANTS

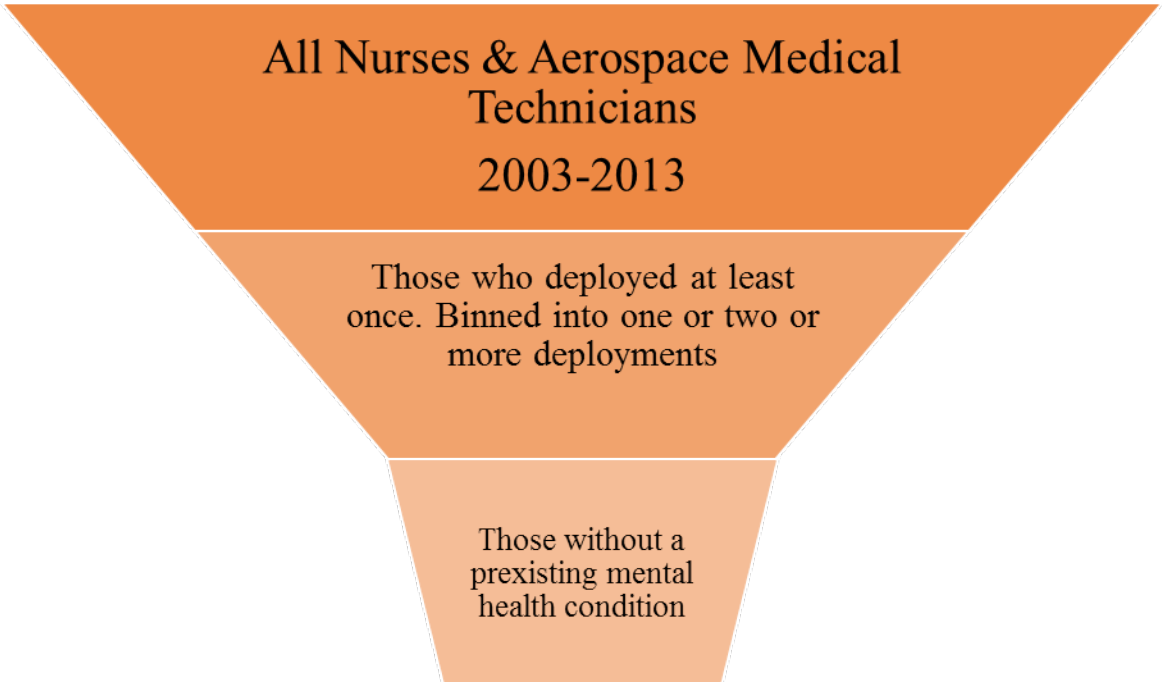
The only participants recruited for this study were the CCATT research members and the AE flight nurse for the interview. For the remainder of the study, pre-collected data from all nurses (46X AFSC) and aerospace medical technicians (4N0X1X AFSC) who deployed between 2003 and 2013 were used, for a total of 23,954 personnel. The data fields analyzed included AFSC, gender, age, marital status, number of dependents, rank, start and end dates of deployment, deployment location, and medical diagnosis data. The medical data included all diagnoses made at both on- and off-base medical facilities.

The data were provided in yearly files so filtering and merging were required before the data were suitable for statistical analysis. The primary variable for merging was the random numerical subject ID that replaced the participants' social security number in the de-identifying process. After compiling the yearly files, several filters were employed to screen the different sub-populations of interest.

Two different sets of filtering requirements, referred to as phase one and phase two for the rest of this document, were utilized in this study. The phase one filtering requirements were those used by the 711th HPW during the original CCATT study to analyze any similarities between the CCATT and AE populations. The phase two filtering requirements were those established by the author and her advisors. The phase two filtering requirements were more detailed and inclusive than the first set to determine the diagnosis rate for the study sub-populations.

Participants met two criteria for inclusion in phase one. First, they deployed at least once between 2003 and 2013. Second, they did not have any pre-existing mental health conditions identified prior to deploying. A deployment may have exacerbated a pre-existing condition or led to the diagnosis of another condition confounding the results. Hence, pre-existing conditions were not included in the dataset. See Figure 2 for a graphic depiction of the phase one filtering requirements.

Figure 2. Phase One Filtering Requirements



The final dataset for phase one included 23,954 nurses and aerospace medical technicians. 11,225 of these individuals deployed at least once from 2003 to 2013. Of those that deployed, 1,945 were AE crewmembers and 9,280 were non-AE nurses and technicians. 160 AE crewmembers met the study's inclusion criteria for being diagnosed with a PDMH condition. Of the participants, 3,856 were nurses and 7,369 were technicians. 1,153 non-AE nurses and technicians met the study's inclusion criteria for being diagnosed with a PDMH condition. The majority, 7,419, of the participants were on active duty. 1,997 participants were in the Air National Guard and 1,809 were in the Reserves. There was almost a balanced split of female and male participants with 5,650 females and 5,575 males.

The phase two filtering requirements were more detailed and inclusive than the phase one requirements previously discussed. The first filter still pertained to number of deployments completed by the participants. The participants must have completed at least one deployment to be included in the study. What distinguished phase two from the first was the binning of the participants. Participants were binned into one deployment, two deployments, three deployments, four deployments, or five or more deployments. This level of detail was warranted from the finding of the Army Surgeon General (2008) that found that the risk of PDMH conditions increased with more deployments, particularly the third and fourth deployment.

The second filter was also on pre-existing mental health conditions just as with the phase one filtering requirements. Participants who had a pre-existing mental health condition prior to their first AE deployment were excluded in primary dataset, but included for additional analysis. Analyzing those with a pre-existing condition helped determine if this sub-population was at higher risk for developing other PDMH condition.

The third difference was the inclusion of participants who were diagnosed with a PDMH condition while deployed. This increased the participant population to include those who sought medical attention for a PDMH condition while deployed. There is no time requirement for a person to seek medical attention after experiencing a traumatic event; hence, these types of participants were included in the second phase of this thesis. Figure 3 graphically depicts the phase two filtering requirements.

Figure 3. Phase Two Filtering Requirements

The final dataset for phase two included 11,950 participants who deployed at least once from 2003 to 2013. Of those that deployed, 1,986 were AE crewmembers and 9,964 were non-AE nurses and technicians. One-hundred and eighty nine AE crewmembers and 1,823 non-AE nurses and technicians met the study's inclusion criteria for being diagnosed with a PDMH condition. Of the participants, 4,029 were nurses and 7,921 were technicians. As with phase one, the majority, 8,093, of the participants were on active duty. 2,022 participants were in the Air National Guard and 1,835 were in the Reserves. There again was almost a balanced split of female and male participants with 6,112 females and 5,838 males.

C. ANALYSIS

Data from both sets of remaining participants were analyzed to calculate an overall diagnosis rate of PDMH conditions. A participant must have had at least two different PDMH conditions in his or her record to be included in the present study. This is usually an easy requirement to meet since most patients are diagnosed with an "adjustment disorder" by their primary care manager (PCM) before being referred to a psychologist. Since psychologists typically are better trained in mental health diagnoses than PCMs, the psychologist either disconfirm or diagnose a mental health diagnosis, which then becomes the second diagnosis in the patient's record. The two diagnoses requirement excluded individuals who sought mental health assistance for a singular life event, such as readjusting to home life after a deployment, marital trouble, or a death in the family. The requirement for two diagnoses is in line with research that indicates that there is a comorbidity relationship between PTSD, depression, and anxiety (O'Donnell et al., 2004 and Grieger et al., 2007). The AE community diagnosis rate was compared to the diagnosis rate of its ground-based counterparts.

To closely replicate the CCATT study in phase one, the first mental health diagnosis did not count until after an individual's first deployment was completed. Both mental health diagnoses needed to occur upon a patient's return to home station. When analyzing the phase two filtered results, the author included those participants diagnosed with a mental health condition while deployed. There is no minimum time requirement or maximum time constraint for a person to be affected by a traumatic event; hence, those participants diagnosed with a mental health condition while on a deployment were included in the participant pool.

Finally, multiple regression and Pearson chi-square analysis were used on both datasets to determine which sub-populations were at a higher risk of PDMH conditions. The sub-populations include gender, rank, marital status, number of dependents, career field, age, number of deployments, deployment location, and deployment length.

Data filtering and merging were performed with SAS version 8.3 (SAS Institute, Inc., Cary, North Carolina). Filtered and merged datasets were imported into JMP version 10 (SAS Institute, Inc., Cary, North Carolina) and Microsoft Excel (2010) for statistical analysis. Since the entire nurse (46X AFSC) and aerospace medical technician (4N0X1X AFSC) populations from 2003–2013 were included, inferential statistics were not used. An alpha of less than 0.05 was used for p-value significance (De Veaux, Velleman & Bock, 2008). The colinearity between variables helped identify additional at-risk sub-populations. Outliers were explored for further research.

D. LIMITATIONS AND ASSUMPTIONS

There were several assumptions in, and limitations to, the study. First, it was assumed that all participants had correct and/or updated AFSCs, since many personnel transfer into flight nurse and AET career fields. There was no way to verify if the data were accurate since the data were de-identified.

An unavoidable issue existed in the study because some AE crewmembers were considered “deployed” from their home station simply by walking across the flight line to another aircraft and/or aircrew. If an AE crewmember was married and/or had children, he or she would hold a deployed status while still having family obligations. It was impossible to discern who was deployed from their home station, in particular those participants stationed at Ramstein AFB, Germany, from those who were deployed away home; hence, being deployed from home station was not a variable considered in the study.

The results of the AE crewmembers were compared to non-AE nurses and technicians. Non-AE included all types of ground-based nurses and other sub-specialties within the aerospace medical technician career field. A limitation of the data was that many in the AE community performed tours of duty as AE crewmembers and then returned to a ground-based career field. This possibly affected the diagnosis rate since it was unknown if the PDMH condition was attributable to their tour as an AE crewmember or to their current occupational duties as a ground-based medical professional.

Another limitation to the study was the lack of personal history in a patient's medical record. Service members with a PDMH diagnosis were included in this thesis, but there was nothing in a participant's medical records to indicate the events that led to the diagnosis. For example, a case of rape or a vehicle crash (both traumatic events that could cause PTSD, depression, anxiety, or substance abuse) were not indicated in the medical records. It was assumed that this population was small compared to the larger population diagnosed due to combat experiences, so the smaller population was not isolated from the data.

The next chapter will discuss the results of this study. As described above, the results will be presented in two phases. Phase one will present and compare any significant findings to those found in the CCATT study. The second phase will present any significant findings using the more encompassing inclusion criteria and detailed variable binning.

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IV. RESULTS

Following the methodology outlined in Chapter III, the analysis of the rate at which AE crewmembers were diagnosed with PDMH conditions was conducted in two phases. While the population data from 2003 to 2013 was analyzed for this thesis, inferential statistics were still used to allow predictions to be made about the future diagnosis rate of AE crewmembers per the consultation of a statistician at the Naval Postgraduate School. Phase one employed the same inclusion criteria as the original CCATT study. Phase two employed a more inclusive set of criteria. The results for phase one will be presented in the following order: (1) comparison of demographic characteristics between the AE and non AE populations, (2) testing of the four hypotheses, (3) all other relevant results based on demographic characteristic. The type of PDMH diagnoses, the time from deployment to diagnosis, and a multiple regression model to determine the strongest predictors of PDMH diagnosis will also be presented regarding the phase one findings.

In phase two, the same set of analyses were conducted as in phase one; results that were different from phase one will be presented. Phase two also provided the opportunity to explore two questions: (1) was there an effect of having a pre-existing condition on the diagnosis rate of a PDMH condition post-deployment and (2) did life stressors had an effect on the PDMH diagnosis rate of AE crewmembers. For these exploratory questions only descriptive statistics were utilized.

With consultation from a statistician at Naval Postgraduate School, in both phase one and two, Pearson's chi-square test was the primary statistical method for hypothesis testing and analyzing other relevant variables (De Veaux, Velleman, & Bock., 2008). Pearson's chi-square test was used to analyze the difference between the variables in the overall AE and non-AE populations. Pearson's chi-square test was also used to determine if there was a significant difference within the sub-populations of each variable. Multiple regression was used to determine which of the explanatory variables were significant to create a predictive model (De Veaux et al., 2008).

Whenever the chi-square value was significant the standardized residuals of the diagnosed and not diagnosed populations for both the AE and non-AE communities for each factor were examined to determine which sub-populations were causing the variable to be significant. Standardized residuals are the difference between the observed value and the predicted value divided by the square root of the predicted value (De Veaux et al., 2008). The standardized residual can highlight which factors within the specific sub-population were causing the Pearson chi-square test to be significant. It can also inform if the actual diagnosed population was below or above the expected value, which is, respectively, a negative or positive value (De Veaux et al., 2008). Standardized residuals can be interpreted in the same way as z test statistics: standardized residuals more extreme than ±1.96 can be considered to indicate a significant difference between expected and actual values; the larger the standardized residual value, the more extreme the difference (De Veaux et al., 2008).

This study focused on four hypotheses that are similar to those used in the CCATT study. *Hypothesis one* is that AE crewmembers will have a higher diagnosis rate of PDMH conditions compared to the non-AE nurses and technicians. *Hypothesis two* is that AE crewmembers with less than one year experience in the career field will have a higher diagnosis rate of PDMH conditions compared to more experienced AE crewmembers. *Hypothesis three* states that AE crewmembers with two or more deployments will have a higher diagnosis rate of PDMH conditions compared to AE crewmembers who have completed one deployment. Finally, *hypothesis four* is that female AE crewmembers will have a higher diagnosis rate of PDMH conditions compared to their male counterparts.

A. PHASE ONE

1. Demographic Characteristics

Table 1 below summarizes the demographic differences between the AE and non-AE populations. Of the 23,954 nurses and aerospace medical technicians that were employed by the USAF between 2003 and 2013, 13,907 deployed at least once. Of the deployed population, 2,294 were AE crewmembers and 11,613 were non-AE nurses and technicians. For both the AE and ground-based communities, the majority of the population consisted of the aerospace medical technicians. Also, both communities had similar demographics with respect to marital status and the number of dependents.

The AE population was different than the non-AE population with regard to the total number of participants in each of the three service components: active duty, Guard, and Reserves. The AE community consisted of 28 AE squadrons, with only four of them being active duty units. While the four active duty squadrons were large, the Guard and Reserve populations were significantly larger for the AE population compared to their non-AE counterparts.

The majority of the AE population was male, which was distinctive compared to the non-AE nurses and technicians. Generally, the majority of USAF nurses and aerospace medical technicians are female. This suggests that male nurses and aerospace medical technicians are attracted to the AE mission for at least one tour.

On average, the AE crewmembers were older than the non-AE nurses and technicians. There were two reasons for the age disparity. First, with approximately two-thirds of the AE community in the Guard and Reserves, the age ceilings are higher for both components compared to those stipulated by active duty regulations. Second, the flight nurse and AET program usually recruit medical professionals who have already completed some service. Hence, compared to the non-AE nurses and technicians, there are fewer flight nurses and AETs in the lower ranks.

The AE crewmembers completed more deployments than their non-AE counterparts. This is not to say that their total time deployed was longer than the non-AE nurses and technicians, only that they completed more total deployments. This may be due to the Guard and Reserve population and how those communities tally deployments. Also, some AE units have an associated "deployed" unit co-located at their home station. Finally, one of the primary missions of AE squadrons is to provide humanitarian medical aid during natural disasters. These humanitarian aid deployments may be relatively short in nature and high in frequency depending on the AE unit's location.

Finally, the AE and non-AE populations deployed to different locations at varying time lengths. The majority of the non-AE nurses and technicians deployed stateside to Iraq or Afghanistan (commonly referred to as “downrange” by military personnel), while the AE crewmembers completed many deployments from Germany, Qatar, and the United States. The AE crewmembers were deployed to these locations, then flew downrange to pick-up patients before transporting the patients back to the larger medical facilities.

The demographics for the AE and non-AE nurses and technicians were compared using a Pearson’s chi square test with a significance level of 0.05 (see Table 1). All factors were significantly different except for marital status and the total number of dependents.

Table 1. Phase One Demographics of AE & Non-AE Nurses and Technicians Group Participants

	AE (N=1,945)	Control (N=9,280)	P-Value
Career Field			
Nurse	558	3298	<.001
Technician	1387	5982	
Component			
Active Duty	585	6834	<.001
Guard	634	1363	
Reserve	726	1083	
Gender			<.001
Female	735	4915	
Male	1210	4365	
Age			
19-28	526	3830	<.001
29-38	660	2759	
39-48	567	2038	
49 or more	192	653	
Marital Status			
Single	678	3147	0.138
Married	1055	5153	
Divorced	206	965	
Widowed	6	10	
Total # Depend.			
0	912	4324	0.223
1	351	1659	
2	249	1363	
3	262	1128	
4	126	569	
5 or more	45	237	
Total # Deployments			
1	827	5825	<.001
2 or more	1118	3855	
Deployment Location			
Afghanistan	520	2606	<.001
Iraq	188	2084	
Kuwait	21	397	
Qatar	310	723	
Germany	375	800	
United States	317	694	
Other	183	1588	
Classified/Unknown	31	388	

The following results compared the diagnosed AE and non-AE populations to identify any differences in diagnosis rate for each sub-population. Two statistical analyses were completed: first, a 2 proportion z test was used to determine if the overall percent of diagnosed participants differed between the AE and non-AE populations (De Veaux et al, 2008). Second, Pearson's chi-square test was utilized to determine if there was a significant difference in the sub-populations of diagnosed participants between the AE and non-AE populations.

2. Study Hypotheses

Hypothesis One: AE crewmember will have a higher diagnosis rate of PDMH conditions compared to the non-AE nurses and technicians.

To test *hypothesis one*, the overall diagnosis rate was calculated by dividing the number of diagnosed participants by the total population for both communities since the total population was known. Results from the 2 proportion z test indicated that the AE population had a lower diagnosis rate of a PDMH condition 8.2% (+/- .623%) after deploying compared to the non-AE population 12.4% (+/- .342%) ($z = 10.11$, p value $<.0001$). This finding rejected *hypothesis one*, since the AE diagnosis rate was lower than the diagnosis rate of the non-AE population.

Hypothesis Two: AE crewmembers with less than one year experience in the career field will have a higher diagnosis rate of PDMH conditions compared to more experienced AE crewmembers.

Numerous variables were used to analyze *hypothesis two*. Experience level can be determined by the age of the participant as a proxy for years in service, the rank of the participant, and the number of deployments completed. The number of deployments completed is the only variable for hypothesis three; therefore, this variable was not included in the analysis of hypothesis two. Age and rank were analyzed to see if the youngest age group and lowest ranks were the sub-populations with the highest diagnosis rate for each variable.

(1) Age

As can be seen in Table 1, the AE population tended to be older than the non-AE population. For this analysis, participants in both populations were categorized into the following age groups: 19 – 28, 29 – 38, 39 – 48, and 49+ years. There was a significant difference in diagnosis rate between the AE population and the non-AE population by age ($\chi2$ (4) = 37.64, p-value < .0001). The standardized residuals revealed that the diagnosis rate was lower than expected for the youngest group of AE crewmembers, 19 to 28 years old, and the older groups, 39 year old or higher, compared to their non-AE counterparts. The confidence intervals were also well below the middle two age groups for the AE populations, supporting the diagnosis rate being significantly lower for the youngest and oldest age groups. The majority of the participants, both AE and non-AE, were in the middle-age group (see Figure 4 and Table 2). The youngest group having a lower than expected diagnosis rate rejects *hypothesis two*. The CCATT study found that age was a significant factor in predicting a CCATT crewmember's risk of being diagnosed with a PDMH condition.

Figure 4. Phase One Diagnosis Rate by Age

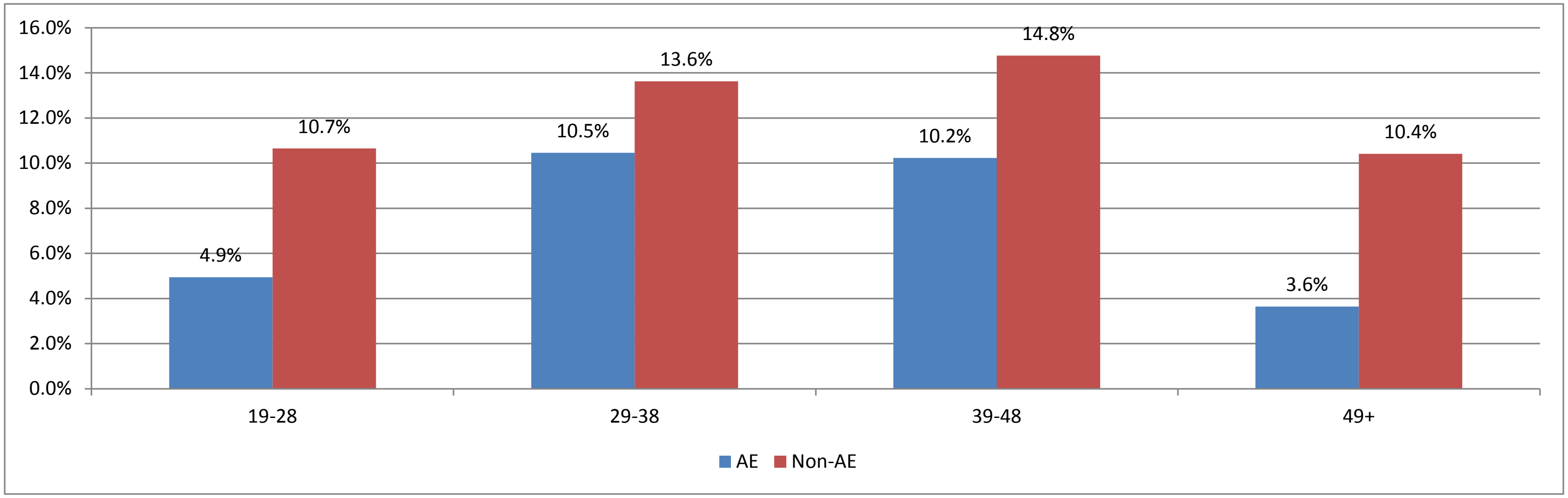


Table 2. Phase One Statistical Analysis by Age

		AE				Non-AE			
		Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate	Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate
Age									
	19-28	26	526	4.9%	0.9%	408	3830	10.7%	0.5%
	29-38	69	660	10.5%	1.2%	376	2759	13.6%	0.7%
	39-48	58	567	10.2%	1.3%	301	2038	14.8%	0.8%
	49+	7	192	3.6%	1.4%	68	653	10.4%	1.2%
Standardized Residuals (values more extreme than +/- 1.96 consider significant)		**Diagnosed**	**Not Diagnosed**			**Diagnosed**	**Not Diagnosed**		
	19-28	-3.648	1.213			1.352	-0.450		
	29-38	-1.824	0.705			0.892	-0.345		
	39-48	-2.278	0.911			1.202	-0.480		
	49+	-2.432	0.759			1.319	-0.412		
				AE Rate				**Non-AE Rate**	
				Lower 95% Conf. Intvl.	**Upper 95% Conf. Intvl.**			**Lower 95% Conf. Intvl.**	**Upper 95% Conf. Intvl.**
	19-28			3.1%	6.8%			9.7%	11.6%
	29-38			8.1%	12.8%			12.3%	14.9%
	39-48			7.7%	12.7%			13.2%	16.3%
	49+			1.0%	6.3%			8.1%	12.8%

(2) Rank

The AE crewmembers had a greater percentage of higher ranking personnel than the non-AE nurses and technicians. There was a significant difference in diagnosis rate between the AE population and the non-AE population by rank ($\chi 2$ (12) = 48.22, p-value < .0001). As seen in Figure 5, there is an increased diagnosis rate for non-commissioned officers and mid-grade officers. Examining the standardized residuals the diagnosis rate was lower than expected for the Senior Airman, Staff Sergeant, and Master Sergeant ranks of the AE population compared to their non-AE counterparts (see Figure 5 and Table 3). The confidence intervals were overlapping for the non-commissioned officers and mid-grade officers indicating there was no significant different in their diagnosis rates. The diagnosis rate not being significantly different for any of the age groups rejects *hypothesis two.*

Figure 5. Phase One Diagnosis Rate by Rank

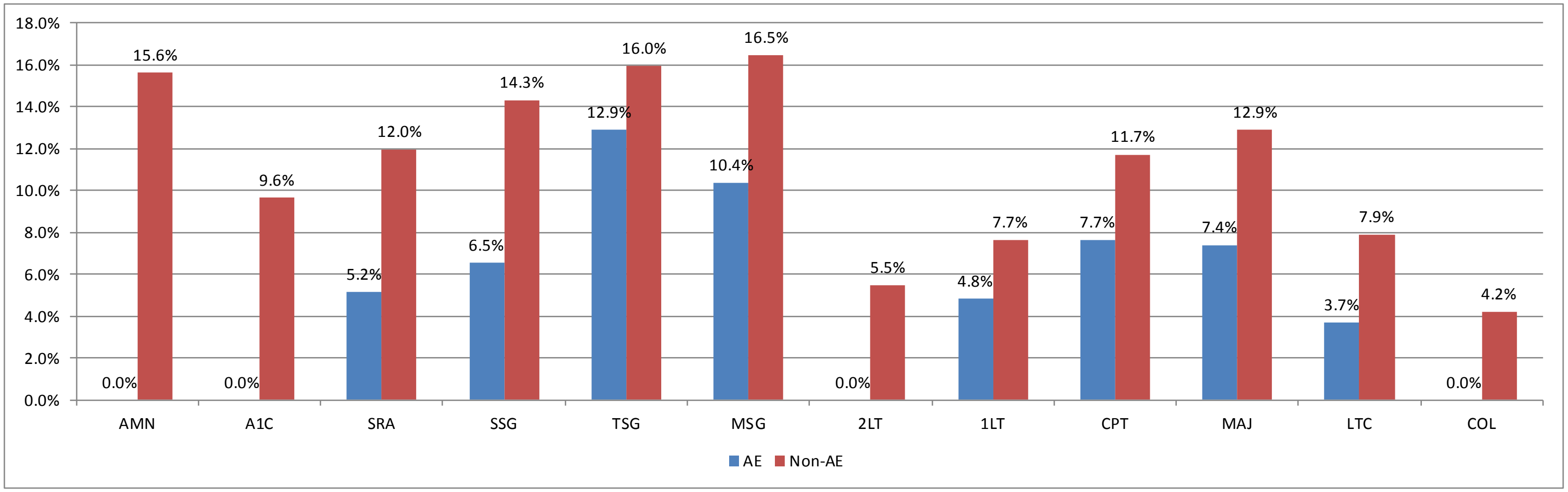


Table 3. Phase One Statistical Analysis by Rank

		AE				Non-AE			
		Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate	Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate
Rank									
	Airman	0	2	0.0%	0.0%	10	64	15.6%	4.5%
	Arm First Class	0	17	0.0%	0.0%	90	933	9.6%	1.0%
	Senior Srm	14	271	5.2%	1.3%	181	1512	12.0%	0.8%
	Staff Sgt	21	321	6.5%	1.4%	217	1515	14.3%	0.9%
	Tech Sgt	49	380	12.9%	1.7%	173	1084	16.0%	1.1%
	Master Sgt	41	395	10.4%	1.5%	142	862	16.5%	1.3%
	1st Lt	0	13	0.0%	0.0%	17	310	5.5%	1.3%
	2nd Lt	3	62	4.8%	2.7%	35	457	7.7%	1.2%
	Captain	16	209	7.7%	1.8%	148	1261	11.7%	0.9%
	Major	12	162	7.4%	2.1%	109	846	12.9%	1.2%
	Lt Colonel	4	108	3.7%	1.8%	28	354	7.9%	1.4%
	Colonel	0	5	0.0%	0.0%	3	71	4.2%	2.4%
Standardized Residuals (values more extreme than +/- 1.96 consider significant)		**Diagnosed**	**Not Diagnosed**			**Diagnosed**	**Not Diagnosed**		
	Airman	-0.550	0.233			0.097	-0.041		
	Arm First Class	-1.269	0.411			0.171	-0.055		
	Senior Srm	-2.873	1.007			1.216	-0.426		
	Staff Sgt	-3.195	1.233			1.471	-0.568		
	Tech Sgt	-1.136	0.480			0.673	-0.284		
	Master Sgt	-2.177	0.898			1.473	-0.608		
	1st Lt	-0.827	0.195			0.169	-0.040		
	2nd Lt	-0.723	0.203			0.266	-0.075		
	Captain	-1.515	0.537			0.617	-0.219		
	Major	-1.689	0.624			0.739	-0.273		
	Lt Colonel	-1.273	0.347			0.703	-0.192		
	Colonel	-0.444	0.090			0.118	-0.024		
				AE Rate				**Non-AE Rate**	
95% Confidence Interval				**Lower**	**Upper**			**Lower**	**Upper**
	Airman			0.0%	0.0%			6.7%	24.5%
	Arm First Class			0.0%	0.0%			7.8%	11.5%
	Senior Srm			2.5%	7.8%			10.3%	13.6%
	Staff Sgt			3.8%	9.2%			12.6%	16.1%
	Tech Sgt			9.5%	16.3%			13.8%	18.1%
	Master Sgt			7.4%	13.4%			14.0%	18.9%
	1st Lt			0.0%	0.0%			2.9%	8.0%
	2nd Lt			-0.5%	10.2%			5.2%	10.1%
	Captain			4.1%	11.3%			10.0%	13.5%
	Major			3.4%	11.4%			10.6%	15.1%
	Lt Colonel			0.1%	7.3%			5.1%	10.7%
	Colonel			0.0%	0.0%			-0.5%	8.9%

Hypothesis Three: AE crewmembers with two or more deployments will have a higher diagnosis rate of PDMH conditions compared to AE crewmembers who have completed one deployment.

The number of deployments completed was analyzed to answer *hypothesis three*. The AE crewmembers had completed significantly more deployments at the time of diagnosis compared to the non-AE nurses and technicians (see Table 1). There was a significant difference in diagnosis rate between the AE population and the non-AE population by number of completed deployments ($\chi 2$ (5) = 33.54, p-value < .0001). The diagnosis rate was lower than expected for the AE population that complete three or fewer deployments compared to their non-AE counterparts as seen in Table 4. The diagnosis rate increased slightly with each deployment for AE crewmembers, whereas the diagnosis rate peaked at three deployments for the non-AE population as seen in Figure 6. The confidence intervals for all sub-populations overlapped considerably, indicating that the diagnosis rate for each AE sub-population was not significantly different. *Hypothesis three* was not supported since there was no significant difference in the diagnosis rate for AE crewmembers on the number of deployments completed. The CCATT study found that the number of deployments completed was significant in predicting the diagnosis rate of a PDMH condition.

Figure 6. Phase One Diagnosis Rate by Number of Deployments Completed

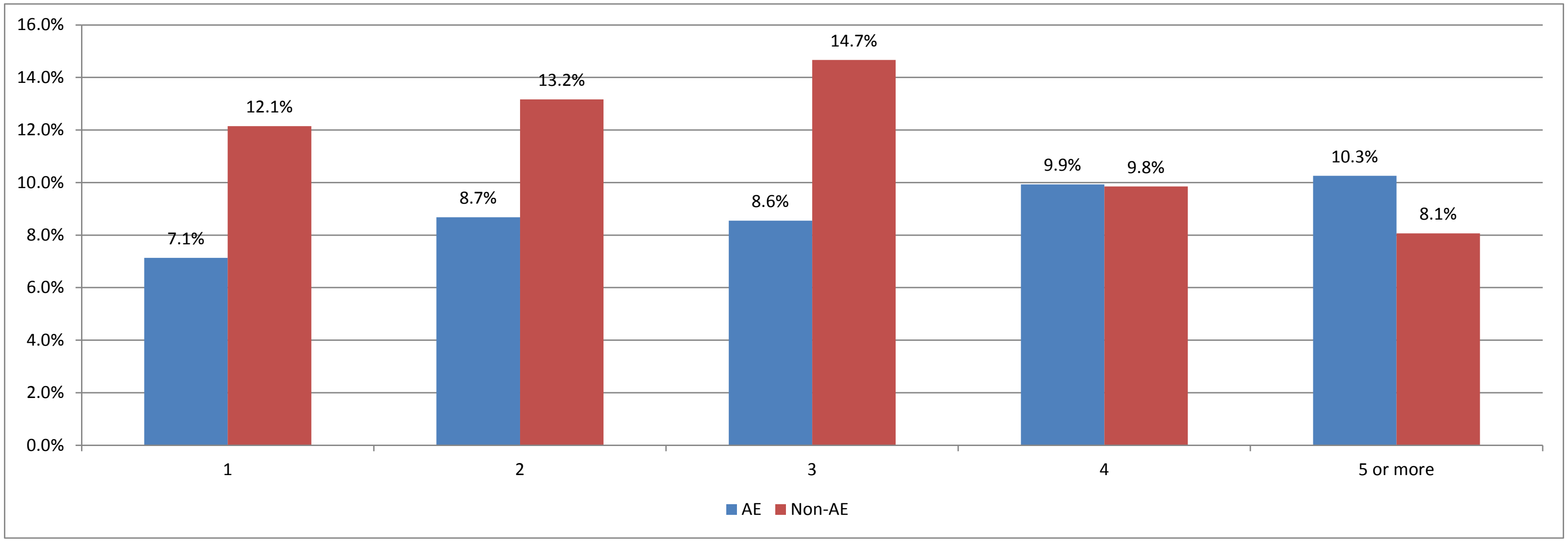


Table 4. Phase One Statistical Analysis by Number of Deployments Completed

		AE				Non-AE			
		Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate	Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate
# of Deployments									
	1	59	827	7.1%	0.9%	659	5425	12.1%	0.4%
	2	44	507	8.7%	1.3%	294	2233	13.2%	0.7%
	3	26	304	8.6%	1.6%	138	941	14.7%	1.2%
	4	15	151	9.9%	2.4%	39	396	9.8%	1.5%
	5 or more	16	156	10.3%	2.4%	23	285	8.1%	1.6%
Standardized Residuals		Diagnosed	Not Diagnosed			Diagnosed	Not Diagnosed		
(values more extreme	1	-3.691	1.330			1.441	-0.519		
than +/- 1.96 consider	2	-2.345	0.880			1.117	-0.419		
significant)	3	-2.219	0.864			1.262	-0.491		
	4	0.024	-0.008			-0.015	0.005		
	5 or more	0.593	-0.185			-0.439	0.137		
				AE Rate				Non-AE Rate	
				Lower 95% Conf. Intvl.	Upper 95% Conf. Intvl.			Lower 95% Conf. Intvl.	Upper 95% Conf. Intvl.
	1			5.4%	8.9%			11.3%	13.0%
	2			6.2%	11.1%			11.8%	14.6%
	3			5.4%	11.7%			12.4%	16.9%
	4			5.2%	14.7%			6.9%	12.8%
	5 or more			5.5%	15.0%			4.9%	11.2%

Hypothesis Four: female AE crewmembers will have a higher diagnosis rate of PDMH conditions compared to their male counterparts.

Finally, gender was analyzed to answer *hypothesis four*. In general, the majority of professionals in the USAF nursing and medical technician community are female, just as the study's non-AE population. However, the majority of the AE population was male during the 2003-2013 timeframe (see Table 1). There was a significant difference in diagnosis rate between the AE population and the non-AE population by gender ($\chi2$ (2) = 26.29, p-value < .0001). While the diagnosis rate was lower for females compared to males for the AE population, as seen in Figure 7, the confidence intervals overlapped considerably. Hence there was no significant difference in the diagnosis rate between AE males and females, not supporting *hypothesis four*. As depicted in Table 5, the standardized residuals for the AE population, both male and female, were significantly below their non-AE counterparts.

These findings were quite different from the CCATT study. The CCATT gender demographics were in line with those of the overall USAF medical community, with the majority of the participants being female. Also, the CCATT study found that a higher percentage of females were diagnosed with a PDMH condition than their male counterparts. This finding contradicts the findings of this thesis.

Figure 7. Phase One Diagnosis Rate by Gender

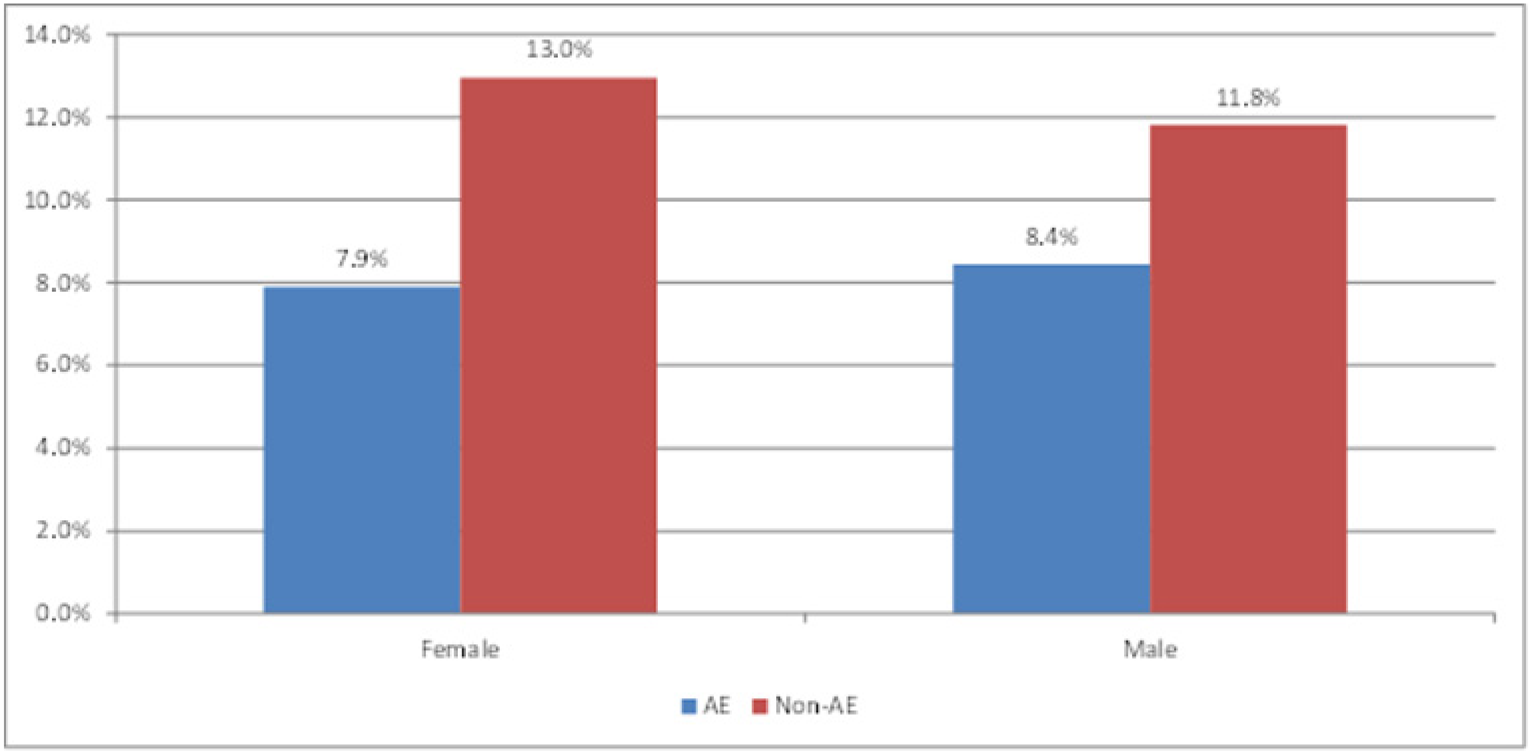


Table 5. Phase One Statistical Analysis by Gender

		AE				Non-AE			
		Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate	Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate
Gender									
	Male	102	1210	8.4%	0.8%	516	4365	11.8%	0.5%
	Female	58	735	7.9%	1.0%	637	4915	13.0%	0.5%
Standardized Residuals (values more extreme than +/- 1.96 consider significant)		**Diagnosed**	**Not Diagnosed**			**Diagnosed**	**Not Diagnosed**		
	Male	-2.774	0.980			1.461	-0.516		
	Female	-3.409	1.277			1.318	-0.494		
				AE Rate				**Non-AE Rate**	
				Lower 95% Conf. Intvl.	**Upper 95% Conf. Intvl.**			**Lower 95% Conf. Intvl.**	**Upper 95% Conf. Intvl.**
	Male			6.9%	10.0%			10.9%	12.8%
	Female			5.9%	9.8%			12.0%	13.9%

3. Other Relevant Results

a. Component

There was a significant difference in diagnosis rate between the AE population and the non-AE population by component (Active Duty, Guard, or Reserves) ($\chi 2$ (3) = 8.27, p-value = .041). The AE population is essentially split equally between Active Duty, Guard, and Reserve components. Even though there are only four active duty AE squadrons, they are the largest squadrons; hence, the AE active duty population size is equitable to the AE Guard and Reserve populations. This is different from the non-AE population, since the majority of the non-AE population is on active duty (reference Table 1). Examining the standardized residuals, the diagnosis rate was significantly higher than expected for the active duty component of the AE population compared to their non-AE counterparts (see Figure 8 and Table 6). The confidence interval for the AE active duty component was the only sub-population significantly different without any overlapping values with the Guard and Reserve components.

The CCATT study found that component was a significant variable in predicting a participant's risk of being diagnosed with a PDMH condition. Just as with the CCATT study, the Guard and Reserves populations were both less likely than the active duty population to be diagnosed with a PDMH condition.

Figure 8. Phase One Diagnosis Rate by Component

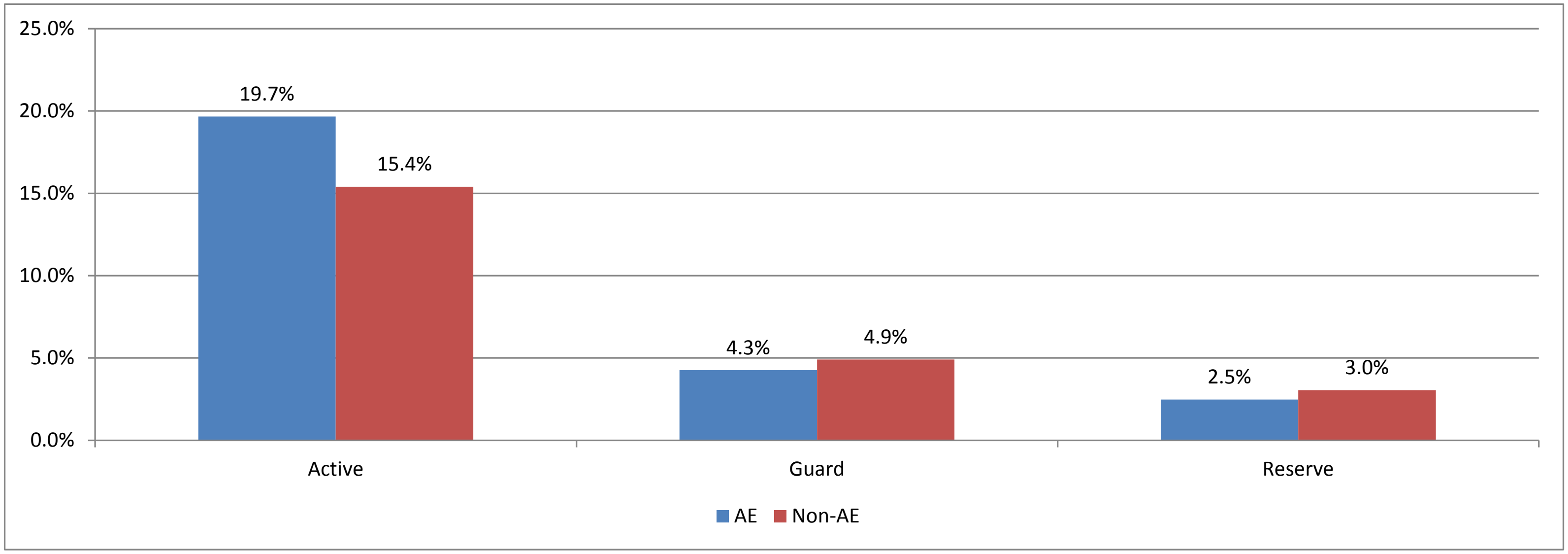


Table 6. Phase One Statistical Analysis by Component

		AE				Non-AE			
		Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate	Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate
Component	Active Duty	115	585	19.7%	1.6%	1053	6834	15.4%	0.4%
	Guard	27	634	4.3%	0.8%	67	1363	4.9%	0.6%
	Reserves	18	726	2.5%	0.6%	33	1083	3.0%	0.5%
Standardized Residuals (values more extreme than +/- 1.96 consider significant)		**Diagnosed**	**Not Diagnosed**			**Diagnosed**	**Not Diagnosed**		
	Active Duty	2.386	-1.032			-0.698	0.302		
	Guard	-0.520	0.116			0.355	-0.079		
	Reserves	-0.545	0.093			0.447	-0.076		
				AE Rate				**Non-AE Rate**	
				Lower 95% Conf. Intvl.	**Upper 95% Conf. Intvl.**			**Lower 95% Conf. Intvl.**	**Upper 95% Conf. Intvl.**
	Active Duty			16.4%	22.9%			14.6%	16.3%
	Guard			2.7%	5.8%			3.8%	6.1%
	Reserves			1.3%	3.6%			2.0%	4.1%

b. Marital Status

There was a significant difference in diagnosis rate between the AE population and the non-AE population by marital status ($\chi 2$ (4) = 228.44, p-value <.0001). Analyzing the standardized residuals, the diagnosis rate was lower than expected for single and married AE crewmembers compared to their non-AE counterparts. The diagnosis rate was lower than expected for the single AE population compared to their married or divorced counterparts as its confidence interval was the only one that did not overlap any other sub-populations (see Figure 9 and Table 7).

Figure 9. Phase One Diagnosis Rate by Marital Status

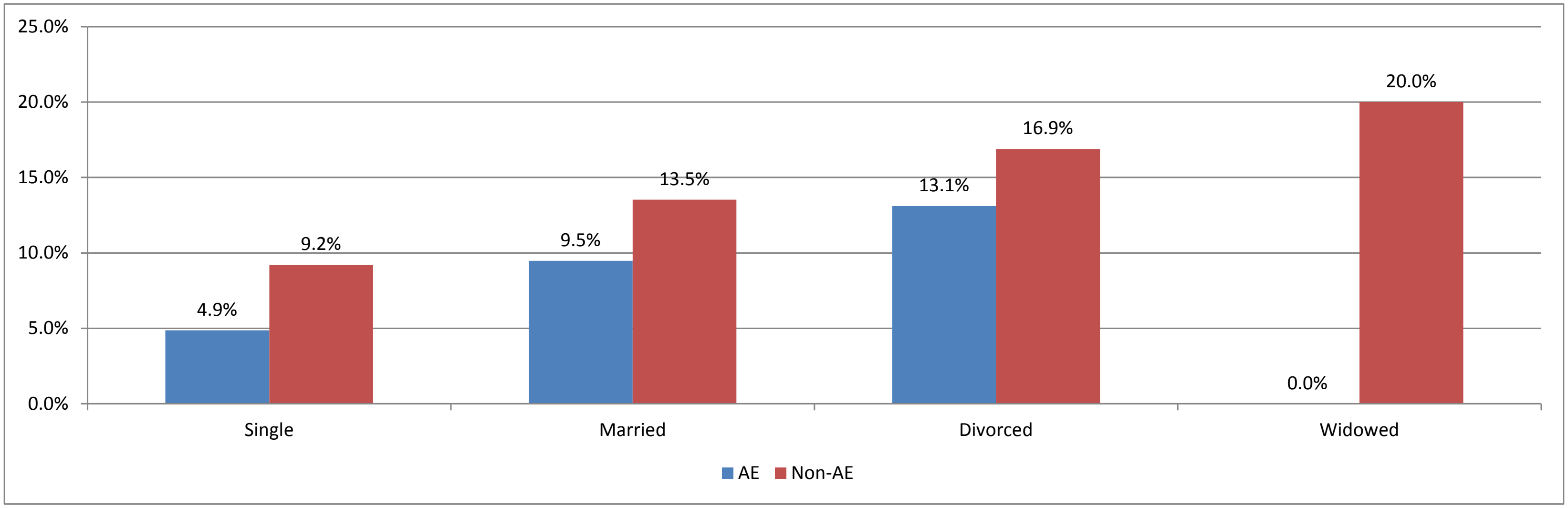


Table 7. Phase One Statistical Analysis by Martial Status

		AE				Non-AE			
		Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate	Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate
Marital Status									
	Single	33	678	4.9%	0.8%	290	3147	9.2%	0.5%
	Married	100	1055	9.5%	0.9%	697	5153	13.5%	0.5%
	Divorced	27	206	13.1%	2.4%	163	3147	5.2%	0.4%
	Widowed	0	6	0.0%	0.0%	2	10	20.0%	12.6%
Standardized Residuals (values more extreme than +/- 1.96 consider significant)		**Diagnosed**	**Not Diagnosed**			**Diagnosed**	**Not Diagnosed**		
	Single	-3.205	0.973			1.488	-0.452		
	Married	-3.046	1.169			1.378	-0.529		
	Divorced	4.486	12.968			-1.148	-3.318		
	Widowed	-0.866	0.327			0.671	-0.254		
				AE Rate				**Non-AE Rate**	
				Lower 95% Conf. Intvl.	**Upper 95% Conf. Intvl.**			**Lower 95% Conf. Intvl.**	**Upper 95% Conf. Intvl.**
	Single			3.2%	6.5%			8.2%	10.2%
	Married			7.7%	11.2%			12.6%	14.5%
	Divorced			8.5%	17.7%			4.4%	6.0%
	Widowed			0.0%	0.0%			-4.8%	44.8%

c. Number of Dependents

There was a significant difference in diagnosis rate between the AE population and the non-AE population by number of dependents ($\chi2$ (6) = 29.29, p-value <.0001). Examining the standardized residuals, the diagnosis rate was lower than expected for the AE crewmembers without dependents (i.e. not married and without children) and with only one dependent (either married without children or single with one child) compared to their non-AE counterparts. The confidence intervals for each AE sub-population overlapped considerably; hence there was no significant difference in the diagnosis rate for each sub-population (see Figure 10 and Table 8).

Figure 10. Phase One Diagnosis Rate by Number of Dependents

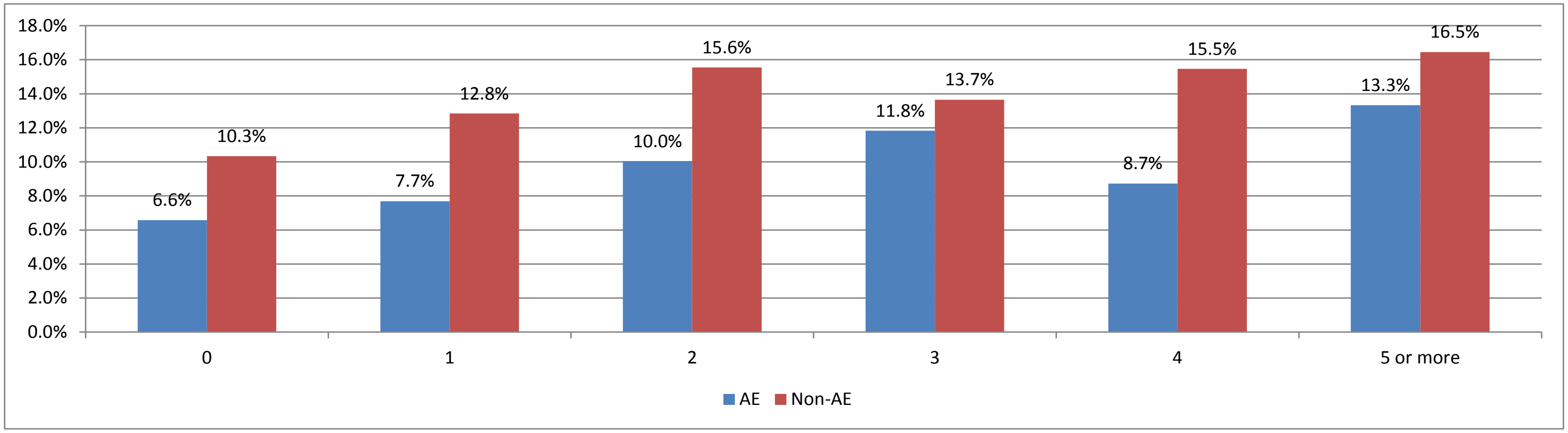


Table 8. Phase One Statistical Analysis by Number of Dependents

		AE				Non-AE			
		Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate	Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate
# Dependents									
	0	60	912	6.6%	0.8%	447	4324	10.3%	0.5%
	1	27	351	7.7%	1.4%	213	1659	12.8%	0.8%
	2	25	249	10.0%	1.9%	212	1363	15.6%	1.0%
	3	31	262	11.8%	2.0%	154	1128	13.7%	1.0%
	4	11	126	8.7%	2.5%	88	569	15.5%	1.5%
	5 or more	6	45	13.3%	5.1%	39	237	16.5%	2.4%
Standardized Residuals (values more extreme than +/- 1.96 consider significant)		Diagnosed	Not Diagnosed			Diagnosed	Not Diagnosed		
	0	-3.012	0.986			1.383	-0.453		
	1	-2.303	0.848			1.059	-0.390		
	2	-1.919	0.797			0.820	-0.340		
	3	-0.655	0.257			0.316	-0.124		
	4	-1.640	0.668			0.772	-0.315		
	5 or more	-0.441	0.192			0.192	-0.084		
				AE Rate				Non-AE Rate	
				Lower 95% Conf. Intvl.	Upper 95% Conf. Intvl.			Lower 95% Conf. Intvl.	Upper 95% Conf. Intvl.
	0			5.0%	8.2%			9.4%	11.2%
	1			4.9%	10.5%			11.2%	14.4%
	2			6.3%	13.8%			13.6%	17.5%
	3			7.9%	15.7%			11.6%	15.7%
	4			3.8%	13.7%			12.5%	18.4%
	5 or more			3.4%	23.3%			11.7%	21.2%

d. Career Field

There was a significant difference in diagnosis rate between the AE population and the non-AE population by career field ($\chi2$ (2) = 30.03, p-value <.0001). Analyzing the standardized residuals, the diagnosis rate was lower than expected for the nurses in both the AE and non-AE populations, Table 9. As seen in Figure 11, the diagnosis rate was higher for the technicians compared to the nurse participants, for both the AE and non-AE populations. The confidence intervals for the AE nurses and technicians overlapped, so there was no significant difference in the diagnosis rate between the two career fields. The CCATT study found that both the nurses and technicians were twice as likely as CCATT physicians to be diagnosed with a PDMH condition. The CCATT study also found that the technicians were diagnosed at a higher rate than the nurses.

Figure 11. Phase One Diagnosis Rate by Career Field

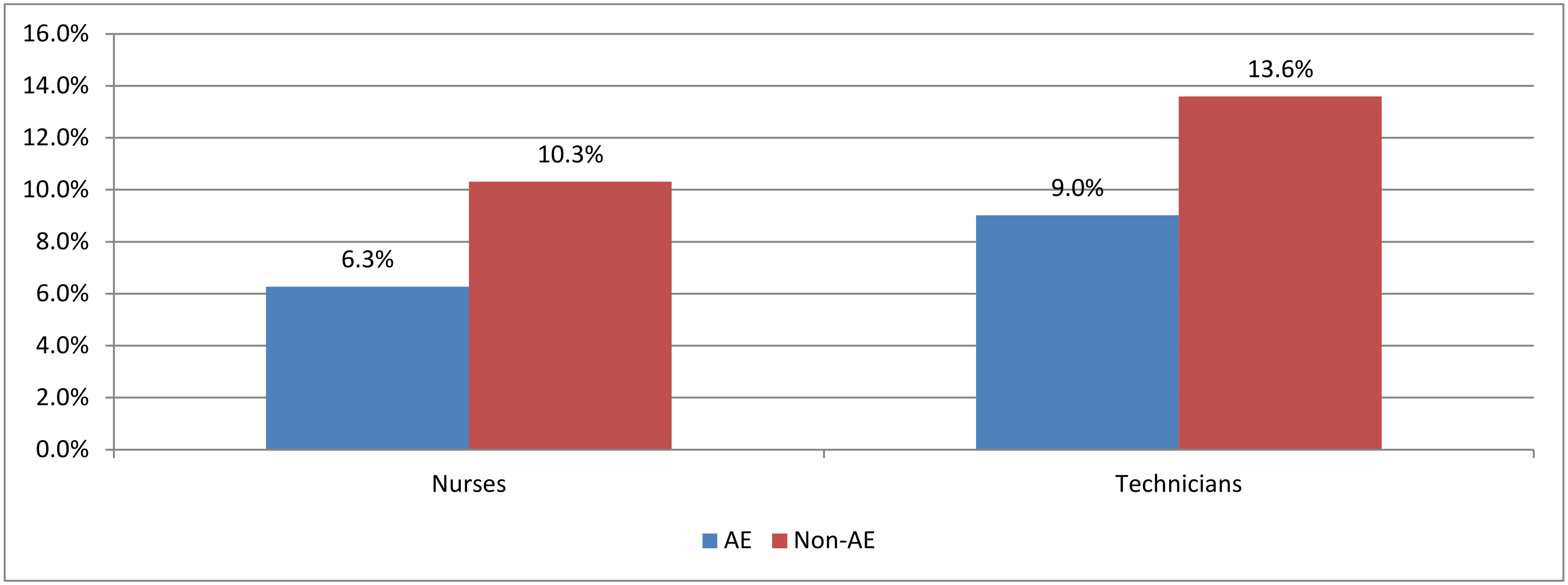


Table 9. Phase One Statistical Analysis by Career Field

		AE				Non-AE			
		Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate	Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate
AFSC									
	Nurses	35	558	6.3%	1.0%	340	3298	10.3%	0.5%
	Techs	125	1386	9.0%	0.8%	813	5982	13.6%	0.4%
Standardized Residuals (values more extreme than +/- 1.96 consider significant)		Diagnosed	Not Diagnosed			Diagnosed	Not Diagnosed		
	Nurses	-2.615	0.858			-3.873	1.479		
	Techs	1.076	-0.353			1.864	-0.712		
				AE Rate				Non-AE Rate	
				Lower 95% Conf. Intvl.	Upper 95% Conf. Intvl.			Lower 95% Conf. Intvl.	Upper 95% Conf. Intvl.
	Nurses			4.3%	8.3%			9.3%	11.3%
	Techs			7.5%	10.5%			12.7%	14.5%

e. Year of Last Deployment

There was a significant difference in diagnosis rate between the AE population and the non-AE population by the year of a participant's last deployment prior to being diagnosed, or the year of a participant's last deployment if he or she was never diagnosed with a PDMH condition ($\chi 2$ (11) = 21.73, p-value =.027). Examining the standardized residuals, the diagnosis rate was lower than expected for the AE sub-population that deployed in 2011 compared to their non-AE counterparts as seen in Table 10. Referencing Figure 12, the diagnosis rate spiked for last deployments in 2004 and 2008. The 2004 spike corresponds with an especially violent year in OIF. 2008 was also considered a violent year with the surge in Afghanistan. The diagnosis rate starts to decrease significantly in 2012, which corresponds to the withdrawals of troops from Iraq and Afghanistan. The confidence intervals for each sub-population significantly overlapped; hence there was no significant difference in the diagnosis rate for each year of last deployment.

Figure 12. Phase One Diagnosis Rate by Year of Last Deployment

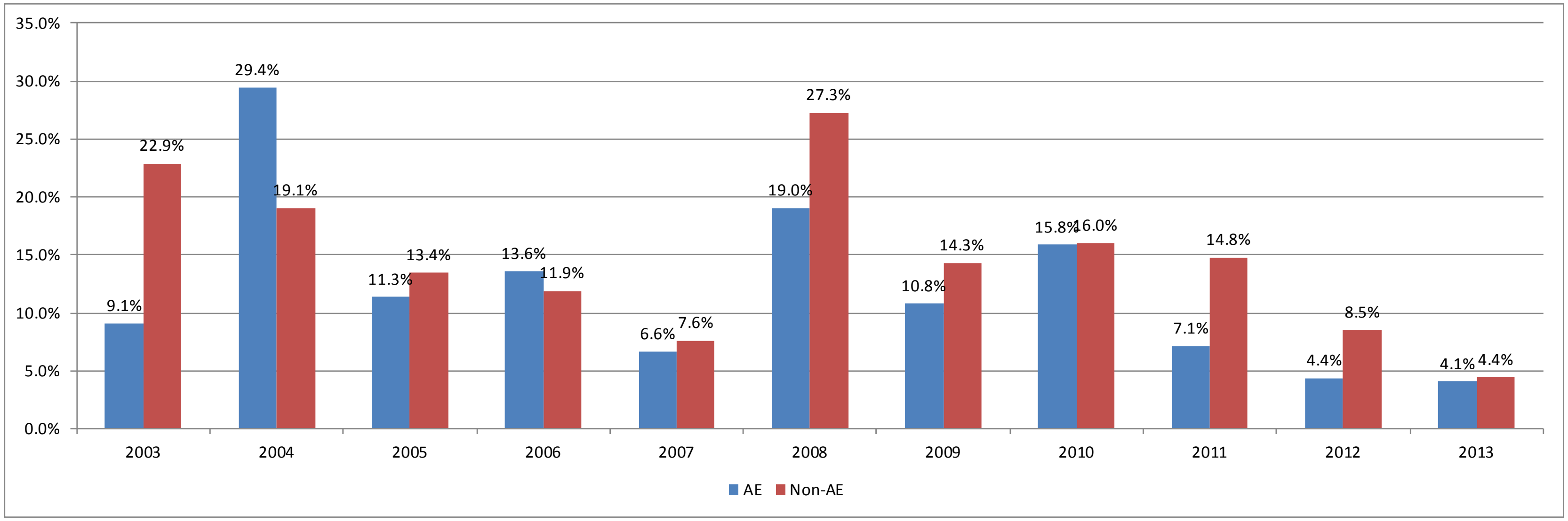


Table 10. Phase One Statistical Analysis by Year of Last Deployment

		AE				Non-AE			
		Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate	Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate
Year of Last Deploy.									
	2003	2	22	9.1%	6.1%	73	319	22.9%	2.4%
	2004	10	34	29.4%	7.8%	61	320	19.1%	2.2%
	2005	11	97	11.3%	3.2%	105	781	13.4%	1.2%
	2006	11	81	13.6%	3.8%	75	630	11.9%	1.3%
	2007	17	256	6.6%	1.6%	112	1469	7.6%	0.7%
	2008	20	105	19.0%	3.8%	176	645	27.3%	1.8%
	2009	14	130	10.8%	2.7%	114	797	14.3%	1.2%
	2010	29	183	15.8%	2.7%	148	925	16.0%	1.2%
	2011	14	196	7.1%	1.8%	142	960	14.8%	1.1%
	2012	9	205	4.4%	1.4%	76	891	8.5%	0.9%
	2013	12	295	4.1%	1.2%	36	811	4.4%	0.7%
Standardized Residuals (values more extreme than +/- 1.96 consider significant)		Diagnosed	Not Diagnosed			Diagnosed	Not Diagnosed		
	2003	-1.290	0.685			0.339	-0.180		
	2004	1.218	-0.610			-0.397	0.199		
	2005	-0.507	0.198			0.179	-0.070		
	2006	0.384	-0.143			-0.138	0.051		
	2007	-0.490	0.139			0.205	-0.058		
	2008	-1.420	0.845			0.573	-0.341		
	2009	-0.932	0.373			0.377	-0.151		
	2010	-0.043	0.019			0.019	-0.008		
	2011	-2.421	0.956			1.094	-0.432		
	2012	-1.730	0.502			0.830	-0.241		
	2013	-0.224	0.048			0.135	-0.029		
				AE Rate				Non-AE Rate	
				Lower 95% Conf. Intvl.	Upper 95% Conf. Intvl.			Lower 95% Conf. Intvl.	Upper 95% Conf. Intvl.
	2003			-2.9%	21.1%			18.3%	27.5%
	2004			14.1%	44.7%			14.8%	23.4%
	2005			5.0%	17.7%			11.1%	15.8%
	2006			6.1%	21.0%			9.4%	14.4%
	2007			3.6%	9.7%			6.3%	9.0%
	2008			11.5%	26.6%			23.8%	30.7%
	2009			5.4%	16.1%			11.9%	16.7%
	2010			10.6%	21.1%			13.6%	18.4%
	2011			3.5%	10.7%			12.5%	17.0%
	2012			1.6%	7.2%			6.7%	10.4%
	2013			1.8%	6.3%			3.0%	5.9%

f. Length of Last Deployment

There was a significant difference in diagnosis rate between the AE population and the non-AE population by the length of the deployment ($\chi 2$ (9) = 51.77, p-value <.0001). Analyzing the standardized residuals, the diagnosis rate was lower than expected for the AE crewmembers that deployed between 101 and 150 days compared to their non-AE counterparts who had a higher than expected diagnosis rate during the same time period, yet the confidence intervals for both deployment lengths overlapped the other deployments lengths. Therefore the diagnosis rate for those AE participants who deployed between 101-150 days was not significantly different from the other sub-populations (see Figure 13 and Table 11).

Figure 13. Phase One Diagnosis Rate by Length of Last Deployment (Days)

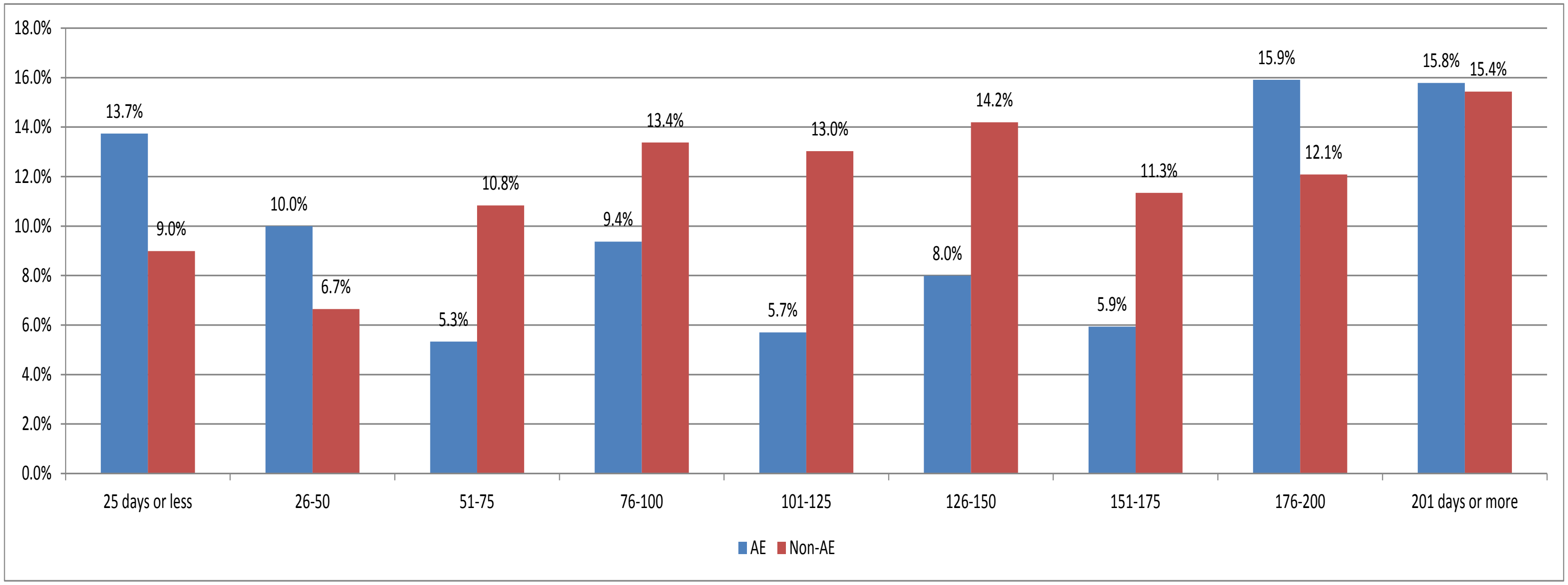


Table 11. Phase One Statistical Analysis by Length of Last Deployment (Days)

		AE				Non-AE			
		Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate	Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate
Length of Deployment									
	25 or less	18	131	13.7%	3.0%	85	945	9.0%	0.9%
	26-50	8	80	10.0%	3.4%	27	406	6.7%	1.2%
	51-75	8	150	5.3%	1.8%	53	489	10.8%	1.4%
	76-100	6	64	9.4%	3.6%	61	456	13.4%	1.6%
	101-125	27	473	5.7%	1.1%	153	1174	13.0%	1.0%
	126-150	64	801	8.0%	1.0%	302	2127	14.2%	0.8%
	151-175	6	101	5.9%	2.4%	49	432	11.3%	1.5%
	176-200	14	88	15.9%	3.9%	286	2366	12.1%	0.7%
	201 or more	9	57	15.8%	4.8%	137	881	15.6%	1.2%
Standardized Residuals (values more extreme than +/- 1.96 consider significant)		Diagnosed	Not Diagnosed			Diagnosed	Not Diagnosed		
	25 or less	1.542	-0.502			-0.574	0.187		
	26-50	0.933	-0.260			-0.414	0.115		
	51-75	-1.670	0.543			0.925	-0.300		
	76-100	-0.782	0.301			0.293	-0.113		
	101-125	-3.435	1.203			2.180	-0.764		
	126-150	-3.610	1.365			2.215	-0.837		
	151-175	-1.370	0.465			0.662	-0.225		
	176-200	0.988	-0.369			-0.191	0.071		
	201 or more	0.064	-0.027			-0.016	0.007		
				AE Rate				Non-AE Rate	
				Lower 95% Conf. Intvl.	Upper 95% Conf. Intvl.			Lower 95% Conf. Intvl.	Upper 95% Conf. Intvl.
	25 or less			7.8%	19.6%			7.2%	10.8%
	26-50			3.4%	16.6%			4.2%	9.1%
	51-75			1.7%	8.9%			8.1%	13.6%
	76-100			2.2%	16.5%			10.3%	16.5%
	101-125			3.6%	7.8%			11.1%	15.0%
	126-150			6.1%	9.9%			12.7%	15.7%
	151-175			1.3%	10.6%			8.4%	14.3%
	176-200			8.3%	23.6%			10.8%	13.4%
	201 or more			6.3%	25.3%			13.2%	17.9%

g. *Deployment Location*

There was a significant difference in diagnosis rate between the AE population and the non-AE population by the length of the deployment ($\chi2$ (8) = 29.08, p-value =.0003). As seen in Figure 14, the diagnosis rate for the "other" category was the only location in which the AE diagnosis rate was higher than that of the non-AE population. This is most likely due to the higher percentage of humanitarian medical aid missions. The standardized residuals, the diagnosis rate was lower than expected for the AE crewmembers that deployed to Afghanistan and Germany compared to their non-AE counterparts as seen in Table 12. The confidence intervals for the AE sub-populations overlapped, so there was no significant difference in the diagnosis rate for any of the sub-populations.

Figure 14. Phase One Diagnosis Rate by Deployment Location

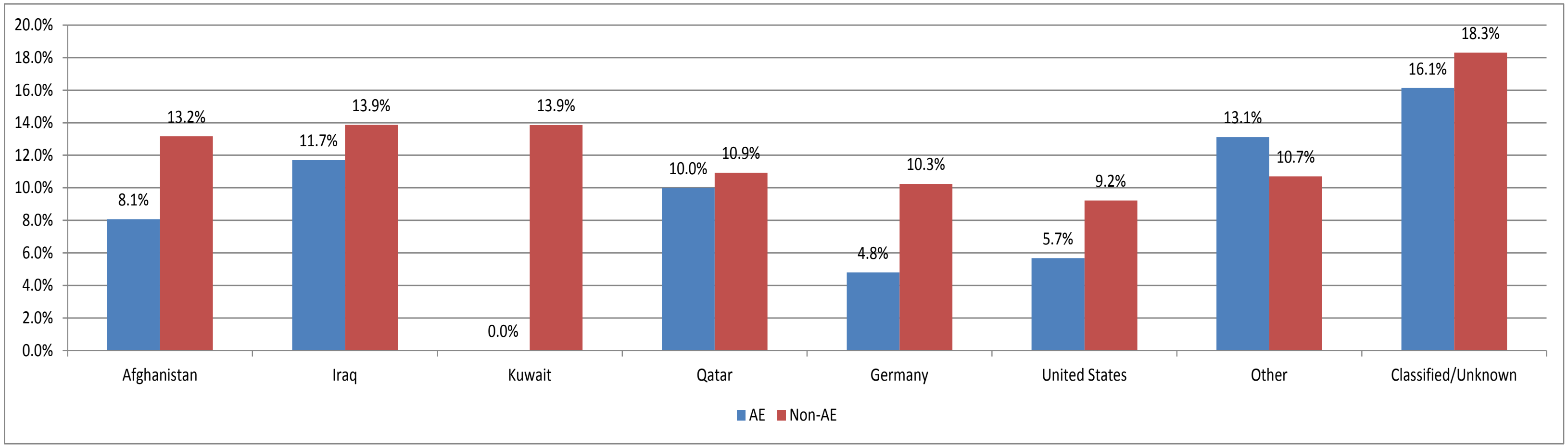


Table 12. Phase One Statistical Analysis by Deployment Location

		AE				Non-AE			
		Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate	Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate
Deployment Location									
	Afghanistan	42	520	8.1%	1.2%	343	2606	13.2%	0.7%
	Iraq	22	188	11.7%	2.3%	289	2084	13.9%	0.8%
	Kuwait	0	21	0.0%	0.0%	55	397	13.9%	1.7%
	Qatar	31	310	10.0%	1.7%	79	723	10.9%	1.2%
	Germany	18	375	4.8%	1.1%	82	800	10.3%	1.1%
	United States	18	317	5.7%	1.3%	64	694	9.2%	1.1%
	Other	24	183	13.1%	2.5%	170	1588	10.7%	0.8%
	Classified/Unknown	5	31	16.1%	6.6%	71	388	18.3%	2.0%
Standardized Residuals (values more extreme than +/- 1.96 consider significant)		Diagnosed	Not Diagnosed			Diagnosed	Not Diagnosed		
	Afghanistan	-2.755	1.032			1.230	-0.461		
	Iraq	-0.736	0.293			0.221	-0.088		
	Kuwait	-1.662	0.647			0.382	-0.149		
	Qatar	-0.350	0.121			0.229	-0.079		
	Germany	-2.463	0.751			1.686	-0.514		
	United States	-1.521	0.452			1.028	-0.305		
	Classified/Unknown	-0.263	0.124			0.074	-0.035		
				AE Rate				Non-AE Rate	
				Lower 95% Conf. Intvl.	Upper 95% Conf. Intvl.			Lower 95% Conf. Intvl.	Upper 95% Conf. Intvl.
	Afghanistan			5.7%	10.4%			11.9%	14.5%
	Iraq			7.1%	16.3%			12.4%	15.4%
	Kuwait			0.0%	0.0%			10.5%	17.3%
	Qatar			6.7%	13.3%			8.7%	13.2%
	Germany			2.6%	7.0%			8.1%	12.4%
	United States			3.1%	8.2%			7.1%	11.4%
	Other			8.2%	18.0%			9.2%	12.2%
	Classified/Unknown			3.2%	29.1%			14.5%	22.1%

4. Diagnosed Conditions

Of those meeting the inclusion criteria, the majority of participants were diagnosed with one or two PDMH conditions: 57.5% (+/- 3.91%) of AE crewmembers and 59.5% (+/- 1.45%) ($z = 0.482$, p value = .630) of non-AE nurses and technicians, as seen in Figure 15. There was not a significant difference in diagnosis rate between the AE population and the non-AE population by the number of diagnosed conditions ($\chi2$ (9) = 10.23, p-value =.95). Consistent with the literature review, the largest sub-population were participants diagnosed with two PDMH conditions; this is likely due to the comorbidity nature of the conditions (O'Donnell et al., 2004). The number of conditions gradually decreased for both the AE and non-AE populations after two PDMH conditions. There was no significant difference in the standardized residuals between the AE and non-AE diagnosed population, as seen in Table 13.

Figure 15. Phase One Total Number of Diagnosed Conditions per Participant

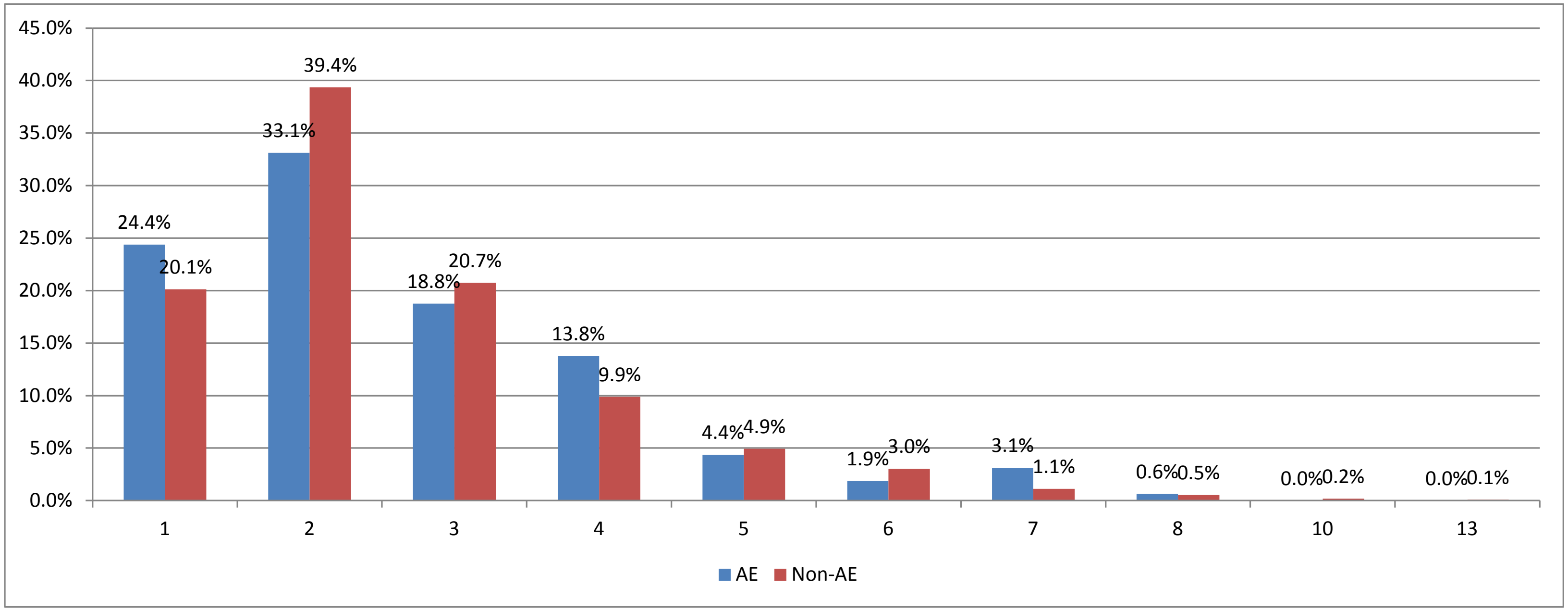


Table 13. Phase One Statistical Analysis of Total Number of Diagnosed Conditions per Participant

	AE			Non-AE		
Number of Diagnoses	Diagnosed	Percent Diagnosed	Std. Dev. of Percent Diagnosed	Diagnosed	Percent Diagnosed	Std. Dev. of Percent Diagnosed
1	39	24.4%	3.4%	232	20.1%	1.2%
2	53	33.1%	3.7%	454	39.4%	1.4%
3	30	18.8%	3.1%	239	20.7%	1.2%
4	22	13.8%	2.7%	114	9.9%	0.9%
5	7	4.4%	1.6%	57	4.9%	0.6%
6	3	1.9%	1.1%	35	3.0%	0.5%
7	5	3.1%	1.4%	13	1.1%	0.3%
8	1	0.6%	0.6%	6	0.5%	0.2%
10	0	0.0%	0.0%	2	0.2%	0.1%
13	0	0.0%	0.0%	1	0.1%	0.1%
Standardized Residuals (+/- 1.96)						
1	1.040			-0.387		
2	-1.117			0.416		
3	-0.486			0.181		
4	1.333			-0.497		
5	-0.286			0.107		
6	-0.758			0.282		
7	1.895			-0.706		
8	0.159			-0.059		
10	-0.494			0.184		
13	-0.349			0.130		

5. Model to Predict Most Significant Factors of PDMH Diagnosis

Multiple regression was used to determine which of the variables were significant in contributing the diagnosis rate of a PDMH condition. Regression provided the coefficients for the significant factors to calculate the expected risk an Airman has for being diagnosed with a PDMH condition. The regression was completed three separate times: Once for just the AE population, once again for just the non-AE population, and finally, with all the AE and non-AE nurses and technicians who deployed at least once (See Table 14).

Table 14. Phase One Multiple Regression Coefficient Results

Variable	AE Model	Non-AE Model	Total Population Model
Component			
Active Duty	0.118 (S.E.=.010, p-value <.0001)	0.100 (S.E. = .006, p-value <.0001)	0.100 (S.E. = .006, p-value <.0001)
Guard	-0.046 (S.E.=.009, p-value <.0001)	-0.030 (S.E.=.007, p-value < .001)	-0.034 (S.E.=.006, p-value < .001)
Reserve	-0.072 (S.E.=.009, p-value <.0001)	-0.068 (S.E.=.008, p-value < .001)	-0.067 (S.E.=.006, p-value < .001)
Deployment Location			
Iraq	0.040 (S.E.=.020, p-value= .046)	0.020 (S.E.=.008, p-value= .008)	0.021 (S.E.=.007, p-value= .003)
Kuwait	-0.114 (S.E.=.051, p-value= .026)	--	--
Other	--	-0.023 (S.E.=.008, p-value= .006)	-0.020 (S.E.=.008, p-value= .009)
Qatar	--	--	--
Gender			
Male	--	-0.016 (S.E.=.004, p-value <.0001)	-0.014 (S.E.=.003, p-value <.0001)
Female	--	0.016 (S.E.=.004, p-value <.0001)	0.014 (S.E.=.003, p-value <.0001)
# Deployments Completed	-0.008 (S.E.=.004, p-value= .040)	-0.012 (S.E.=.003, p-value <.0001)	-0.010 (S.E.=.003, p-value <.0001)
Age	--	0.004 (S.E.=.001, p-value <.0001)	0.004 (S.E.=.001, p-value <.0001)

Three factors were significant in predicting if an AE crewmember would be diagnosed with a PDMH condition: component, number of deployments completed, and the deployed country (notably Kuwait and Iraq). The *R*-squared value for the model was a modest 0.104. Of note, all three significant variables were not personal to participants (e.g. age, rank, career field, etc.), but instead were general variables to consider about a deployment.

To put these estimates into context: For a female flight nurse who is a major on active duty, married, has one child (2 dependents, husband and child), is 30 years old, and recently completed her third deployment to Iraq, her chance of being diagnosed with a PDMH condition is 8.9%. In contrast, if this flight nurse had just completed her first deployment to Iraq, her chance of being diagnosed with a PDMH is 10.5 %.

The model for the non-AE nurses and technicians was different in that more variables were significant. Five total variables were significant, to include: component, gender, age, deployment location (Iraq, Qatar, & other), and the total number of deployments completed. While the three variables that were significant for the AE crewmembers were again significant, the non-AE participants include more personal information (gender and age) that could be used for predicting a future diagnosis rate for a PDMH condition. The *R*-squared value for the Non-AE model was also low at 0.053. A female clinical nurse with same profile used with the AE model above would have a 10.9% chance of being diagnosed with a PDMH condition.

Putting the total AE and non-AE populations together into a total model determined five significant variables, the same five as the non-AE population. Notice that being an AE crewmember is not a significant factor in the model. The R-squared value for the total study remained low at 0.059. The same female non-AE clinical nurse would have a 12.2% chance of being diagnosed with a PDMH condition using the total population model.

6. Diagnosed Populations

The author explored the most frequently diagnosed conditions in each population. Over 70% of the AE PDMH diagnoses were one of six conditions: adjustment disorder, PTSD, depressive disorder not elsewhere classified, anxiety, major depressive disorder, and sleep disorders, as seen in Table 15. It was not surprising that the most frequently diagnosed condition was adjustment reaction, as most PCMs will initially diagnose patients with this condition and then refer them to a psychologist or psychiatrist for a definitive diagnosis.

Table 15. Phase One Number of Diagnoses by PDMH Condition

	AE		Control	
Mental Health Diagnosis	N	% Total	N	% Total
Adjustment Reaction (not including PTSD)	**67**	**17.5%**	**641**	**19.3%**
PTSD	**52**	**13.6%**	**310**	**9.4%**
Depressive disorder, not elswhere classified	**44**	**11.5%**	**409**	**12.3%**
Anxiety	**42**	**11.0%**	**369**	**11.1%**
Major Depressive Disorder	**36**	**9.4%**	**274**	**8.3%**
Specfic disorders of sleep of nonorganic origin	**36**	**9.4%**	**249**	**7.5%**
Dysthymic disorder	20	5.2%	114	3.4%
Other anxiety, dissociative and somatoform disorders	19	5.0%	199	6.6%
Organic psychotic conditions	17	4.4%	66	2.0%
Other neurotic, personality, or nonpsychotic mental disorders	15	3.9%	140	4.2%
Alcohol Dependence Syndrome	10	2.6%	52	1.6%
Drug Dependence	6	1.6%	22	0.7%
Personality Disorder	5	1.3%	36	1.1%
Psychosexual dysfunction	5	1.3%	36	1.1%
Acute Reaction to Stress	4	1.0%	67	2.0%
Postconcussion Syndrome	3	0.8%	11	0.3%
Other psychoses	1	0.3%	15	0.5%
Other special symptoms or syndromes, not elsewhere classified	1	0.3%	2	0.1%

Bolded values are the top six most diagnosed PDMH conditions.

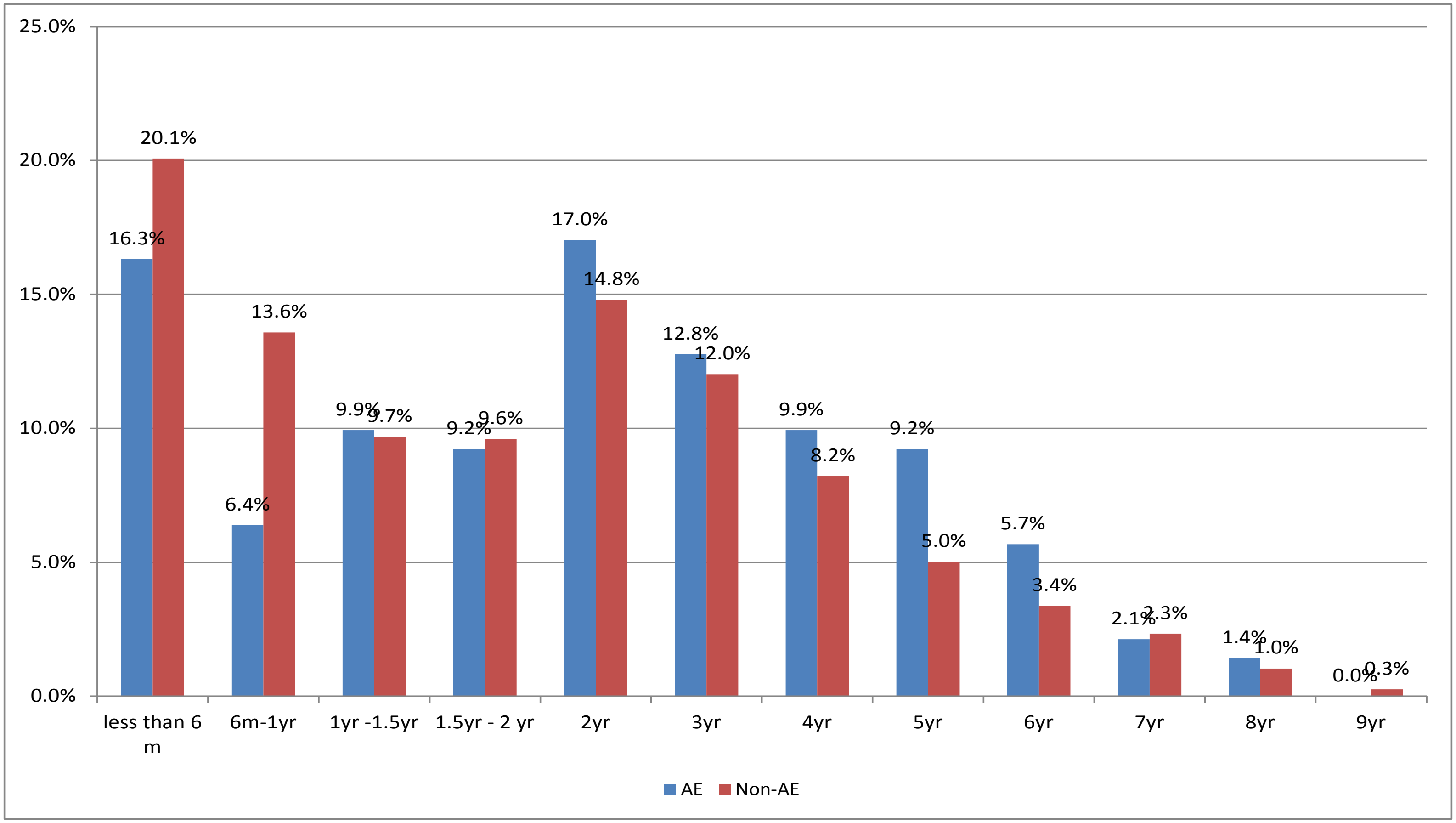
The only condition that was not in the same rank order for non-AE nurses and technicians and the AE crewmembers was PTSD. PTSD was in the top six most diagnosed PDMH conditions for both the AE and non-AE populations. PTSD was the fourth most diagnosed condition for the non-AE population and it was the second most diagnosed condition for the AE population.

Comparatively, the CCATT study found that the six most frequently diagnosed conditions (in highest to lowest order) were: adjustment disorder, anxiety, major depressive disorder, sleep disorders, PTSD, and depressive disorder not elsewhere classified. While in a different rank order, the most frequently diagnosed conditions were the same for both the AE and CCATT populations.

7. Time from Deployment to Diagnosis

The author also explored time from deployment to diagnosis. As expected, both the AE and non-AE populations had a spike in diagnoses immediately upon return from deployments as seen in Figure 16. This pattern is exacerbated by the 1:1 dwell rate for the Active Duty squadrons at Pope AFB, South Carolina and Scott AFB, Illinois. A 1:1 dwell rate means that, for every six months an AE crewmember is at his or her home station, he or she will be deployed for six months. This is an accelerated deployment schedule compared to the USAF goal of a 1:4 dwell rate, which means an Airman deploys for six months and then has eighteen months at home station before deploying again. There is also a secondary spike in diagnoses two and three years after a deployment. This may be due to several reasons. First is the way the inclusion criteria were established for phase one: once participants met the inclusion criteria, their future deployments didn't count. For example, if a participant was deployed four times total, but was diagnosed with a PDMH condition after his or her second deployment, he or she would be counted in the two deployment category. In essence, many participants may have been gearing up for, or returning from, their next deployment two to three years after their last deployment. This is in line with the majority of the other AE squadrons and non-AE nurses and technicians who were deploying at the USAF goal dwell rate of 1:4 (explained above). The dwell rate doesn't take into account humanitarian medical aid missions that are unique to the AE community.

Figure 16. Phase One Time from Last Deployment to Diagnosis of First PDMH condition



B. PHASE TWO

Phase two incorporated different inclusion criteria than the one utilized in phase one. Phase two inclusion criteria differed from that of phase one in five ways: (1) this approach takes into account that there is no time limit after a person experiences a traumatic event to when that person can start to experience symptoms of depression, anxiety, PTSD, etc. Therefore, participants who were diagnosed with a PDMH condition while deployed were included. (2) Phase two also included ICD-9 code 305, which represents drug dependence that includes narcotics and tobacco products. This code was excluded during phase one because of the high number of personnel who use tobacco products, but the author chose to include it in phase two since tobacco can calm a person experiencing stress. (3) To reduce the possibility of type I error an alpha level of .01 was used to make the test more stringent. (4) The author chose to explore the diagnosis rate and number of conditions diagnosed for the AE crewmembers that had pre-existing conditions before their first deployment instead of those who were diagnosed with PDMH conditions after deploying. Personnel with a pre-existing mental health condition are still required to deploy, so it is of interest to determine if their mental health conditions were exacerbated by the deployment experience. (5) Finally, the author chose to analyze the personnel information of the AE crewmembers to determine if life stressors unrelated to the deployment were more frequently seen in diagnosed participants compared to their undiagnosed counterparts. There are daily stressors upon everyone that are potentially exacerbated by a deployment. Hence, it was of interest to see if a relationship existed between the amount of daily life stress and the diagnosis of a PDMH condition. With the two exploratory questions on pre-existing conditions and daily stressors only descriptive statistics were utilized. With the new inclusion criteria, 1,986 AE crewmember and 9,964 non-AE nurses and technicians were included in the analysis. This was an increase of 41 AE crewmembers and 684 non-AE nurses and technicians with a PDMH diagnosis from phase one.

Aside from the new inclusion criteria, two variables were binned differently to gain more fidelity within the analysis. First, age was binned into five-year groupings to get a more precise analysis of the effect of age on the diagnosis rate instead of the ten-year groupings used in phase one. Secondly, the deployment location that was titled "other" in phase one was split into the major geographical commands to determine if there were significant regions within the "other" category that made it significant in the phase one regression model.

For phase two, the dataset was analyzed using the same process from phase one. The four hypotheses were retested to determine if the new datasets produced similar conclusions. The other relevant factors were also retested to determine if they produced similar conclusions. Next a survival analysis was performed to determine the timeframe in which the AE and non-AE populations were diagnosed with a PDMH condition. Then the AE participants with a pre-existing condition were analyzed to determine if a deployment exacerbated their mental health conditions. Finally, six factors from the personnel file that equated to factors on the life stress scale were analyzed to calculate a life stress score. The average life stress score of the diagnosed personnel was compared to the average life stress score of their non-diagnosed counterparts to determine if there was a difference in their life stress level leading up to the diagnosis of the PDMH condition.

As with phase one, the percentage of diagnosed personnel was compared between the AE and non-AE populations, and a Pearson's chi-square test was performed for each variable to determine which sub-populations caused a variable to be significant. Statistics could not be performed to determine if the differences in diagnosis rate between phase one and phase two was significant because the majority of both populations were the same participants, hence the phase one and phase two groups are not independent. Any differences observed were of practical significance. The author defines practical significance as a subjective measure determined by the similarity of the shape of the data and percent difference between the two datasets.

With the majority of the participants in phase two included in phase one, much of the analysis was redundant and produced similar statistical results. Therefore, only the differences between the phase one and phase two results will be discussed in this section.

For more detailed information on the phase two data not presented in this section, refer to Appendix B.

1. Demographic Variables

The demographic breakdown was similar to phase one, with marital status and the number of dependents being the only two demographics that were not significantly different between the two populations (see Table 23 in Appendix B). Rank, component, age, number of deployments, and the deployment location were all significantly different between both populations. The number of deployments and deployment locations were binned differently than phase one. Up to five deployments were displayed to see if there was a difference in diagnosis rate for the third and fourth deployments compared to the first and second, as suggested by a study conducted by the U.S. Army Surgeon General (2008). Also, the deployment location was broken out by component command instead of being binned into 'other,' like it was in phase one. This change helped to determine if there were any other locations in the phase one 'other' category that had a significant association with PDMH diagnosis rate.

The demographics for the AE and non-AE nurses and technicians were compared using a Pearson's chi square test (alpha level of 0.01). This was not done in phase one since phase one mimicked the statistics performed in the CCATT study. Even with the more stringent alpha, the significant differences between the AE and non-AE population demographic variables were the same as phase one. The only two variables that were not significant again were marital status and the number of dependents

2. Study Hypotheses

The results for hypothesis one and two were identical to the findings in phase one. Hypothesis one was still rejected since the diagnosis rate for the AE population was still lower than the diagnosis rate for the non-AE nurses and technicians. Hypothesis two was still rejected. The results from the analysis of the age and rank data again showed that the youngest and lowest ranking AE crewmembers were not the sub-populations with the highest diagnosis rate as hypothesized. For more detailed discussion and the statistical information for hypothesis one and two please refer to appendix B.

a. Hypothesis Three

As with phase one, there was a significant difference in diagnosis rate between the AE population and the non-AE population by the number of deployments completed ($\chi 2$ (5) = 82.1, p-value <.0001). Yet unlike phase one, there was not a steady rise in the diagnosis rate with the increase in deployments completed for AE crewmembers. Surprisingly, there was a continual decrease in the diagnosis rate for the non-AE nurses and technicians with more deployments (See Figure 17). The AE population has a slight peak at two deployments and remains elevated until four deployments. Examining the standardized residuals, the diagnosis rate was lower than expected for the AE population who completed three or fewer deployments compared to their non-AE counterparts, which is consistent with the phase one results (see Table 16). Yet examining the confidence intervals, the only significantly different diagnosis rate was for AE crewmembers that completed two deployments being significantly higher than those who completed five or more deployments. These findings were consistent with phase one and continue to not support *hypothesis three*, which states that the diagnosis rate for AE crewmembers should continue to increase after two deployments

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Figure 17. Phase Two Diagnosis Rate by Number of Deployment Completed

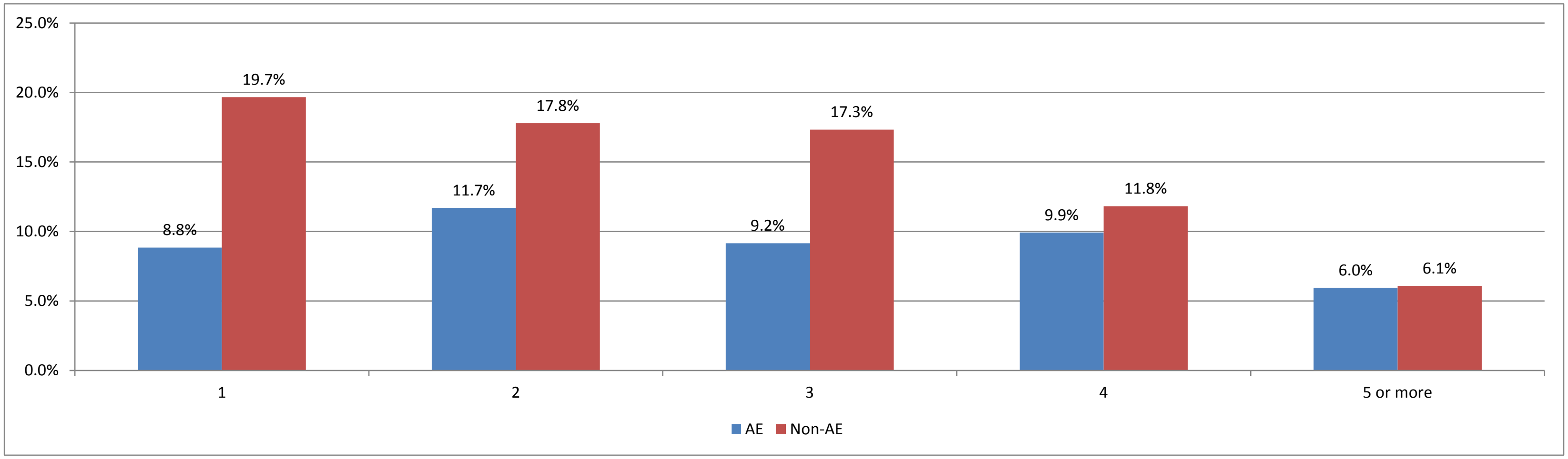


Table 16. Phase Two Statistical Analysis by Number of Deployments Completed

		AE				Non-AE			
		Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate	Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate
# of Deployments									
	1	75	848	8.8%	1.0%	1167	5933	19.7%	0.5%
	2	62	530	11.7%	1.4%	422	2371	17.8%	0.8%
	3	28	306	9.2%	1.6%	169	975	17.3%	1.2%
	4	15	151	9.9%	2.4%	48	406	11.8%	1.6%
	5 or more	9	151	6.0%	1.9%	17	279	6.1%	1.4%
Standardized Residuals (values more extreme than +/- 1.96 consider significant)	1	-6.445	3.052			2.436	-1.154		
	2	-2.810	1.257			1.329	-0.595		
	3	-2.778	1.184			1.556	-0.664		
	4	-0.503	0.180			0.307	-0.110		
	5 or more	-0.043	0.011			0.032	-0.008		
				AE Rate				Non-AE Rate	
95% Confidence Interval				Lower	Upper			Lower	Upper
	1			6.9%	10.8%			18.7%	20.7%
	2			9.0%	14.4%			16.3%	19.3%
	3			5.9%	12.4%			15.0%	19.7%
	4			5.2%	14.7%			8.7%	15.0%
	5 or more			2.2%	9.7%			3.3%	8.9%

b. Hypothesis Four

3. Gender

As with phase one, there was a significant difference in diagnosis rate between the AE population and the non-AE population by gender ($\chi 2$ (2) = 83.25, p-value <.0001). Yet unlike with phase one, the diagnosis rate was higher for females compared to male AE crewmembers as seen in Figure 18. Yet examining the confidence intervals, there was no significant difference between the diagnosis rate for males and females. The standardized residuals, the diagnosis rate for the AE population, both male and female, were lower than expected compared to their non-AE counterparts that had diagnosis rates higher than expected (see Table 17).

This finding does not support *hypothesis four*, which stated that female AE crewmembers would have a higher diagnosis rate than their male counterparts. While it is interesting that the diagnosis rate for females was increased in phase two, the diagnosis rate is so similar to the diagnosis rate determined in phase one that it is of no practical significance.

Figure 18. Phase Two Diagnosis Rate by Gender

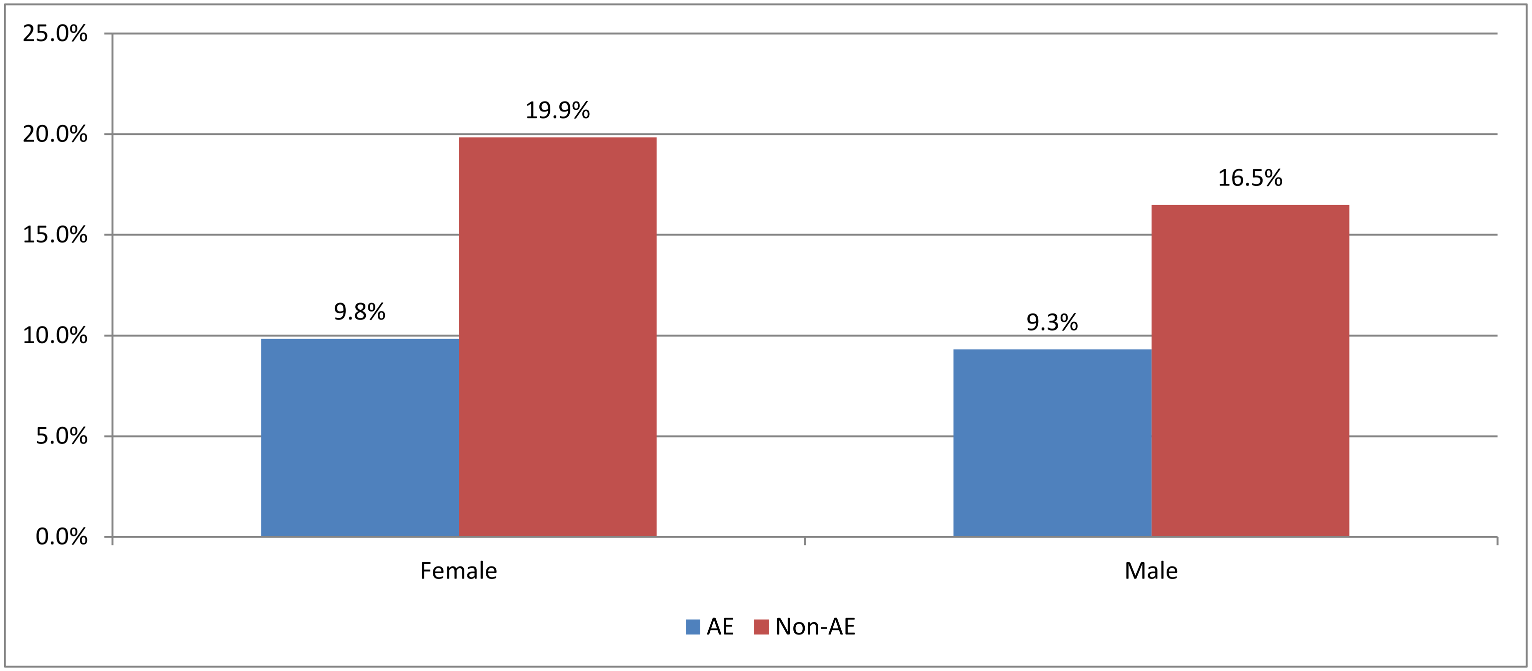


Table 17. Phase Two Statistical Analysis by Gender

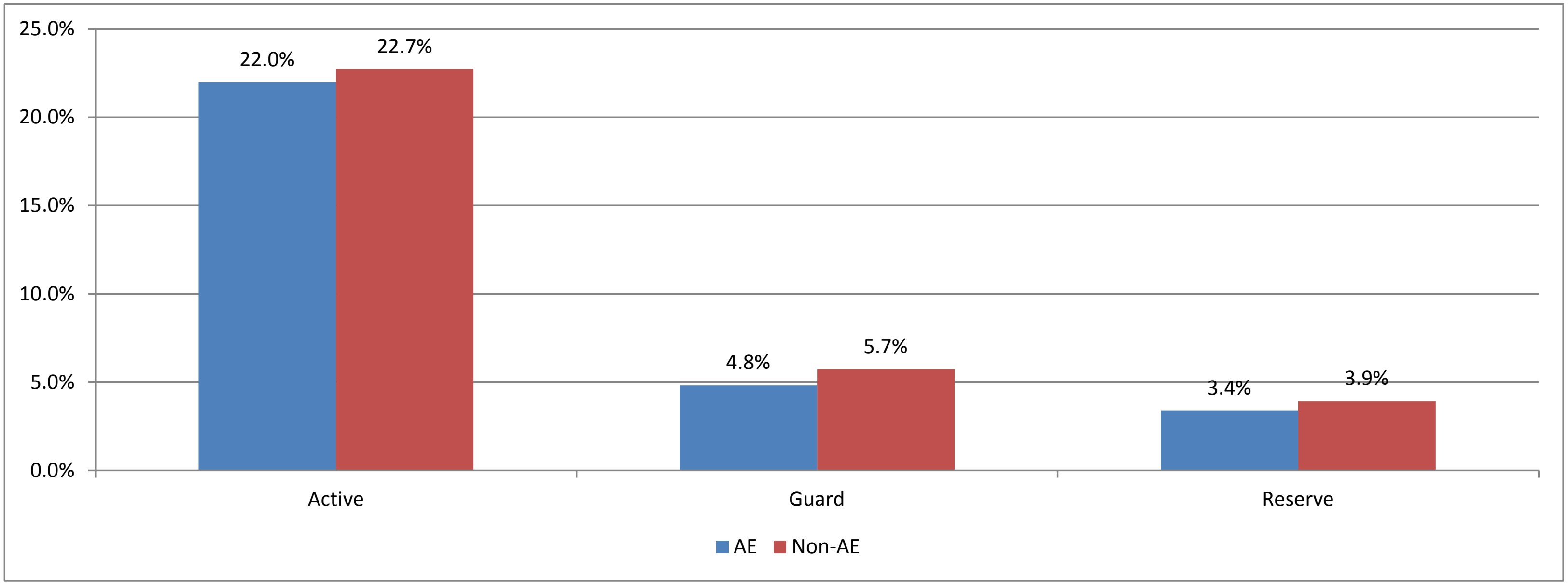
		AE				Non-AE			
		Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate	Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate
Gender									
	Male	75	762	9.8%	1.1%	1062	5350	19.9%	0.5%
	Female	114	1224	9.3%	0.8%	761	4614	16.5%	0.5%
Standardized Residuals (values more extreme than +/- 1.96 consider significant)		Diagnosed	Not Diagnosed			Diagnosed	Not Diagnosed		
	Male	-5.607	2.680			2.116	-1.012		
	Female	-5.128	2.153			2.641	-1.109		
				AE Rate				Non-AE Rate	
95% Confidence Interval				Lower	Upper			Lower	Upper
	Male			7.7%	12.0%			18.8%	20.9%
	Female			7.7%	10.9%			15.4%	17.6%

4. Other Relevant Results

a. Component

Unlike phase one, there was not a significant difference in diagnosis rate between the AE population and the non-AE population by component ($\chi2$ (3) = 1.22, p-value =.747). Phase one found the diagnosis rate was significantly higher for the active duty component for the AE population compared to their non-AE counterparts, yet from Figure 19 that difference was not seen in phase two.

Figure 19. Phase Two Diagnosis Rate by Component



b. Number of Dependents

As with phase one, there was a significant difference in diagnosis rate between the AE population and the non-AE population by the number of dependents ($\chi 2$ (6) = 91.72, p-value <.0001). Yet unlike with phase one, phase two found a steady rise in the diagnosis rate with the increase in number of dependents for non-AE nurses and technicians. Examining the standardized residuals, the diagnosis rates for the AE crewmembers with four or fewer dependents were lower than expected compared to their non-AE counterparts whereas only those with one or fewer dependents was significant in phase one. Yet the confidence intervals show that each sub-population have significant overlap, therefore no significant difference in the diagnosis rate for any of the sub-populations. There was a slight spike in the diagnosis rate for AE crewmembers with three dependents that was not seen in phase one (see Figure 20 and Table 18).

Figure 20. Phase Two Diagnosis Rate by Number of Dependents

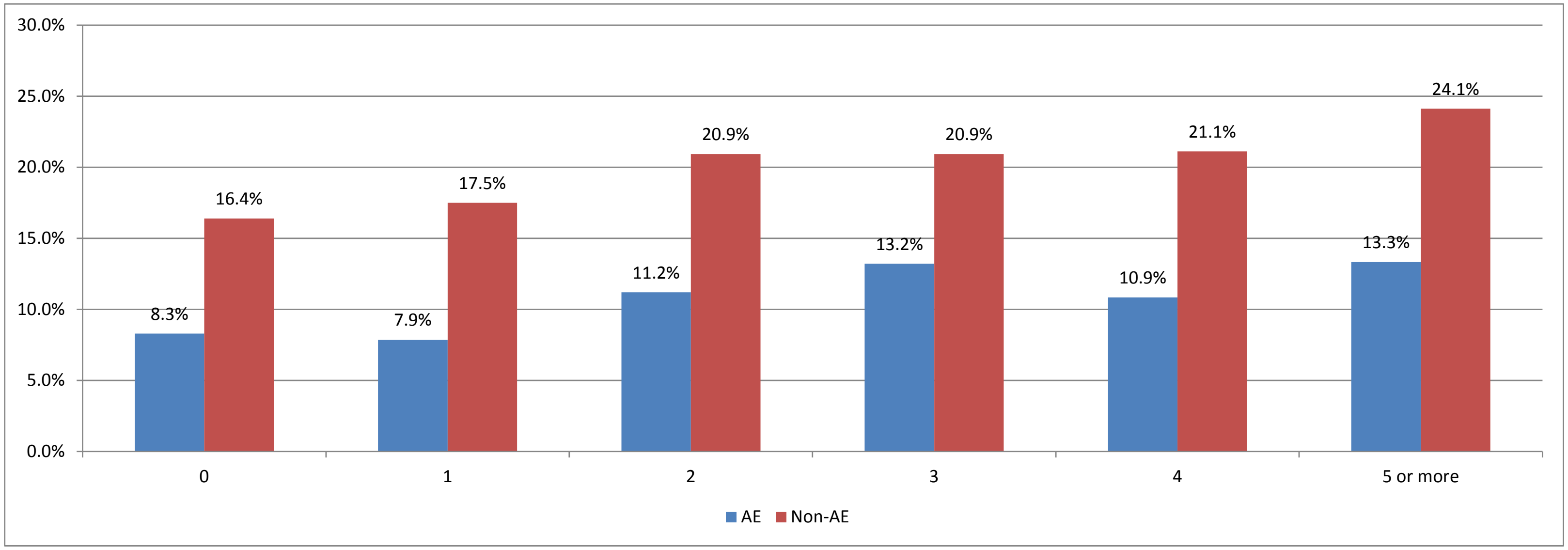


Table 18. Phase Two Statistical Analysis by Number of Dependents

		AE				Non-AE			
		Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate	Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate
# Dependents									
	0	78	941	8.3%	0.9%	762	4649	16.4%	0.5%
	1	28	356	7.9%	1.4%	309	1765	17.5%	0.9%
	2	28	250	11.2%	2.0%	305	1457	20.9%	1.1%
	3	35	265	13.2%	2.1%	256	1223	20.9%	1.2%
	4	14	129	10.9%	2.7%	129	611	21.1%	1.7%
	5 or more	6	45	13.3%	5.1%	62	257	24.1%	2.7%
Standardized Residuals (values more extreme than +/- 1.96 consider significant)		**Diagnosed**	**Not Diagnosed**			**Diagnosed**	**Not Diagnosed**		
	0	-5.332	2.242			2.399	-1.009		
	1	-3.798	1.651			1.706	-0.741		
	2	-2.974	1.464			1.232	-0.606		
	3	-2.337	1.152			1.088	-0.536		
	4	-2.189	1.071			1.006	-0.492		
	5 or more	-1.298	0.700			0.543	-0.293		
				AE Rate				**Non-AE Rate**	
95% Confidence Interval				**Lower**	**Upper**			**Lower**	**Upper**
	0			6.5%	10.1%			15.3%	17.5%
	1			5.1%	10.7%			15.7%	19.3%
	2			7.3%	15.1%			18.8%	23.0%
	3			9.1%	17.3%			18.7%	23.2%
	4			5.5%	16.2%			17.9%	24.3%
	5 or more			3.4%	23.3%			18.9%	29.4%

c. Year of Last Deployment

As with phase one, there was a significant difference in diagnosis rate between the AE population and the non-AE population by year of last deployment ($\chi 2$ (6) = 91.72, p-value <.0001). As with phase one, there was a peak in the diagnosis rate early in OIF/OEF in 2003 and 2004. Unlike with phase one, there wasn’t a spike in the diagnosis rate in 2008 compared to the surrounding year groups (see Figure 21). The dip in diagnosis rate observed in phase one from 2005 to 2007 was dampened significantly in phase two compared to phase one. As seen in Table 19 with the standardized residuals, the diagnosis rate was lower than expected for the AE crewmembers that deployed in 2009, 2011, and 2012. Yet the confidence intervals show a significant overlap for all years accept 2013, indicating that there was no significant difference in the diagnosis rate for each sub-population.

Figure 21. Phase Two Diagnosis Rate by Year of Last Deployment

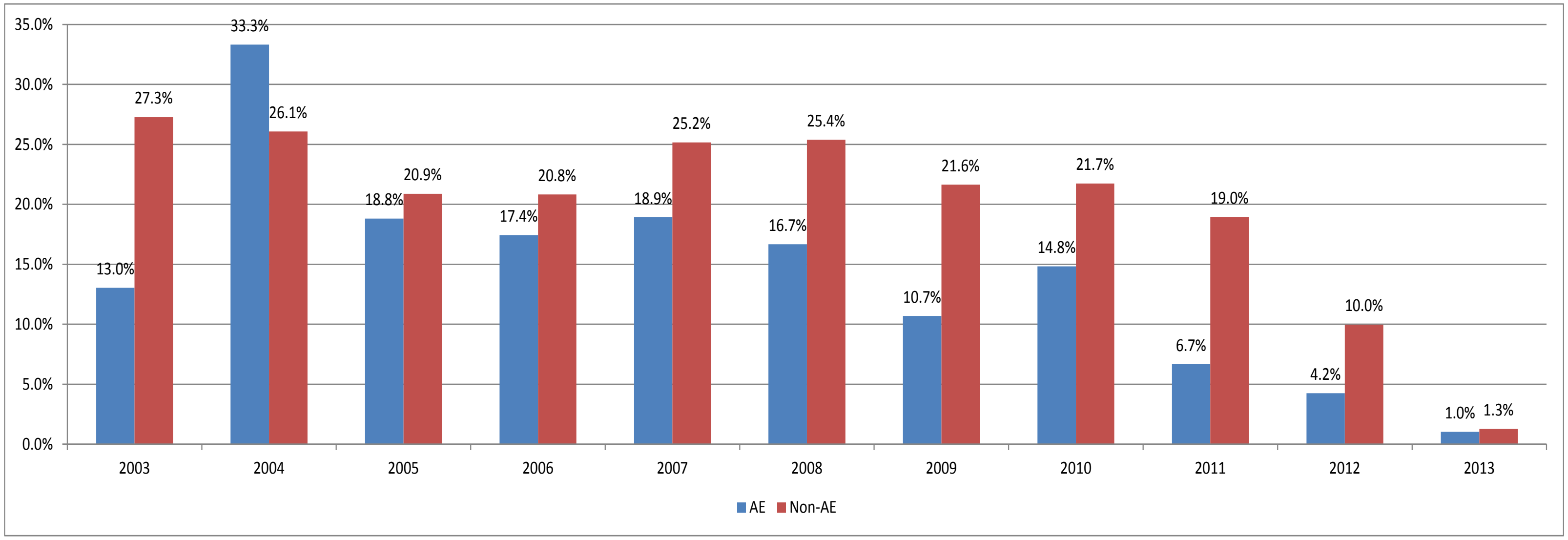


Table 19. Phase Two Statistical Analysis by Year of Last Deployment

		AE				Non-AE			
		Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate	Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate
Year of Last Deploy.									
	2003	3	23	13.0%	7.0%	93	341	27.3%	2.4%
	2004	12	36	33.3%	7.9%	91	349	26.1%	2.4%
	2005	19	101	18.8%	3.9%	176	843	20.9%	1.4%
	2006	15	86	17.4%	4.1%	145	696	20.8%	1.5%
	2007	56	296	18.9%	2.3%	459	1824	25.2%	1.0%
	2008	17	102	16.7%	3.7%	160	630	25.4%	1.7%
	2009	14	131	10.7%	2.7%	189	873	21.6%	1.4%
	2010	27	182	14.8%	2.6%	217	998	21.7%	1.3%
	2011	13	195	6.7%	1.8%	192	1013	19.0%	1.2%
	2012	9	212	4.2%	1.4%	91	912	10.0%	1.0%
	2013	3	291	1.0%	0.6%	10	789	1.3%	0.4%
Standardized Residuals (values more extreme than +/- 1.96 consider significant)		Diagnosed	Not Diagnosed			Diagnosed	Not Diagnosed		
	2003	-1.245	0.745			0.323	-0.193		
	2004	0.763	-0.461			-0.245	0.148		
	2005	-0.408	0.208			0.141	-0.072		
	2006	-0.619	0.314			0.218	-0.110		
	2007	-1.876	1.063			0.756	-0.428		
	2008	-1.543	0.871			0.621	-0.351		
	2009	-2.426	1.221			0.940	-0.473		
	2010	-1.733	0.885			0.740	-0.378		
	2011	-3.493	1.579			1.532	-0.693		
	2012	-2.271	0.710			1.095	-0.342		
	2013	-0.269	0.030			0.163	-0.018		
				AE Rate				Non-AE Rate	
95% Confidence Interval				Lower	Upper			Lower	Upper
	2003			-0.7%	26.8%			22.5%	32.0%
	2004			17.9%	48.7%			21.5%	30.7%
	2005			11.2%	26.4%			18.1%	23.6%
	2006			9.4%	25.5%			17.8%	23.9%
	2007			14.5%	23.4%			23.2%	27.2%
	2008			9.4%	23.9%			22.0%	28.8%
	2009			5.4%	16.0%			18.9%	24.4%
	2010			9.7%	20.0%			19.2%	24.3%
	2011			3.2%	10.2%			16.5%	21.4%
	2012			1.5%	7.0%			8.0%	11.9%
	2013			-0.1%	2.2%			0.5%	2.0%

5. Model to Predict Significant Factors of PDMH Diagnosis

As with phase one, multiple regression was used to determine which of the variables were significant in contributing the diagnosis rate of a PDMH condition. Again, the regression was completed three separate times: (1) for all the nurses and technicians who deployed at least once; (2) for just the AE population, and (3) just for the non-AE population (see Table 20).

Table 20. Phase Two Multiple Regression Coefficients

Variable		Total Population Model	AE Model	Non-AE Model
Component				
	Active Duty	0.139	0.127	0.142
		(S.E. = .006, p-value <.0001)	(S.E. = .011, p-value <.0001)	(S.E. = .007, p-value <.0001)
	Guard	-0.051	-0.05	-0.051
		(S.E.=.007, p-value < .001)	(S.E.=.010, p-value < .001)	(S.E.=.009, p-value < .001)
	Reserve	-0.087	-0.078	-0.091
		(S.E.=.007, p-value < .001)	(S.E.=.010, p-value < .001)	(S.E.=.009, p-value < .001)
Deployment Location				
	Iraq	0.060	0.067	0.06
		(S.E.=.009, p-value <.0001)	(S.E.=.025, p-value= .006)	(S.E.=.010, p-value <.0001)
	EUCOM	-0.059	--	-0.057
		(S.E.=.027, p-value= .027)		(S.E.=.029, p-value= .047)
	CENTCOM	-0.046	--	-0.052
		(S.E.=.015, p-value= .003)		(S.E.=.017, p-value= .002)
	Qatar	--	0.050	--
			(S.E.=.022, p-value= .022)	
Gender				
	Male	-0.026	--	-0.029
		(S.E.=.004, p-value <.0001)		(S.E.=.004, p-value <.0001)
	Female	0.026	--	0.029
		(S.E.=.004, p-value <.0001)		(S.E.=.004, p-value <.0001)
# Deployments Completed				
		-0.027	-0.019	-0.031
		(S.E.=.003, p-value <.0001)	(S.E.=.004, p-value <.0001)	(S.E.=.004, p-value <.0001)
Age				
		0.004	--	0.005
		(S.E.=.001, p-value <.0001)		(S.E.=.001, p-value <.0001)

(S.E. = standard error)

As with phase one, three factors were determined to best predict the diagnosis rate of AE crewmembers. The three factors include an AE crewmember's component, deployment location (specifically, Iraq and Qatar) and the total number of deployments completed. These are the same factors as in phase one, except that Qatar was included in the phase two model while Kuwait was included in phase one. As with phase one, none of the significant factors were personal in nature. The R-squared value was only slightly higher than phase one at .11.

Using the same female example from phase one, a female flight nurse who is a major on active duty, married with one child (2 dependents, husband and child), is 30 years old, and recently completed her third deployment to Iraq, would have a 9.7% chance of being diagnosed with a PDMH condition. The phase two predictive diagnosis rate is slightly (0.8%) higher than the phase one AE model.

Compared to their non-AE counterparts, six factors were determined to be the best model to predict PDMH diagnosis rate. Compared to the non-AE model in phase one, there was one additional factor in the phase two model. These six factors include component, gender, number of dependents (specifically, one), age, deployment location (specifically, Iraq, CENTCOM, and EUCOM), and the number of deployments completed. These were the same factors found significant in phase one with the addition of the number of dependents. The R-squared for the model was low at .082, but is stronger than phase one (.053). Once again using the same example as phase one, a female clinical nurse with same profile used with the AE model above, has a 29.1% chance of being diagnosed with a PDMH condition.

As with the non-AE model, a total population model used six significant factors to best model the diagnosis rate for the total study population: component, gender, number of dependents (specifically, one), age, number of deployments completed, and the deployment location (specifically, Iraq, CENTCOM, and EUCOM). These same factors were significant in phase one with the addition of the number of dependents. With the relatively small size of the AE population compared to the non-AE population, the total population model is clearly driven by the non-AE factors. The model had an R-squared value of .089, which is stronger than phase one (.059). Finally, the same clinical nurses above would have a 27% chance of being diagnosed with a PDMH condition.

6. Diagnosed Populations

As with phase one, over 70% of the diagnoses were encompassed within the first six listed conditions for both the AE and non-AE populations, as seen in Table 21. The diagnosis of nondependent abuse of drugs was the most diagnosed condition for AE crewmembers. With respect to this study, it refers specifically to the use of tobacco as military members are regularly screened to the use of illegal narcotics and not-prescribed medications. Interestingly, nondependent abuse of drugs was not the highest ranked diagnosis for the non-AE population, suggesting that more AE crewmembers smoke, or at least are trying to stop smoking than their non-AE counterparts. The second most frequently diagnosed condition was adjustment disorder. This finding is in line with phase one; this is expected as PCMs frequently diagnose patients with adjustment disorder before referring them to psychologists or psychiatrists. The other four conditions in the top six were also consistent with phase one, aside from major depressive disorder falling off the list.

Table 21. Phase Two Number of Diagnoses by PDMH Condition

Mental Health Diagnosis	AE N	AE % Total	Non-AE N	Non-AE % Total
Nondependent Abuse of Drugs	74	**16.6%**	519	**11.4%**
Adjustment Reaction (not including PTSD)	67	**15.0%**	924	**20.3%**
PTSD	63	**14.1%**	449	**9.9%**
Depressive disorder, not elswhere classified	53	**11.9%**	705	**15.5%**
Specfic disorders of sleep of nonorganic origin	42	**9.4%**	326	**7.2%**
Anxiety	36	**8.1%**	391	**8.6%**
Other anxiety, dissociative and somatoform disorders	19	4.3%	225	5.0%
Dysthymic disorder	18	4.0%	169	3.7%
Other neurotic, personality, or nonpsychotic mental disorders	17	3.8%	252	5.5%
Psychosexual dysfunction	15	3.4%	63	1.4%
Major Depressive Disorder	11	2.5%	194	4.3%
Drug Dependence	8	1.8%	42	0.9%
Alcohol Dependence Syndrome	7	1.6%	71	1.6%
Organic psychotic conditions	5	1.1%	26	0.6%
Acute Reaction to Stress	4	0.9%	74	1.6%
Personality Disorder	3	0.7%	63	1.4%
Postconcussion Syndrome	3	0.7%	17	0.4%
Other special symptoms or syndromes, not elsewhere classified	1	0.2%	5	0.1%
Other psychoses	0	0.0%	28	0.6%

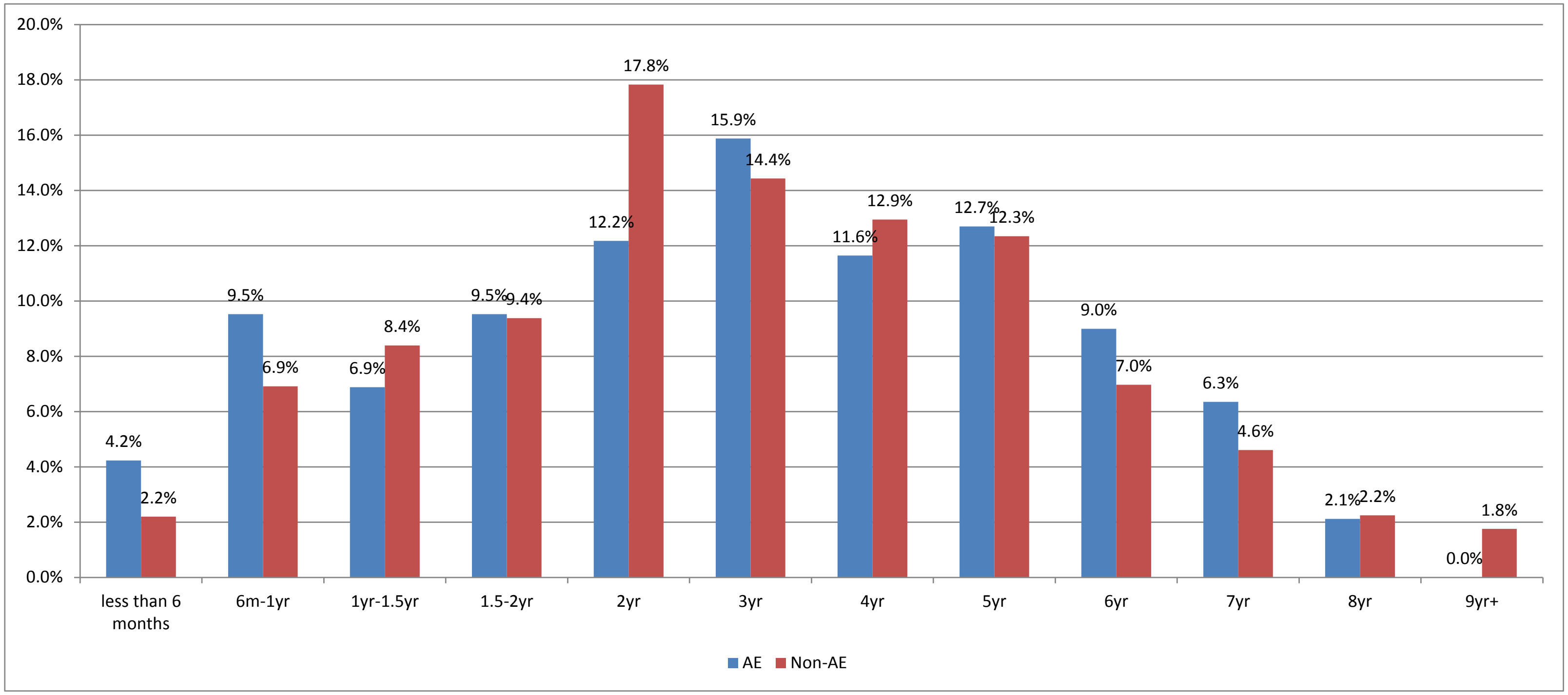
Bolded values are the top six most diagnosed PDMH conditions

Unlike phase one, more AE crewmembers were diagnosed with sleep disorders. This suggests that the AE crewmembers were affected by the flight schedule and unpredictable work schedule associated with the deployed medical mission more than their non-AE counterparts. Once again, PTSD was ranked higher for the AE population than the non-AE population.

7. Time from Deployment to Diagnosis

Phase two used the deployment start date to count any PDMH diagnosis, whereas phase one used the deployment completion date. The findings of phase two are more normalized in that they account for the different deployment lengths. Also, with the majority of the deployments being six months or longer, phase two accounts for those participants who sought medical help for mental health conditions while deployed. Still, there was a slight spike in diagnoses at six months to one year from the start of the deployment, as seen in Figure 22, which encompassed many participants who had recently returned from a deployment. The most frequent time period to be diagnosed with a PDMH condition was between the second and third year after the start of a deployment. This corresponded to the time frame many participants would start preparing for their next deployment. Thereafter, the diagnosis rate for a PDMH condition gradually decreases to the last diagnosis in the dataset at nine plus years.

Figure 22. Phase Two Time From Last Deployment to Diagnosis of First PDMH Condition

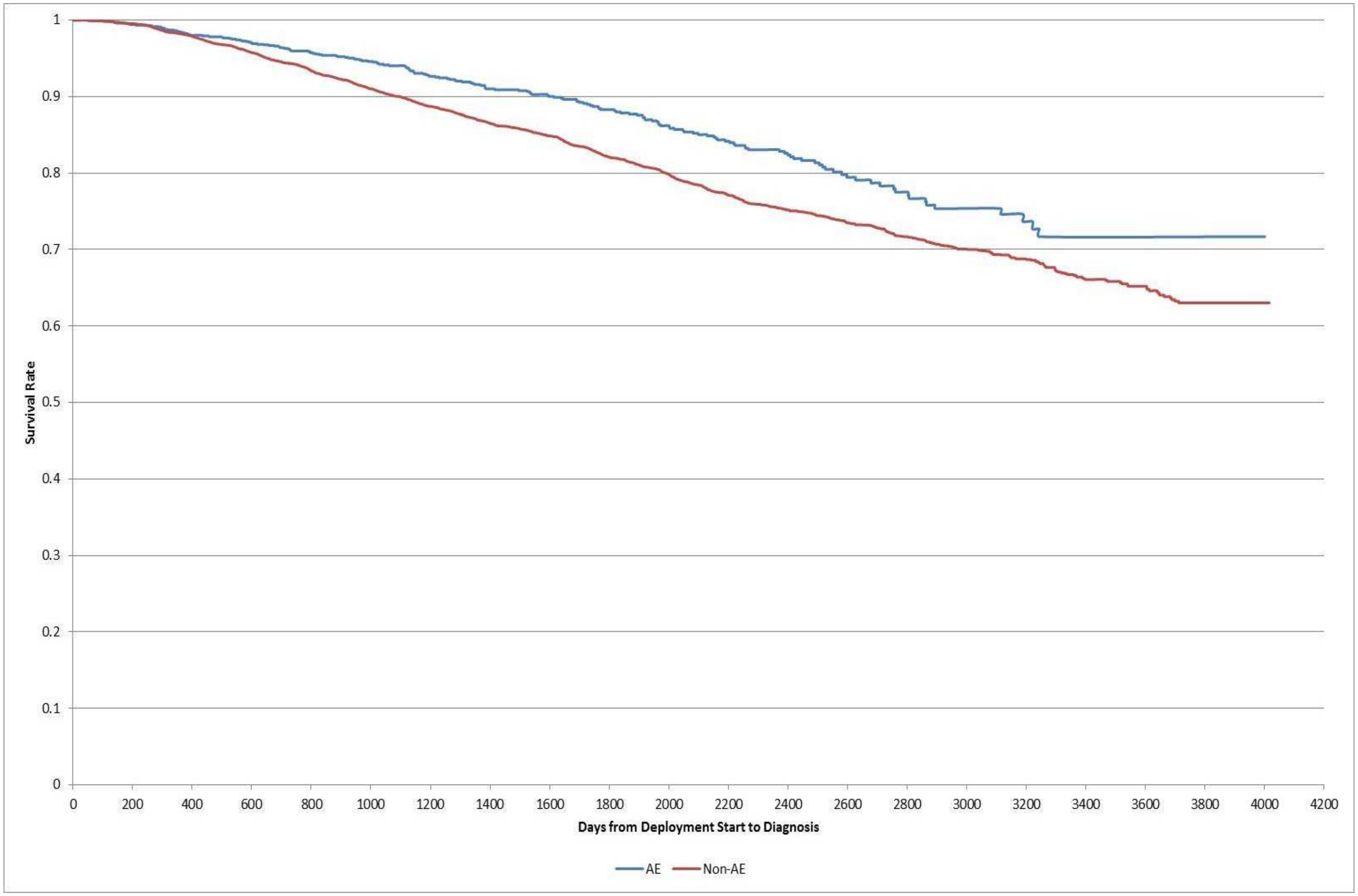


C. SURVIVAL ANALYSIS

Survival analysis was conducted to better understand the time frame and rate in which participants were diagnosed with PDMH conditions Survival analysis is a statistical analysis method that tracks a variable of interest until an event of interest occurs; in other words, it indicates the amount of time from a 'start point' until the event of interest occurs (Hosmer, Lemeshow & May, 2008). Higher survival rates mean longer time until the event of interest happens. In this study, the event of interest was the diagnosis of a PDMH condition. The diagnostic status of each participant in the entire population is taken at start of a participant's deployment (i.e., time zero in figure 23) to either a diagnosis of a PDMH condition or, for those participants without a PDMH diagnosis, to the end of the study was graphed to determine the overall "survival" rate for the AE and non-AE population.

As Figure 23 below shows, AE crewmembers had a higher survival rate, 0.7168, compared to their non-AE counterparts, who had a survival rate of 0.6302. Aside from fewer participants being diagnosed with a PDMH condition, the AE population was diagnosed at a slower rate than their non-AE counterparts as seen in the more gradual slope of the AE line compared to the non-AE line. JMP version 10 (SAS Institute, Inc., Cary, North Carolina) and Microsoft Excel (2010) were used to calculate the survival rate.

Figure 23. Kaplan-Meier Estimate of the Survival Function



D. RESEARCH QUESTION THREE

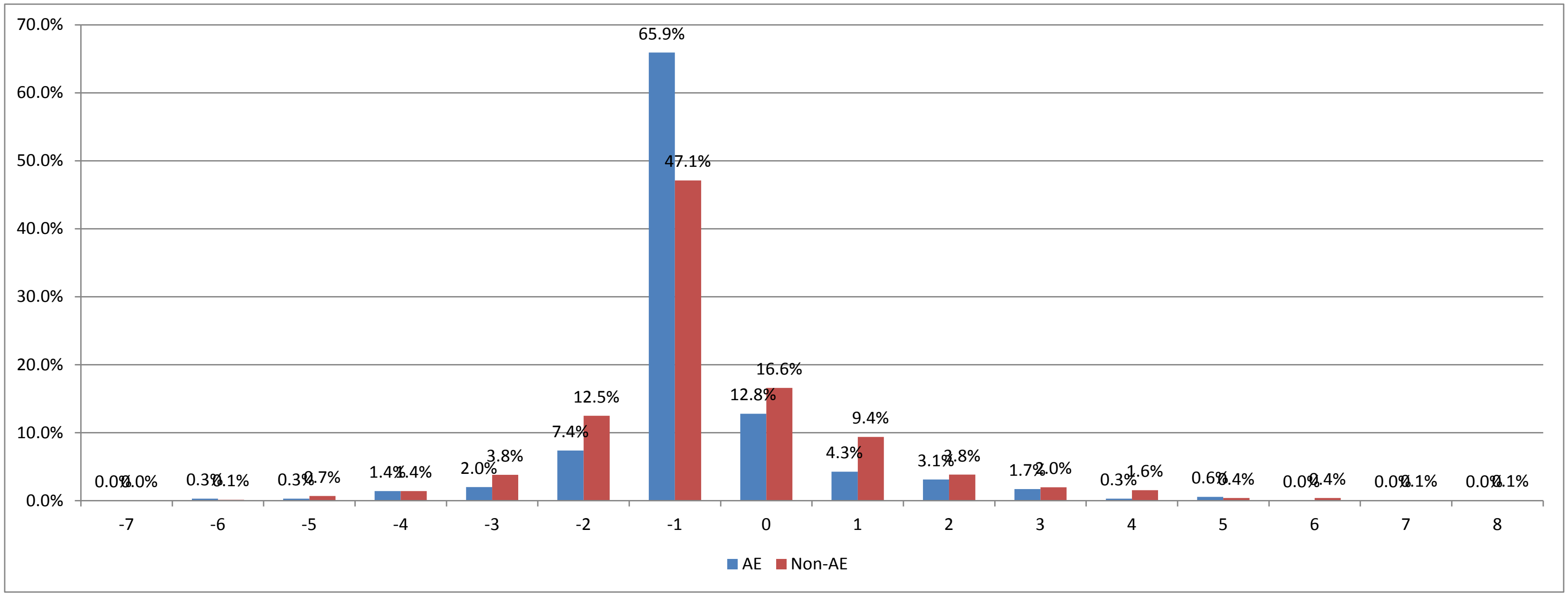
Due to time constraints and the opportunity to assess pre-existing mental health conditions and psychological resilience, the author decided to not attempt research question three. Research question three addressed PDHA DD 2796 data, which could potentially determine which environmental/occupational factors contribute to a higher risk of PDMH conditions. Instead of pursuing this research question, an analysis was conducted on the sub-population with a pre-existing mental health conditions and psychological resilience. Specifically, the author analyzed whether a member of the sub-population was at a higher risk of being diagnosed with PDMH conditions if his or her previous condition(s) was exacerbated by certain life events. Also, the author used the Holmes-Rahe Life Stress Scale to analyze the relationship between everyday life stressors and PDMH diagnoses.

E. PRE-EXISTING CONDITIONS

Participants with pre-existing conditions prior to their first deployments were filtered from the dataset. Because the personnel data analyzed were from the last deployment prior to being diagnosed with a PDMH condition, the author was unable to include the pre-existing participants in the phase one and phase two analyses related to the four hypotheses. However, the author notes participants with pre-existing conditions were still required to deploy. Therefore, it was of interest to explore whether participants with pre-existing conditions were diagnosed with more mental health conditions post-deployment compared to those participants without a pre-existing condition. So this exploratory section on pre-existing conditions used the population with pre-existing conditions that was filtered out from the phase one and phase two datasets related to the four hypotheses. Also, it was of interest to compare the time participants with a pre-existing mental health condition were diagnosed with a PDMH condition after deploying compared to those participants without a pre-existing condition.

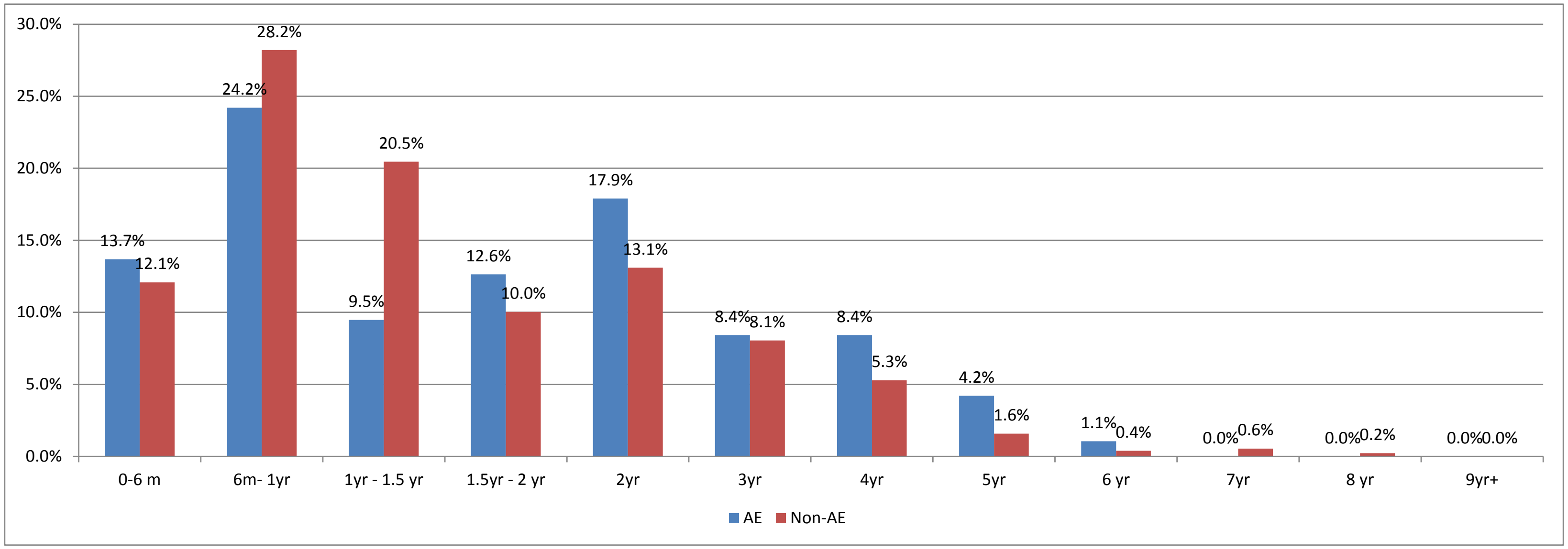
During the 2003-2013 timeframe, 352 AE crewmembers and 2,772 non-AE nurses and technicians deployed with a pre-existing mental health condition. For those participants with a pre-existing condition, the number of total diagnosed conditions ranged from one to seven. The majority of participants with a pre-existing condition had only one diagnosis. Compared to the number of conditions a participant was diagnosed with prior to deploying, the majority of participants were diagnosed with fewer mental health conditions after deploying. As seen in Figure 24 below, approximately 90% of AE crewmembers and 80% of non-AE nurses and technicians had the same number or fewer number of conditions after deploying compared to their number of pre-existing conditions. This is not to say that participants were not still suffering from pre-existing conditions, only that they did not seek medical attention for pre-existing conditions. It was a limitation of the study that medical records were used to determine a diagnosis, so a participant had to seek medical attention to qualify for the diagnosed population.

Figure 24. Delta in Number of Conditions of Participants with a Pre-existing Mental Health Condition Prior to Deploying Compared to Post-Deployment



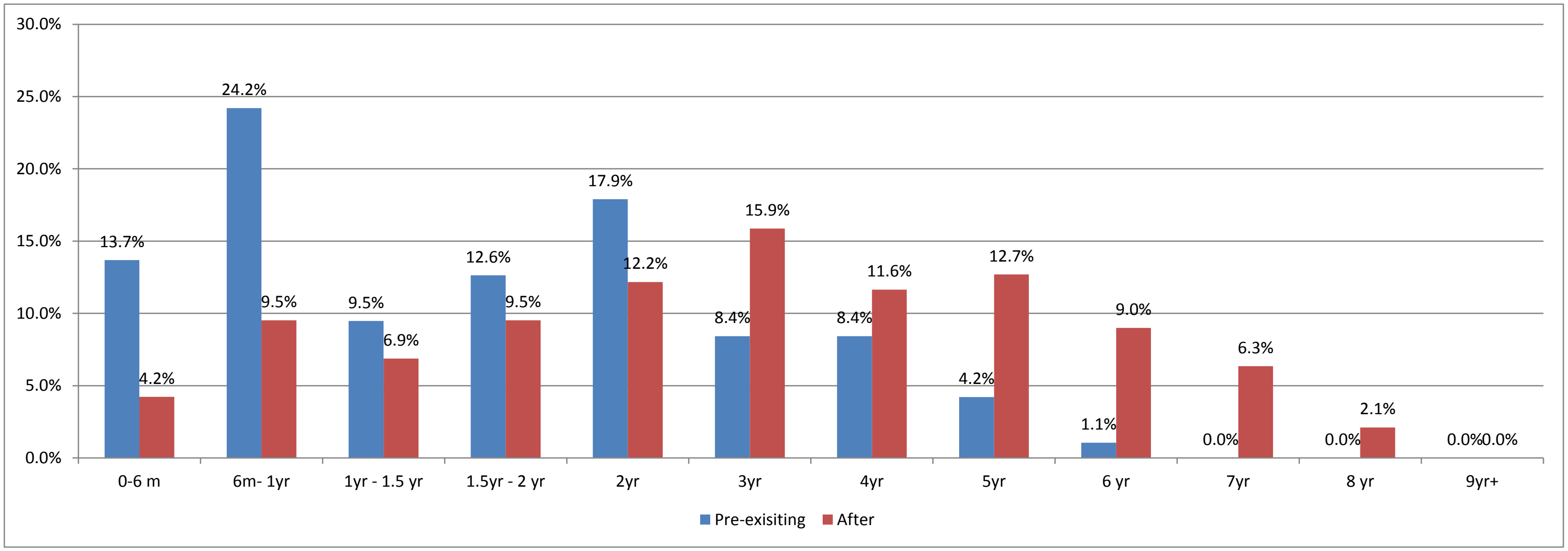
The author also wanted to determine how quickly those participants with a pre-existing condition sought medical attention to address the pre-existing condition or for a newly diagnosed condition post-deployment. When AE and non-AE populations were compared, both populations had a spike between six months and one year post-deployment. As seen in Figure 27 below, there is a spike for both the AE and non-AE populations of participants seeking medical attention for a PDMH condition between two and three years after the start of a deployment. This corresponds to the deployment dwell rate for the medical community; hence, the participants may be preparing for or on a subsequent deployment. This was similar to the timeframe observed in the phase one and phase two analyses.

Figure 25. Time from Deployment Start to Time of Diagnosis Comparing AE and Non-AE Populations with Pre-existing Conditions



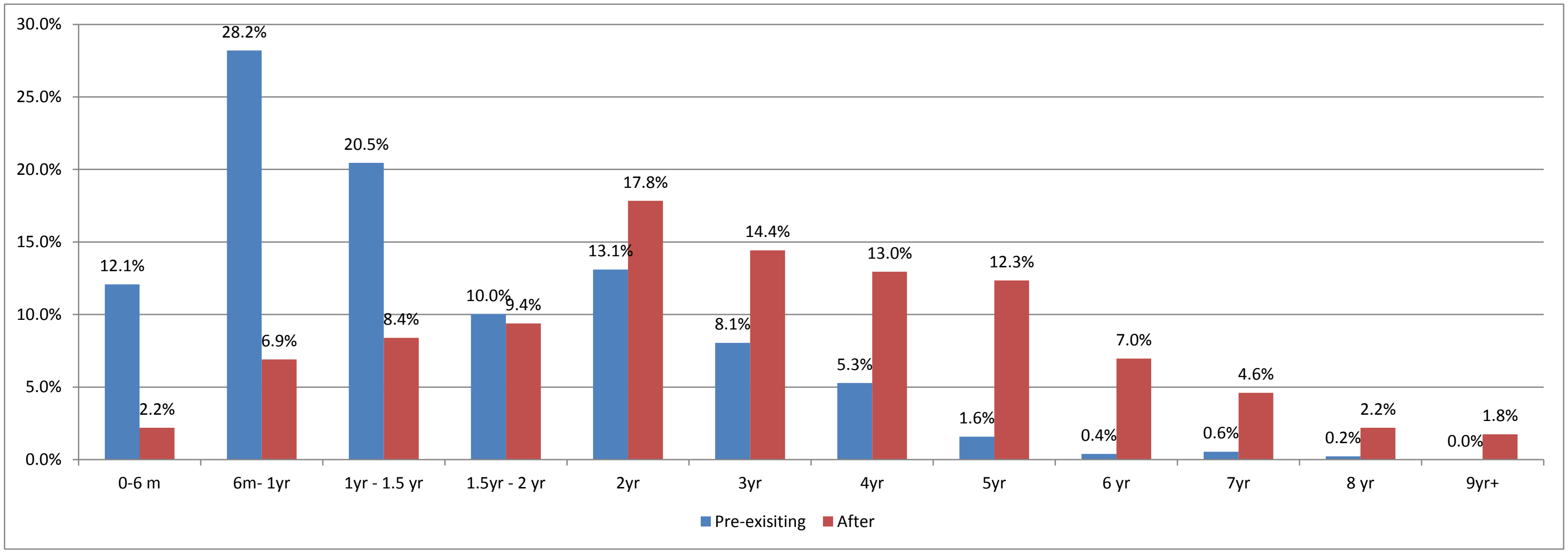
Comparing the AE pre-existing sample to the AE sample without a pre-existing condition, the pre-existing sample sought medical attention sooner than their counterparts with no pre-existing condition (see Figure 26).

Figure 26. Time from Deployment Start to Diagnosis Comparing AE Participants with a Pre-existing Mental Health Condition to Those Without a Pre-existing Condition



Comparing the non-AE pre-existing sample to the non-AE sample without a pre-existing condition resulted in a similar trend of those with a pre-existing condition seeking medical attention sooner than their counterparts with no pre-existing condition. Figure 27 shows a similar spike between six months and one year and between the second and third year after the start of a deployment. These again correspond to the typical reintegration phase from the initial deployment and the pre-deployment spin-up for a subsequent deployment.

Figure 27. Time from Deployment Start to Diagnosis Comparing Non-AE Participants with a Pre-existing Mental Health Condition to Those without a Pre-existing Condition



F. HOLMES-RAHE LIFE STRESS SCALE

In 1967, psychiatrists Thomas Holmes and Richard Rahe created the Holmes-Rahe Life Stress Scale to help the Canadian government predict which citizens were at a higher risk of disease. Homes and Rahe found a correlation of .118 between 43 stressful life events and patient health. When using the Holmes-Rahe Life Stress Scale, participants are asked to tally which of the forty-three events occurred in the preceding one-year time period. Events have various scores associated with them, with higher scores indicating more stressful events. For example, getting married is assigned 50 points whereas getting a divorce is assigned 73 points. The scores are then summed up for an overall score. A score over 300 points indicates that the person is at a higher risk of illness (Holmes & Rahe, 1967). A complete copy of the Holmes-Rahe Life Stress Scale can be found in Appendix C.

While every deployment experience comes with its own distinct stressors, Soldiers must still contend with everyday life stressors. These everyday stressors can occur during deployment spin-up, during a deployment, and during the re-integration phase. To explore if these daily life stressors can exacerbate deployment stressors, and thereby increase the risk of being diagnosed with a mental health condition, the author analyzed the daily life stressors that were attainable from the personnel file.

The life stressors that were attainable from the personnel file include: change in rank for either a promotion or a demotion, change in marital status, pregnancy, gain of a family member, change in career field, and change of component. These changes had to occur in the preceding three years from the last deployment prior to being diagnosed with a PDMH condition. For example, if a participant was deployed and diagnosed with a PDMH condition in 2010 then personnel information was used from 2007, 2008, 2009, and 2010. There had to be at least two years' worth of personnel information to have a participant included in the scoring. For example, if someone was deployed and diagnosed in 2003, he or she would be excluded from the scoring since the dataset started in 2003 and there was not enough information to calculate a change in status.

This analysis used the same point assignment as in the Holmes - Rahe Life Stress Scale. The change in rank, career field, and component were all considered “a change in responsibilities at work.” These participants were given a score of 29 points. A participant with a marital status that went from single to married was given a score of 50 points. A participant with a marital status that went from married to divorced, annulled, or legally separated was given a score of 73 points. A female participant who had a positive change in the number of dependents greater than one, (because going from zero to one dependent may have been adding a spouse) was given a score of 40 for a pregnancy. Participants, both male and female, who had a positive change in the number of dependents greater than one was given a score of 39 for “gain of a family member.” These scores were summed up for a total score.

Descriptive statistics were conducted on the scores for both the AE diagnosed and not-diagnosed (control) populations. The results are summarized in Table 22 below. The average score for the AE diagnosed population was 27.25 compared to the AE non-diagnosed control population had an average score of 22.48.

Table 22. Descriptive Statistics of AE population Holmes-Rahe Life Stress Scores

	Diagnosed AE Pop.	Not Diagnosed AE Pop.
N	1813	9080
Mean	27.25	22.48
Median	0	0
Standard Deviation	36.96	29.71
Range	237	339
Lower 95%	25.55	21.87
Upper 95%	28.96	23.09

A nonparametric, Wilcoxon, test was conducted because the score distributions had a significant skew to the left. A significant difference between the two scores was found ($t(2302.04) = -5.18$, p value <0.0001). This result supports the hypothesis that, while the personnel file is clearly unable to account for all of someone's daily life stressors, there was an increased life stress score for the diagnosed population compared to the control population.

G. SUMMARY OF RESULTS

In conclusion, AE crewmembers have a lower diagnosis rate than their non-AE counterparts. A less experienced AE crewmember is at greater risk of being diagnosed with a PDMH condition. AE crewmembers may have a higher diagnosis rate with the completion of more deployments. Females had essentially the same diagnosis rate as their male counterparts. Finally, technicians had a higher diagnosis rate compared to their nurse counterparts. These sub-populations may warrant further analysis within the broader USAF community to identify any macro trends.

The analysis performed on pre-existing conditions and the Holmes-Rahe Life Stress Scale highlight the contribution of human psychology in trying to build a predictive model. Having a pre-existing condition does not appear to predispose an AE nurse or technician to future PDMH condition diagnosis. Every Airman is an individual and deploying does not necessarily increase the diagnosis rate for a PDMH condition. The majority of the participants in the study were never diagnosed with a PDMH condition despite completing several deployments downrange and/or humanitarian missions. Airmen are not only affected by major life disruptions, such as a deployment, but also by everyday life stressors that may accumulate until they manifest into a PDMH condition.

V. DISCUSSION

This study contributed to a growing body of research relevant to mental health and USAF medical professionals. The implications of the results presented in Chapter IV will be discussed in this chapter. Each hypothesis will be reviewed with respect to both the data analysis conducted in the last chapter and the literature cited in Chapter II. Overall, the findings for hypothesis one and three supported the cited literature. Conversely, the findings for hypothesis two and four differed from recent studies and more research is needed in both of those areas.

(1) Hypothesis one: the AE population would have a higher diagnosis rate than the non-AE population

The results from both phase one and phase two did not support hypothesis one. In fact, the diagnosis rate for the AE population was lower than the rate for non-AE nurses and technicians. This was consistent with the findings from the CCATT study that the CCATT population had a lower diagnosis rate than its ground-based counterparts.

The findings of this thesis and the CCATT study support previous research that supports the theory that ground-based military medical personnel (in this case, non-AE nurses and technicians) who are exposed to combat and treat gruesome wounds are more like to be diagnosed with PDMH conditions (Shen, Arkes & Pilgrim, 2009; Jones et al., 2008; Gibbons et al., 2012). Per AFI 11-2AE, Aeromedical Evacuation Operations Procedures, patients need to be stabilized for flight, unless in extreme cases in which patient safety requires expedited removal from their current location (Department of the Air Force, 2013). Hence, the non-AE nurses and technicians are the frontline responders, treating patients prior to being stabilized. The non-AE nurses and technicians are also treating patients who expire from their injuries before ever being stabilized for aeromedical evacuation. This exposure to more gruesome injuries and casualties could create more traumatic combat experiences for the non-AE nurses and technicians compared to those of the AE crewmembers.

(2) Hypothesis two: AE crewmembers with less than one year experience in their respective career fields would have a higher diagnosis rate of PDMH conditions than more experienced AE crewmembers

The results from this study did not support hypothesis two. The variables of age and rank were used as metrics for experience. The results showed that the diagnosis rate for both age and rank approximated a bell curve. That is, diagnosis rate was lower for lower ranking enlisted personnel and higher for mid-grade non-commissioned officers. The diagnosis rate for the officers was of no significant difference between the ranks. The younger and older participants had the lowest diagnosis rate, while the middle age range had the highest diagnosis rate. Yet there was no significant difference in the diagnosis rates among all age groups.

With respect to the younger participants and participants of lower ranks, the results showed that they were more likely to be single than their older counterparts. The analysis performed in chapter four found that single participants had the lowest diagnosis rate of all the sub-populations within the marital status factor. The author also speculates that participants lower in rank have fewer supervisory and extraneous duties compared to their higher ranking counterparts. The additional duties could add to the overall stress level of higher ranking participants, making them more susceptible to a PDMH condition. More research is needed in this area.

The lack of support for hypothesis two contradicts a 2008 report by the Office of the Surgeon General United States Army Medical Command, which found a higher PTSD diagnosis rate for Soldiers that were ranked E-4 and lower. This contradiction may be due to AE crewmembers being older on average (see Table 1 and Table 23) than the general Soldier population in the Army. The AE technician must first complete the aerospace medical technician training and then can apply for an AE technician position. Flight nurses are in a similar situation where they must complete their nurse training and then complete flight nurse specific training. This additional experience may contribute to the AE crewmember's overall psychological resiliency level, buffering them against future psychological stressors. More research also needs to be conducted in this area.

While not directly related to hypothesis two, the author suspects that the lower diagnosis rate for the older and higher ranking participants was due to their experience prior to the start of OIF/OEF and the nature of their deployed duties. The author speculates that the older participants had some military medical experience prior to the start of OIF/OEF, whereas the mid-range participants with the highest diagnosis rates had been performing their mission only during a time of conflict. Also, the duties of participants that are more senior in rank tend to shift from tactical duties, where they provide frontline medical treatment, to supervisory duties, where they would be a squadron/medical unit commander. Both of the aforementioned ideas need further exploration.

The lack of support for hypothesis two also counters a study Paul et al. (1985) conducted on Vietnam nurses that found that those nurses with less than six months of military experience prior to deploying were at the highest risk of being diagnosed with a PDMH condition. While there are no data to support the following ideas, the author offers a few possible explanations for the difference in the findings. First, while nurses in both conflicts were volunteers, a majority of the nurses in Vietnam were trained just prior to deploying, deployed for one year, then returned home with most not deploying again. This is a different deployment model than what the USAF employed during the timeframe of this study (2003-2013). Second, in both conflicts, medical professionals treated wounds that were caused by emerging tactics and were particularly gruesome. However, available medical equipment, treatment procedures, and aeromedical evacuation procedures have changed greatly in the fifty-years since the Vietnam conflict. These changes have resulted in increased survival rates, which may have contributed to decreased PDMH diagnosis rates observed in more recent conflicts.

(3) Hypothesis three: AE crewmembers that had completed two or more deployments would have a higher diagnosis rate of PDMH conditions than AE crewmembers that had completed only one deployment

The results of this study did not support hypothesis three. There was no significant difference in the diagnosis rate by number of deployments completed, expect for phase two found that the diagnosis rate was significantly lower for those participants who completed five or more deployments. This pattern was different than the findings of the CCATT study that found that CCATT members who deployed two or more times had a slightly lower diagnosis rate compared to those CCATT members who only deployed once. The increase in diagnosis rate is partially supported by the study performed by the Office of the Surgeon General United States Army Medical Command (2008) that found the number of PTSD diagnoses increased for soldiers who deployed three or more times.

(4) Hypothesis four: female AE crewmembers would have a higher diagnosis rate of PDMH conditions compared to their male counterparts

The results of this study do not support hypothesis four. Female AE crewmembers did indeed have a higher diagnosis rate; however, the difference in the diagnosis rate was not statistically relevant. This is consistent with the CCATT study that found the diagnosis rate between male and female participants to be not significant, with an alpha of 0.05. These findings contradict a study conducted by Gibbons et al. (2012) that found female medical professionals to be diagnosed with PTSD at a rate seven to nine percent higher than their male counterparts.

There are no gender-specific deployment criteria for the AE crewmembers, so male and female participants have the same likelihood of experiencing combat-related traumatic events. The majority of the AE community was male compared to the non-AE community that was mostly female. Non-AE females had a diagnosis rate almost twice the diagnosis rate of the AE females. More research also is needed to explore this area.

(5) Pre-existing conditions

The opportunity arose to add an exploratory question to the study. This exploratory question stated do participants diagnosed with mental health conditions prior to their first deployment have those conditions exacerbated by deployment, and would he or she be more likely to seek medical attention than their counterparts without a pre-existing mental health condition? The majority of participants (over 90%) with a pre-existing mental health condition were not diagnosed with more mental health conditions post-deployment. Yet, the timeline in which participants with a pre-existing condition sought medical attention was shorter than those participants without a pre-existing condition.

While there is no data to support this conjecture, the author speculates that many of the pre-existing conditions were due to daily life stresses or a single traumatic event unrelated to the deployment. Participants sought medical attention for the pre-existing condition, but since that condition was not directly related to a deployment, the subsequent deployment did not exacerbate that condition. More research is needed in this area.

With regard to the timeline that participants with a pre-existing mental health condition sought medical attention post-deployment, the author speculates the participants were more aware of the symptoms of mental health conditions and also were not affected by the stigma that may delay some from seeking medical attention. There are currently no data to support both conjectures and more research is needed in this area.

(6) Life stress factors

The opportunity also presented itself to pursue a second exploratory question that stated: does the diagnosed population have higher average Holmes-Rahe Life Stress Scores than its undiagnosed counterpart? The diagnosed population did have a significantly higher average Holmes-Rahe Life Stress Scale score than the control group.

This finding supports the premise of the Holmes-Rahe Life Stress Scale that those with a higher stress score are more susceptible to illness in general. The life stress factors that were scored were changes in responsibilities at work, a change in marital status, a pregnancy, and a birth of a child. These are only four of forty-three possible factors that could be assessed in the study. However, this finding is consistent with Holmes and Rahe's (1968) original study that found a higher rate of illness for those with more life stressors. Deployed personnel still have to deal with life issues related to career and family; and, the stress resulting from these issues may render them more susceptible to a PDMH condition. Additional research that includes all forty-three factors in the Holmes-Rahe Life Stress Scale is needed to better understand the contribution of life events to PDMH diagnosis rates.

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VI. CONCLUSION

A. MAJOR FINDINGS

The AE population had a lower diagnosis rate of PDMH conditions than the non-AE population. Lower experience levels did not contribute to an increase of the diagnosis rate for a PDMH condition. The youngest age group, lower ranks, and one completed deployment - the three factors proxy to inexperience in the study - did not have the highest diagnosis rate within each of their respective sub-populations. The diagnosis rate was not statistically different based on the number of deployments completed for AE crewmembers. The diagnosis rate for both female and male AE crewmembers were essentially the same. Approximately 90% of participants with a pre-existing condition did not seek medical attention for the same or fewer total diagnosed PDMH conditions post-deployment than they had prior to deploying. This is not to suggest that those AE crewmembers with a pre-existing condition did not still suffer from the effects of their pre-existing condition, but that they did not seek further medical attention to treat their pre-existing condition. Finally, participants with higher Holmes-Rahe Life Stress scores had a higher diagnosis rate than those participants that were not diagnosed with a PDMH condition. This finding suggests there are numerous personal life factors that should be taken into consideration when trying to identifying AE crewmembers at risk of being diagnosis with a PDMH condition aside from completing a deployment.

B. STUDY LIMITATIONS

The study had numerous limitations, most of which were centered on the dataset utilized for analysis. The dataset utilized diagnosed conditions, which does not necessarily equate to the actual PDMH conditions present in participants. For example, just because a participant did not seek medical attention for depression does not mean he or she was not suffering from depression. There is no easy solution to this limitation aside from individual interviews with each participant.

Also, the dataset lacked fidelity with respect to the contributing factors that led to the PDMH diagnosis. There may have been numerous factors contributing to a PDMH condition that had nothing to do with a deployment. This shortcoming may have resulted in an inflated number of diagnoses attributed to deployments.

The dataset also did not have the specificity necessary to discern between combat-related deployments and humanitarian medical aid deployments. The type and severity of stress produced by different deployment categories may vary greatly. Combat deployments can cause long-term elevated stress to the participant whereas the humanitarian medical aid deployment may cause more acute stress. More research is needed in this area to determine if there is a difference in the diagnosis rate between those on a combat deployment and those on humanitarian medical aid missions.

Finally, the dataset did not permit discernment between the participants who were deployed downrange away from their families and those who were deployed from home station. Numerous deployments are from home station, so participants are performing a deployed mission at work but still see their family in between missions. Further research is needed to determine if these deployment differences affect the risk of being diagnosed with a PDMH condition.

C. FUTURE RESEARCH

Because the non-AE nurses and technicians were diagnosed with PDMH conditions at a higher rate than the AE crewmember, further research is needed to determine the unique environmental factors or demographics that non-AE nurses and technicians face while deployed. It is assumed that the ground-based nurses and technicians will be exposed to more gruesome combat wounds while stabilizing patients prior to aerial evacuation and casualties, but further research is needed in this area.

More research is needed to determine the extent to which life stressors impact military members, particularly under the unique operational stressors related to military life. It may be impossible to identify a specific event or factor that led to a PDMH diagnosis. This study and a study conducted by O’Donnell et al. (2004) suggest there are comorbidities related to the diagnosis of PDMH conditions hence numerous factors may accumulate to a “tipping point” when a patient is finally diagnosed.

More research is needed to determine how rank-based distribution of job duties affects the diagnosis rate of PDMH conditions. As a Soldier progresses in rank, their duties shift from being on the frontline line providing medical attention to patients to more of a supervisory role such as a medical group commander. Research could shed light on how this shift in deployed duties can affect the diagnosis rate of PDMH conditions. Also, medical experience prior to the start of OIF/OEF compared to those medical professionals who have only served during a time of conflict needs further research to determine if there is a difference in diagnosis rates. Finally, the role of gender in the diagnosis rate of a PDMH needs further research as results from this study and the CCATT study were conflicting with previous research.

D. WAY AHEAD

It is recommended that the USAF Surgeon General consider increased screening of PDMH conditions for the sub-populations identified in the study with a higher diagnosis rates. The sub-populations within the AE population with a higher diagnosis rates include AETs, divorced Airmen, and those on active duty. Also, the USAF Surgeon General should consider extending the frequency of the post-deployment screening process. For example, adding similar PDMH condition questions to the annual physical health assessment (PHA) required annually of all airmen may increase the odds of identifying at-risk airmen potentially years after completing their last deployment.

While there is currently no method of screening an Airman's stress level, creating a relevant measure is recommended. Just as the Holmes-Rahe Life Stress Scale was used to identify at-risk sub-populations within the Canadian social healthcare system, a similar scale could assist in identifying at-risk populations within the USAF. A similar scale should have USAF specific stressors such as deployments, frequent moves, shift work, performing combat mission support performed stateside, etc.

While the operational tempo is dictated by mission requirements, it is recommended that resilience training increase in the six months leading up to a deployment. This study found an increase in the diagnosis rate of PDMH conditions that coincided with the preparation for a subsequent deployment. Even after completing numerous deployments, the spin-up time leading to a deployment can be stressful for the Airmen and their families. Each deployment is unique since professional and personal factors have changed since previous deployments. Educating Airmen and their families about the normal emotional phases of separation, how to prepare financially for a deployment, and how to support each other through the deployment could improve the diagnosis rate of PDMH conditions.

APPENDIX A. INTERVIEW QUESTIONS

AE - Is there a required or typical rank/skill level for an AE crewmember to go on their first deployment? Is there a minimum OJT requirement before first deployment?

AE - What is the typical deployment length? Has that changed with the drawdown?

AE - Deployment frequency/Dwell rate? Certain squadrons or ranks deploy more frequently than others?

AE - Are deployments as a unit or as individuals?

AE - If as individuals, is there any spin-up training for the new crew?

AE - What is the typical flight schedule during the deployment?

AE - What are the range of injuries that AE crewmembers may encounter?

AE - Are all patients active duty, guard, or reserves members or are dependents also transported?

AE - What is the average number of patients on-board? Is there a maximum?

AE - The AFI listed the max FDP of 14-16 hours, but that waiver can be given upon request. Does that happen often?

AE - Is crew rest frequently busted?

AE - What is the minimum crew compliment (rank/skill level) requirements?

AE - The AFI said that the less than basic crew compliment can be waived. Is that done frequently?

AE - The AFI listed 18 hours as the minimum CDT. Is that adequate?

AE - Was the use of the No-Go pill common place with the AE crewmembers?

Epidemiologist - Confirm ICD-9 codes

Epidemiologist - Deployment data: what is "other" in the comments? Should they be included or excluded?

Epidemiologist- Minimum deployment length to be included in the study?

- Is 3 days an error?
- Is over 375 (a 365 with a buffer to get home) the max included?

Epidemiologist- Is compassion fatigue a condition known and experienced by? Should it be included in the study?

Epidemiologist- Assume PTSD is most commonly diagnosed condition? Or is it just the most well-known, publicized, or researched?

APPENDIX B. PHASE TWO RESULTS

A. DEMOGRAPHIC DATA

The demographic data for phase two are present below in Table 24. The differences between the AE and non-AE populations were the same as in phase one with only marital status and number of dependents not being significantly different.

Table 23. Phase Two Demographic Statistics

	AE (N=1,986)	Control (N=9,964)	P-Value
Career Field			
Nurse	564	3465	<.001
Technician	1422	6499	
Component			
Acitve Duty	605	7488	<.001
Guard	643	1379	
Reserve	738	1097	
Gender			<.001
Female	762	5350	
Male	1224	4614	
Age			
19-28	546	4156	<.001
29-38	679	2998	
39-48	566	2138	
49 or more	195	672	
Marital Status			
Single	700	3332	0.069
Married	1073	5585	
Divorced	207	1029	
Widowed	6	11	
Total # Depend.			
0	941	4649	0.183
1	356	1765	
2	250	1457	
3	265	1223	
4	129	611	
5 or more	45	257	
Total # Deployments			
1	848	5933	<.001
2	530	2371	
3	306	975	
4	151	406	
5 or more	151	279	
Country			
Afghanistan	527	2783	<.001
Iraq	197	2318	
Kuwait	23	432	
Qatar	321	771	
CENTCOM	45	531	
Classified/Unknown	32	412	
EUCOM	12	154	
Germany	390	850	
AFRICOM	45	123	
PACOM	47	344	
SOUTHCOM	28	484	
United States	315	727	
NORTHCOM	4	35	

B. STUDY HYPOTHESES

1. Hypothesis One

Dividing the number of diagnosed participants by the total population, the AE crewmembers had an 8.7% (+/- .659%) diagnosis rate for a PDMH condition, compared to 15.5% (+/- .387%) ($z = 7.40$, p value $<.0001$) for the non-AE nurses and technicians. This finding rejects *hypothesis one*, as did the phase one analysis. Including participants with a diagnosis of tobacco dependence and those that were diagnosed with a PDMH condition while on a deployment, increased the diagnosis rate compared from that of phase one.

2. Hypothesis Two

a. Rank

As with phase one, there was a significant difference in diagnosis rate between the AE population and the non-AE population by rank ($\chi2$ (12) = 114.83, p-value $<.0001$). Also the same as with phase one, the diagnosis rate was highest for the non-commissioned officers and mid-grade officers. Specifically, the diagnosis rate in phase two was higher than phase one for the Staff Sergeant, Technical Sergeant and Captain ranks. Conversely, the diagnosis rate was lower for the higher ranks of Master Sergeant, Major, Lt. Colonel in phase two compared to phase one. The confidence interval for the AE Senior Airmen, the lowest enlisted rank for the AE population, did not overlap with the Staff and Technical Sergeants. The confidence intervals for the officer participants all overlapped, hence there was no significant difference in the diagnosis rate for the officer sub-populations (see Figure 28 and Table 24). This continues to not support hypothesis two since the youngest ranking sub-populations did not have a high diagnosis rate as hypothesized.

Figure 28. Phase Two Diagnosis Rate by Rank

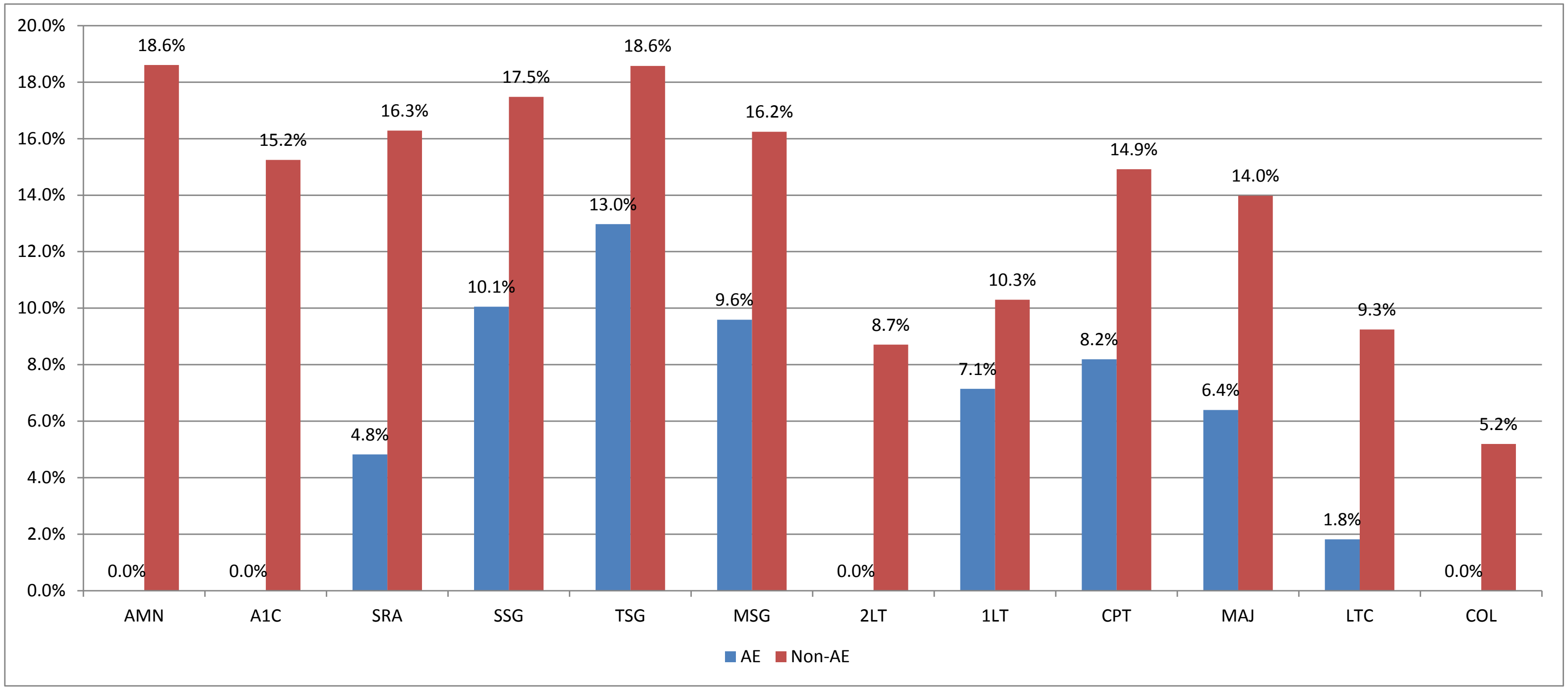

Table 24. Phase Two Statistical Analysis by Rank

		AE				Non-AE			
		Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate	Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate
Rank									
	Airman	0	2	0.0%	0.0%	16	70	22.9%	5.0%
	Arm First Class	0	18	0.0%	0.0%	186	1034	18.0%	1.2%
	Senior Srm	14	276	5.1%	1.3%	322	1655	19.5%	1.0%
	Staff Sgt	38	340	11.2%	1.7%	350	1652	21.2%	1.0%
	Tech Sgt	58	389	14.9%	1.8%	269	1179	22.8%	1.2%
	Master Sgt	42	396	10.6%	1.5%	174	897	19.4%	1.3%
	2nd Lt	0	65	0.0%	0.0%	31	479	6.5%	1.1%
	1st Lt	5	13	38.5%	13.5%	55	325	16.9%	2.1%
	Captain	19	213	8.9%	2.0%	236	1346	17.5%	1.0%
	Major	11	161	6.8%	2.0%	143	880	16.3%	1.2%
	Lt Colonel	2	108	1.9%	1.3%	37	363	10.2%	1.6%
	Colonel	0	5	0.0%	0.0%	4	73	5.5%	2.7%
Standardized Residuals (values more extreme than +/- 1.96 consider significant)		**Diagnosed**	**Not Diagnosed**			**Diagnosed**	**Not Diagnosed**		
	Airman	-0.667	0.356			0.113	-0.060		
	Arm First Class	-1.784	0.827			0.235	-0.109		
	Senior Srm	-4.910	2.253			2.005	-0.920		
	Staff Sgt	-3.468	1.706			1.573	-0.774		
	Tech Sgt	-2.567	1.318			1.475	-0.757		
	Master Sgt	-2.970	1.330			1.973	-0.884		
	2nd Lt	-0.905	0.235			0.149	-0.039		
	1st Lt	-1.581	0.674			0.707	-0.302		
	Captain	-2.684	1.187			1.068	-0.472		
	Major	-2.626	1.094			1.123	-0.468		
	Lt Colonel	-2.322	0.698			1.266	-0.380		
	Colonel	-0.506	0.118			0.133	-0.031		
Standard Error				**Lower 95% Conf. Intvl.**	**Upper 95% Conf. Intvl.**			**Lower 95% Conf. Intvl.**	**Upper 95% Conf. Intvl.**
	Airman			0.0%	0.0%			13.0%	32.7%
	Arm First Class			0.0%	0.0%			15.6%	20.3%
	Senior Srm			2.5%	7.7%			17.5%	21.4%
	Staff Sgt			7.8%	14.5%			19.2%	23.2%
	Tech Sgt			11.4%	18.4%			20.4%	25.2%
	Master Sgt			7.6%	13.6%			16.8%	22.0%
	2nd Lt			0.0%	0.0%			4.3%	8.7%
	1st Lt			12.0%	64.9%			12.8%	21.0%
	Captain			5.1%	12.7%			15.5%	19.6%
	Major			2.9%	10.7%			13.8%	18.7%
	Lt Colonel			-0.7%	4.4%			7.1%	13.3%
	Colonel			0.0%	0.0%			0.3%	10.7%

b. Age

For the phase two analysis, the author chose to bin the age range for analysis by five years instead of by ten years as was used in phase one. The more detailed analysis shows that the diagnosis rate increased until a peak at the 35-39 year group as seen in Figure 29. This was consistent with the findings in phase one, that the diagnosis rate was the highest for 29-38 year group in the AE population. As with phase one, there was a significant difference in diagnosis rate between the AE population and the non-AE population by age ($\chi 2$ (7) = 95.86, p-value <.0001). As seen in Table 25, the diagnosis rate was lower than expected for all AE sub-populations within the age factor compared to their non-AE counterparts. The diagnosis rate then steadily decreased as participant age increased. The confidence interval for the 35-39 age group did not overlap the lowest age groups of 19 to 29 year olds. *Hypothesis two* was still rejected with the phase two analysis. The youngest age group of 19 to 24 years, was one of the lowest diagnosed age ranges in the dataset.

Figure 29. Phase Two Diagnosis Rate by Age

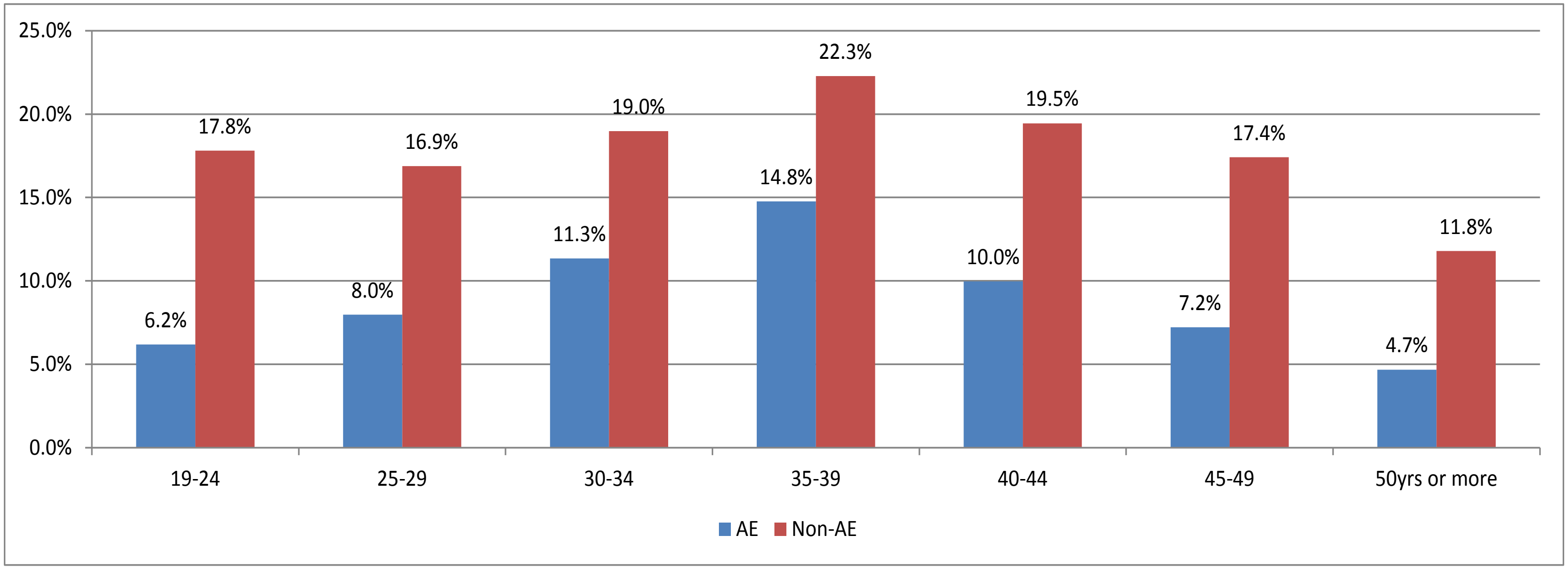

Table 25. Phase Two Statistical Analysis by Age

		AE				Non-AE			
		Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate	Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate
Age									
	19-24	14	226	6.2%	1.6%	431	2420	17.8%	0.8%
	25-29	31	389	8.0%	1.4%	349	2067	16.9%	0.8%
	30-34	37	326	11.3%	1.8%	277	1460	19.0%	1.0%
	35-39	53	359	14.8%	1.9%	337	1513	22.3%	1.1%
	40-44	32	321	10.0%	1.7%	234	1203	19.5%	1.1%
	45-49	14	194	7.2%	1.9%	129	741	17.4%	1.4%
	50yrs or more	8	171	4.7%	1.6%	66	560	11.8%	1.4%
Standardized Residuals (values more extreme than +/- 1.96 consider significant)		Diagnosed	Not Diagnosed			Diagnosed	Not Diagnosed		
	19-24	-3.894	1.751			1.190	-0.535		
	25-29	-3.762	1.610			1.632	-0.698		
	30-34	-2.683	1.239			1.268	-0.586		
	35-39	-2.520	1.293			1.227	-0.630		
	40-44	-3.210	1.476			1.658	-0.762		
	45-49	-2.877	1.222			1.472	-0.625		
	50yrs or more	-2.238	0.751			1.237	-0.415		
				AE Rate				Non-AE Rate	
95% Confidence Interval				Lower	Upper			Lower	Upper
	19-24			3.1%	9.3%			16.3%	19.3%
	25-29			5.3%	10.7%			15.3%	18.5%
	30-34			7.9%	14.8%			17.0%	21.0%
	35-39			11.1%	18.4%			20.2%	24.4%
	40-44			6.7%	13.2%			17.2%	21.7%
	45-49			3.6%	10.9%			14.7%	20.1%
	50yrs or more			1.5%	7.8%			9.1%	14.5%

C. OTHER RELEVANT RESULTS

1. Marital Status

As with phase one, there was a significant difference in diagnosis rate between the AE population and the non-AE population by marital status ($\chi 2$ (4) = 91.04, p-value <.0001). The diagnosis rate was highest for both married and divorced AE crewmembers compared to their single AE counterparts, which is consistent with the results of phase one. The confidence interval for the single AE crewmembers did not overlap their married and divorced counterparts; hence there was a significant difference in the diagnosis rate for the single group compared to the other sub-populations. Examining the standardized residuals, the diagnosis rate was lower than expected for the single, married, and divorced AE sub-populations compared to their non-AE counterparts. The diagnosis rate was higher than expected for the single non-AE nurse and technicians compared to their AE counterparts. The diagnosis rate for single non-AE nurses and technicians was double that of their AE counterparts. This was consistent with the findings in phase one (see Figure 30 and Table 26).

Figure 30. Phase Two Diagnosis Rate by Marital Status

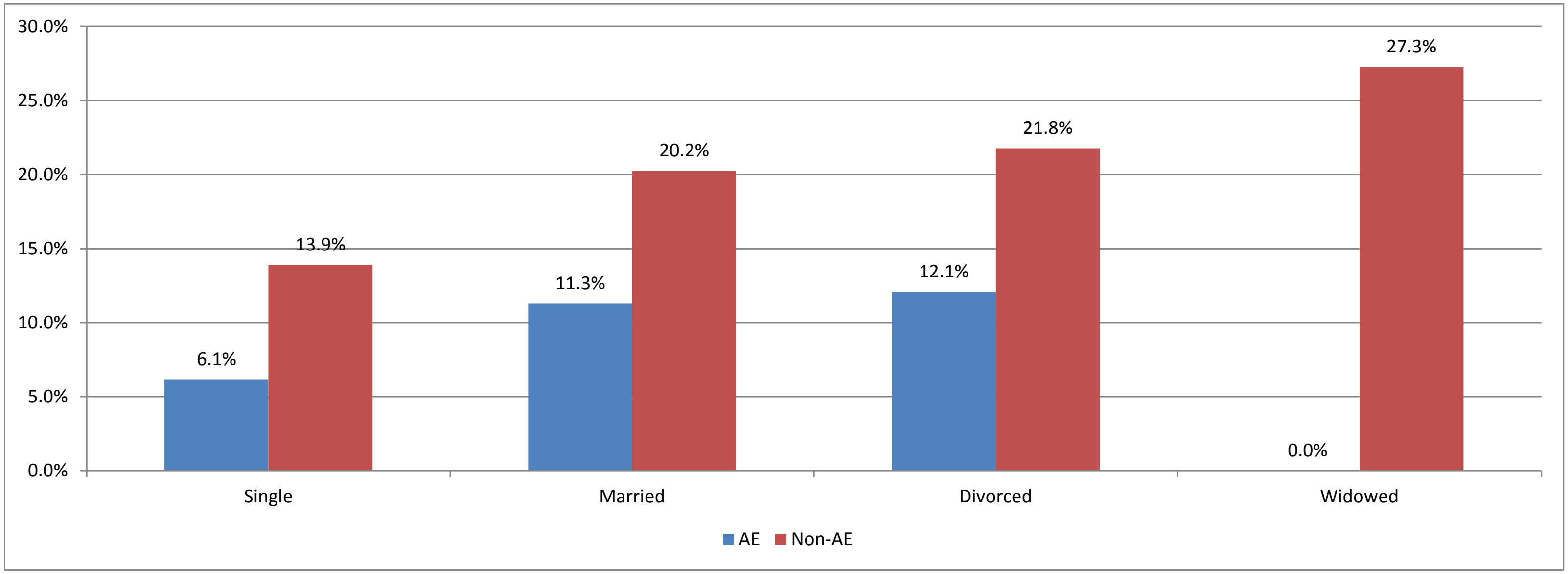

Table 26. Phase Two Statistical Analysis by Marital Status

		AE				Non-AE			
		Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate	Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate
Marital Status									
	Single	43	700	6.1%	0.9%	463	3332	13.9%	0.6%
	Married	121	1073	11.3%	1.0%	1130	5585	20.2%	0.5%
	Divorced	25	207	12.1%	2.3%	224	1029	21.8%	1.3%
	Widowed	0	6	0.0%	0.0%	3	11	27.3%	13.4%
Standardized Residuals (values more extreme than +/- 1.96 consider significant)		Diagnosed	Not Diagnosed			Diagnosed	Not Diagnosed		
	Single	-4.785	1.813			2.193	-0.831		
	Married	-5.677	2.731			2.488	-1.197		
	Divorced	-2.586	1.299			1.160	-0.583		
	Widowed	-1.029	0.476			0.760	-0.352		
				AE Rate				Non-AE Rate	
95% Confidence Interval				Lower	Upper			Lower	Upper
	Single			4.4%	7.9%			12.7%	15.1%
	Married			9.4%	13.2%			19.2%	21.3%
	Divorced			7.6%	16.5%			19.2%	24.3%
	Widowed			0.0%	0.0%			1.0%	53.6%

2. Career Field

As with phase one, there was a significant difference in diagnosis rate between the AE population and the non-AE population by career field ($\chi 2$ (2) = 97.72, p-value <.0001). Also the same as phase one, the diagnosis rate was highest for the technicians compared to the nurses. The confidence interval for the AE technicians did not overlap those of the nurse population; hence the diagnosis rates are significantly different. This was consistent with the findings in the CCATT study of technicians having the highest diagnosis rate, followed by nurses and physicians having the lowest diagnosis rate (see Figure 31 and Table 27).

Figure 31. Phase Two Diagnosis Rate by Career Field

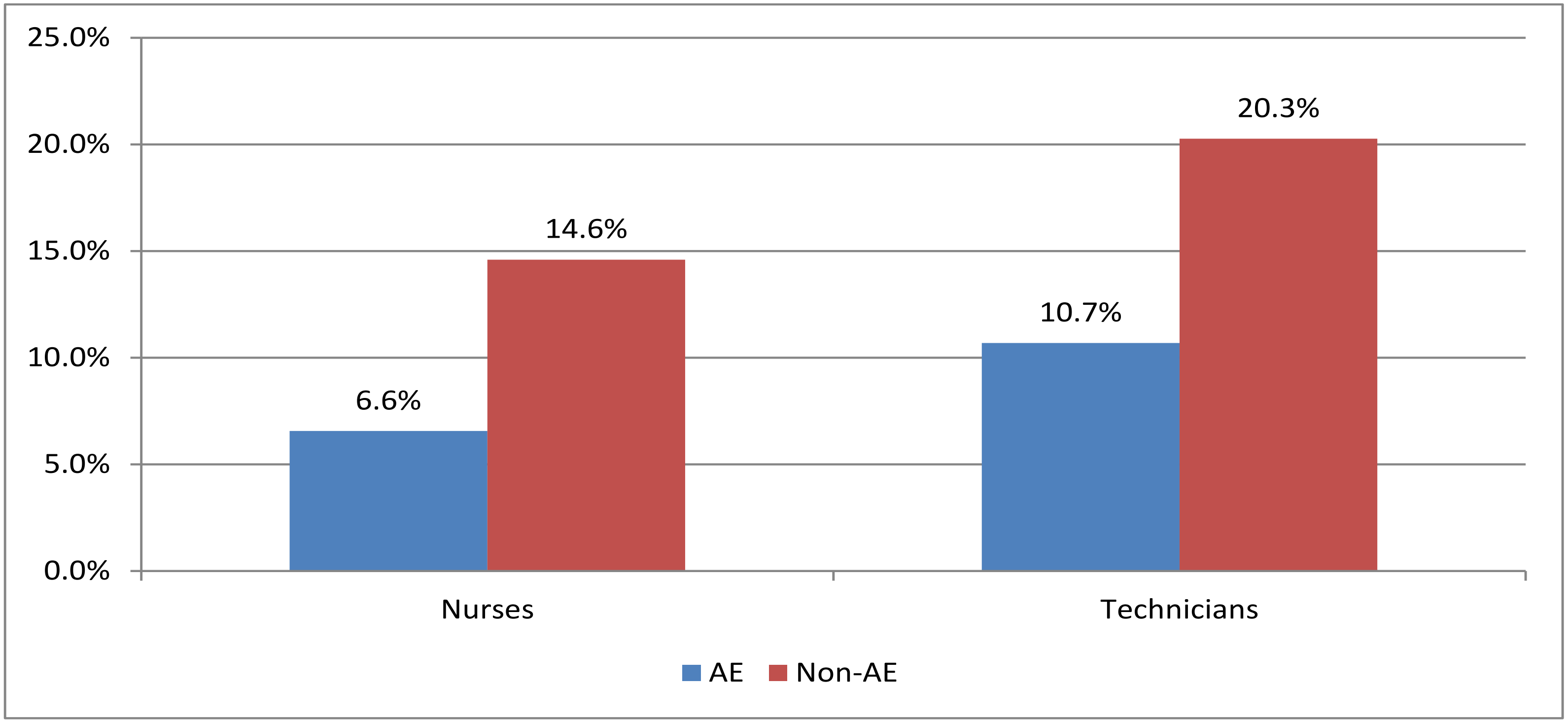

Table 27. Phase Two Statistical Analysis by Career Field

		AE				Non-AE			
		Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate	Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate
AFSC									
	Nurses	37	564	6.6%	1.0%	506	3465	14.6%	0.6%
	Techs	152	1422	10.7%	0.8%	1317	6499	20.3%	0.5%
Standardized Residuals (values more extreme than +/- 1.96 consider significant)		**Diagnosed**	**Not Diagnosed**			**Diagnosed**	**Not Diagnosed**		
	Nurses	-4.475	1.766			1.805	-0.712		
	Techs	-6.879	3.283			3.218	-1.535		
95% Confidence Interval				**AE Rate**				**Non-AE Rate**	
				Lower	**Upper**			**Lower**	**Upper**
	Nurses			4.5%	8.6%			13.4%	15.8%
	Techs			9.1%	12.3%			19.3%	21.2%

3. Length of Deployment

As with phase one, there was a significant difference in diagnosis rate between the AE population and the non-AE population by the length of the deployment ($\chi 2$ (9) = 132.65, p-value <.0001). The diagnosis rate followed a pattern similar to that identified in phase one for the non-AE nurses and technicians, with a spike in diagnoses at the six month deployment mark and for deployments longer than 201 days. The spike at the six month mark was not as significant as it was seen in phase one, but instead it gradually increased as the deployment length grew closer to the six month mark. The confidence intervals for each sub-population overlapped significantly; therefore there was no significant difference in the diagnosis rate for each sub-population.

The diagnosis rate did not have as significant a spike for the shorter deployment length as was seen in the phase one analysis for the AE population. Also, there was not a spike in diagnosis rate for deployments longer than 201 days long (see Figure 32 and Table 28).

Figure 32. Phase Two Diagnosis Rate by Deployment Length

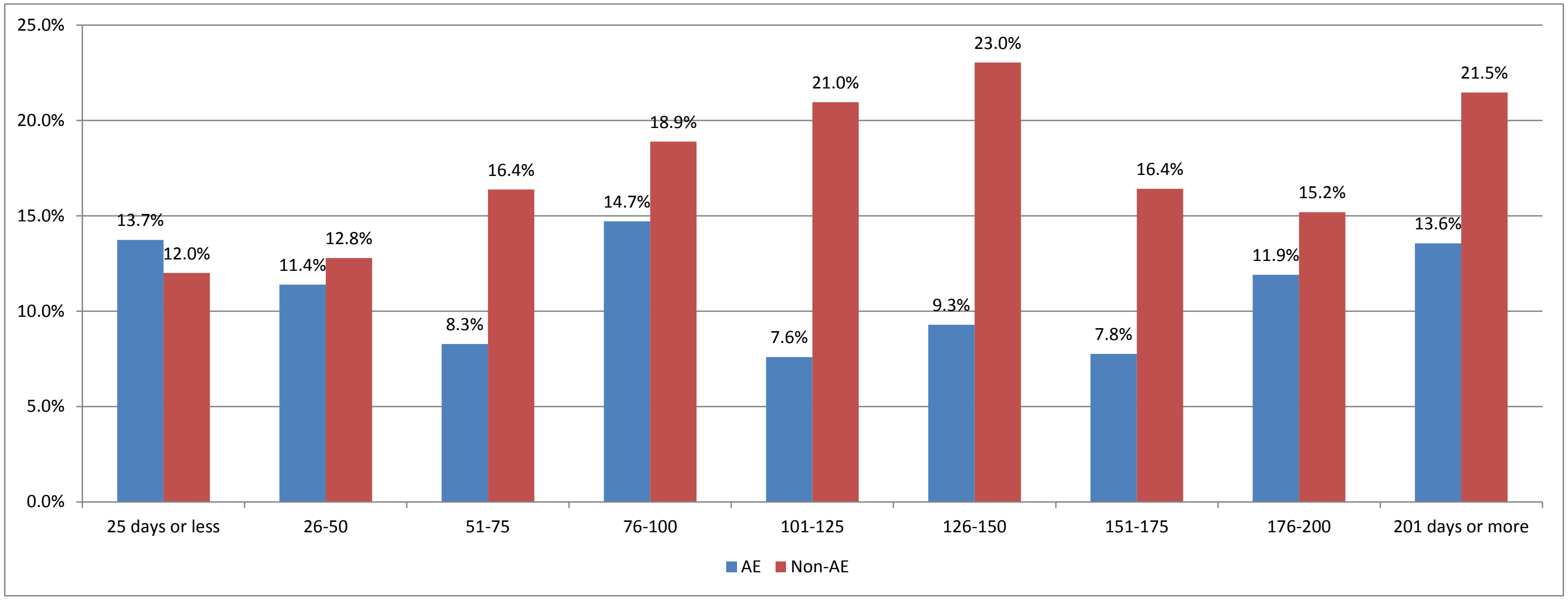

Table 28. Phase Two Statistical Analysis by Deployment Length

		AE				Non-AE			
		Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate	Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate
Length of Deployment									
	25 or less	18	131	13.7%	3.0%	117	975	12.0%	1.0%
	26-50	9	79	11.4%	3.6%	56	438	12.8%	1.6%
	51-75	13	157	8.3%	2.2%	85	519	16.4%	1.6%
	76-100	10	68	14.7%	4.3%	92	487	18.9%	1.8%
	101-125	37	487	7.6%	1.2%	271	1293	21.0%	1.1%
	126-150	76	818	9.3%	1.0%	547	2374	23.0%	0.9%
	151-175	8	103	7.8%	2.6%	76	463	16.4%	1.7%
	176-200	10	84	11.9%	3.5%	374	2461	15.2%	0.7%
	201 or more	8	59	13.6%	4.5%	204	950	21.5%	1.3%
		Diagnosed	Not Diagnosed			Diagnosed	Not Diagnosed		
Standardized Residuals (values more extreme than +/- 1.96 consider significant)	25 or less	0.503	-0.187			-0.184	0.069		
	26-50	-0.296	0.112			0.126	-0.048		
	51-75	-2.046	0.842			1.125	-0.463		
	76-100	-0.706	0.335			0.264	-0.125		
	101-125	-5.149	2.355			3.160	-1.446		
	126-150	-6.621	3.260			3.886	-1.914		
	151-175	-1.864	0.778			0.879	-0.367		
	176-200	-0.751	0.317			0.139	-0.059		
	201 or more	-1.249	0.644			0.311	-0.160		
				AE Rate				Non-AE Rate	
95% Confidence Interval				Lower	Upper			Lower	Upper
	25 or less			7.8%	19.6%			10.0%	14.0%
	26-50			4.4%	18.4%			9.7%	15.9%
	51-75			4.0%	12.6%			13.2%	19.6%
	76-100			6.3%	23.1%			15.4%	22.4%
	101-125			5.2%	10.0%			18.7%	23.2%
	126-150			7.3%	11.3%			21.3%	24.7%
	151-175			2.6%	12.9%			13.0%	19.8%
	176-200			5.0%	18.8%			13.8%	16.6%
	201 or more			4.8%	22.3%			18.9%	24.1%

4. Deployment Location

As with phase one, there was a significant difference in diagnosis rate between the AE population and the non-AE population by marital status ($\chi 2$ (13) = 75.37, p-value <.0001). Also the same as phase one, there was still a significant difference between the AE and non-AE populations. The highest diagnosis rate was for participants who deployed to an unknown or classified locations, along with Iraq, Afghanistan, and Kuwait. Phase two included the more detailed analysis of breaking out the "other" category from phase one into the component commands. The diagnosis rate was not significantly high for any of the component commands. The confidence intervals for each deployment location overlapped significantly; hence there was no significant difference in the diagnosis rate for each sub-population (see Figure 33 and Table 29).

Figure 33. Phase Two Diagnosis Rate by Deployment Location

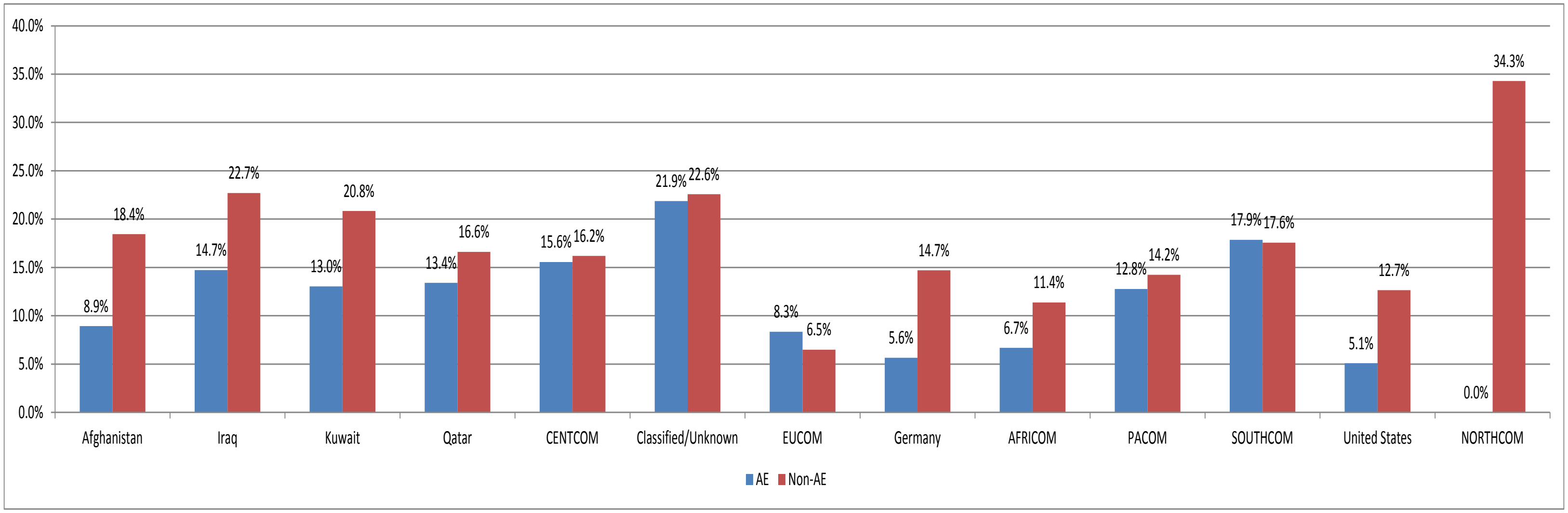

Table 29. Phase Two Statistical Analysis by Deployment Location

		AE				Non-AE			
		Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate	Diagnosed	Total	Diagnosis Rate	Std. Dev. of Diagnosis Rate
Deployment Location									
	Afghanistan	47	527	8.9%	1.2%	513	2783	18.4%	0.7%
	Iraq	29	197	14.7%	2.5%	526	2318	22.7%	0.9%
	Kuwait	3	23	13.0%	7.0%	90	432	20.8%	2.0%
	Qatar	43	321	13.4%	1.9%	128	771	16.6%	1.3%
	CENTCOM	7	45	15.6%	5.4%	86	531	16.2%	1.6%
	Classified/Unknown	7	32	21.9%	7.3%	93	412	22.6%	2.1%
	EUCOM	1	12	8.3%	8.0%	10	154	6.5%	2.0%
	Germany	22	390	5.6%	1.2%	125	850	14.7%	1.2%
	AFRICOM	3	45	6.7%	3.7%	14	123	11.4%	2.9%
	PACOM	6	47	12.8%	4.9%	49	344	14.2%	1.9%
	SOUTHCOM	5	28	17.9%	7.2%	85	484	17.6%	1.7%
	United States	16	315	5.1%	1.2%	92	727	12.7%	1.2%
	NORTHCOM	0	4	0.0%	0.0%	12	35	34.3%	8.0%
Standardized Residuals (values more extreme than +/- 1.96 consider significant)		Diagnosed	Not Diagnosed			Diagnosed	Not Diagnosed		
	Afghanistan	-4.465	2.015			1.943	-0.877		
	Iraq	-2.195	1.168			0.640	-0.341		
	Kuwait	-0.785	0.398			0.181	-0.092		
	Qatar	-1.025	0.442			0.661	-0.285		
	CENTCOM	-0.099	0.043			0.029	-0.013		
	Classified/Unknown	-0.077	0.042			0.022	-0.012		
	EUCOM	0.230	-0.061			-0.064	0.017		
	Germany	-3.564	1.307			2.414	-0.885		
	AFRICOM	-0.728	0.244			0.440	-0.148		
	PACOM	-0.238	0.096			0.088	-0.036		
	SOUTHCOM	0.035	-0.016			-0.008	0.004		
	United States	-2.914	0.991			1.918	-0.652		
	NORTHCOM	-1.109	0.740			0.375	-0.250		
				AE Rate				Non-AE Rate	
95% Confidence Interval				Lower	Upper			Lower	Upper
	Afghanistan			6.5%	11.4%			17.0%	19.9%
	Iraq			9.8%	19.7%			21.0%	24.4%
	Kuwait			-0.7%	26.8%			17.0%	24.7%
	Qatar			9.7%	17.1%			14.0%	19.2%
	CENTCOM			5.0%	26.1%			13.1%	19.3%
	Classified/Unknown			7.6%	36.2%			18.5%	26.6%
	EUCOM			-7.3%	24.0%			2.6%	10.4%
	Germany			3.4%	7.9%			12.3%	17.1%
	AFRICOM			-0.6%	14.0%			5.8%	17.0%
	PACOM			3.2%	22.3%			10.6%	17.9%
	SOUTHCOM			3.7%	32.0%			14.2%	21.0%
	United States			2.7%	7.5%			10.2%	15.1%
	NORTHCOM			0.0%	0.0%			18.6%	50.0%

D. DIAGNOSED CONDITIONS

As with phase one, there was not a significant difference in diagnosis rate between the AE population and the non-AE population by marital status ($\chi2$ (9) = 3.57, p-value =.937). Also the same as phase one, the highest diagnosis rate was for participants with two or fewer conditions. There was a steady decrease in the diagnosis rate as the number of conditions increased (see Figure 34 and Table 30).

Figure 34. Phase Two Total Number of Conditions Diagnosed per Participant

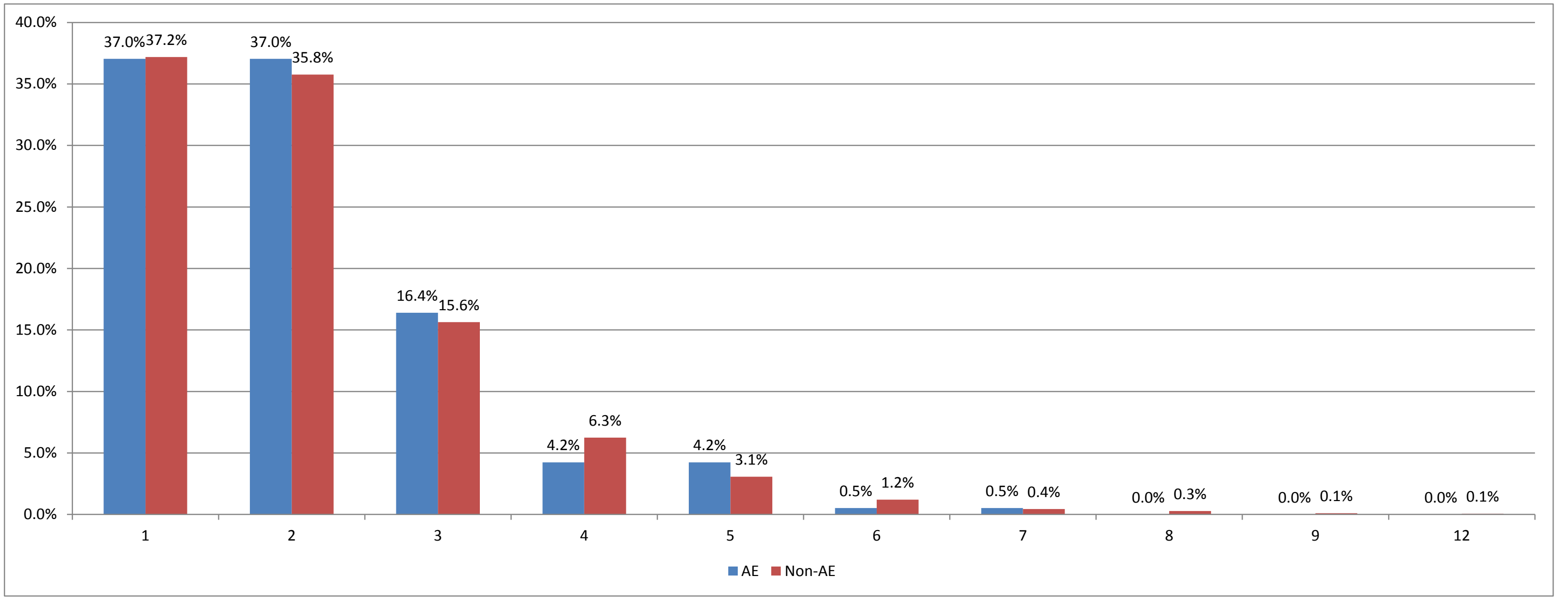

Table 30. Phase Two Statistical Analysis Total Number of Conditions Diagnosed per Participant

	AE			Non-AE		
Number of Diagnoses	Diagnosed	Percent Diagnose	Std. Dev. of	Diagnosed	Percent Diagnose	Std. Dev. of
1	70	37.0%	3.5%	678	37.2%	1.1%
2	70	37.0%	3.5%	652	35.8%	1.1%
3	31	16.4%	2.7%	285	15.6%	0.9%
4	8	4.2%	1.5%	114	6.3%	0.6%
5	8	4.2%	1.5%	56	3.1%	0.4%
6	1	0.5%	0.5%	22	1.2%	0.3%
7	1	0.5%	0.5%	8	0.4%	0.2%
8	0	0.0%	0.0%	5	0.3%	0.1%
9	0	0.0%	0.0%	2	0.1%	0.1%
12	0	0.0%	0.0%	1	0.1%	0.1%
Standardized Residuals (+/- 1.96)						
1	-0.03154			0.010157		
2	0.264459			-0.08515		
3	0.241563			-0.07778		
4	-1.02214			0.329114		
5	0.810821			-0.26107		
6	-0.78955			0.254223		
7	0.16811			-0.05413		
8	-0.68533			0.220668		
9	-0.43344			0.139563		
12	-0.30649			0.098686		

APPENDIX C. HOLMES-RAHE LIFE STRESS SCALE

The Holmes-Rahe Life Stress Inventory

The Social Readjustment Rating Scale

INSTRUCTIONS: Mark down the point value of each of these life events that has happened to you during the previous year. Total these associated points.

Life Event	Mean Value
1. Death of spouse	100
2. Divorce	73
3. Marital Separation from mate	65
4. Detention in jail or other institution	63
5. Death of a close family member	63
6. Major personal injury or illness	53
7. Marriage	50
8. Being fired at work	47
9. Marital reconciliation with mate	45
10. Retirement from work	45
11. Major change in the health or behavior of a family member	44
12. Pregnancy	40
13. Sexual Difficulties	39
14. Gaining a new family member (i.e.. birth, adoption, older adult moving in, etc)	39
15. Major business readjustment	39
16. Major change in financial state (i.e.. a lot worse or better off than usual)	38
17. Death of a close friend	37
18. Changing to a different line of work	36
19. Major change in the number of arguments w/spouse (i.e.. either a lot more or a lot less than usual regarding child rearing, personal habits, etc.)	35
20. Taking on a mortgage (for home, business, etc..)	31
21. Foreclosure on a mortgage or loan	30
22. Major change in responsibilities at work (i.e. promotion, demotion, etc.)	29
23. Son or daughter leaving home (marriage, attending college, joined mil.)	29
24. In-law troubles	29
25. Outstanding personal achievement	28
26. Spouse beginning or ceasing work outside the home	26
27. Beginning or ceasing formal schooling	26
28. Major change in living condition (new home, remodeling, deterioration of neighborhood or home etc.)	25
29. Revision of personal habits (dress manners, associations, quitting smoking)	24
30. Troubles with the boss	23
31. Major changes in working hours or conditions	20
32. Changes in residence	20
33. Changing to a new school	20
34. Major change in usual type and/or amount of recreation	19
35. Major change in church activity (i.e.. a lot more or less than usual)	19
36. Major change in social activities (clubs, movies,visiting, etc.)	18
37. Taking on a loan (car, tv,freezer,etc)	17
38. Major change in sleeping habits (a lot more or a lot less than usual)	16
39. Major change in number of family get-togethers ("")	15
40. Major change in eating habits (a lot more or less food intake, or very different meal hours or surroundings)	15
41. Vacation	13
42. Major holidays	12
43. Minor violations of the law (traffic tickets, jaywalking, disturbing the peace, etc)	11

Now, add up all the points you have to find your score.

150pts or less means a relatively low amount of life change and a low susceptibility to stress-induced health breakdown.

150 to 300 pts implies about a 50% chance of a major health breakdown in the next 2 years.

300pts or more raises the odds to about 80%, according to the Holmes-Rahe statistical prediction model.

Image from http://www.stress.org/holmes-rahe-stress-inventory/, on 9 Sept 2015.

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