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Post-Deployment Health Assessment in  
United States Service Members after Iraq deployment.

A Dissertation Presented

by

Sean T. Collins

Submitted to the Graduate School of Nursing  
University of Massachusetts Worcester in partial fulfillment  
of the requirements for the degree of

Doctor of Philosophy  
Submitted in fulfillment of the requirements  
for the degree of

Doctor of Philosophy

Nursing

2009

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Deployment”

A Dissertation Presented

By

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## Dedication

This work is dedicated to my wife Sharon, who has provided me with endless support and encouragement on my life's journey. This work or my military service to our country would not be possible without her personal sacrifice. She has provided me with a wonderful family, endless love and an understanding of my constant need to explore the next thing!

## Acknowledgements

I would like to first acknowledge my sincerest appreciation to the men and women who have worn their countries uniform and answered their nations call during difficult times. I can think of no greater honor than to be in the company of those individuals who have sacrificed a piece of themselves to maintain the freedom that I enjoy today. One of the most humbling experiences I have had is to stand next to a flag draped casket of a US service member who has made the ultimate sacrifice for their country. Working side by side with all branches of the military in an active combat zone is truly awe-inspiring.

This work is the culmination of doctoral coursework that spanned an eight year period. There are many people to acknowledge and thank during this time period. However, it was not only the length of time to complete this journey, but the circumstance in which I found my studies disrupted. My first day of my doctoral program was on September 11, 2001 in Herter Hall at the UMass Amherst campus. My first class of the day was Philosophy of Science with Dr. Donna Zucker. Class was ultimately disrupted by the terrorist attacks on New York City and the Pentagon. The Amherst campus was evacuated that afternoon, and I recall the fear and apprehension on the faces of the thousands of students – many of whom may have been away at school for the first time ever. The unfolding drama of the collapsing towers and the pentagon as a smoky inferno repeated on the multiple televisions throughout campus. I knew that day would be a day that would change and shape my future.

I am eternal grateful to have been blessed with the exceptional faculty resources along my journey. Dr. James Fain was my original advisor who demonstrated a deep understanding of my military obligations and carried my flag in support of changes in my enrollment status. However, Dr. Carol Bova came to my rescue as a student in need of a mentor. No one faculty

member has been more supportive or encouraging on my road to complete my studies. Dr. Bova single handedly took up my cause and met with me on numerous occasions to transition me back to the Worcester campus and ensured I met the requirements for my comprehensive exams. It was during a course with Dr. Bova that the current study evolved. Without her mentorship, amazing research talent and unending patience with an apprehensive doctoral student, I would not have evolved as a doctoral candidate.

My dissertation committee gave me the courage to tackle such a daunting and complex research proposal. Dr. Bova provided the leadership to my team as my committee chair. Dr Janet Hale as a retired Army Nurse Officer and Dr. Sybil Crawford with her statistical prowess provided invaluable insight. My committee members went above and beyond the call of duty, staying in constant contact with me while I was deployed. Nearly 90% of this dissertation was completed in Baghdad Iraq. I have been lucky to have many supportive faculty throughout my studies, with specially noted encouragement by Dr. Susan Sullivan-Bolyai.

My family has been the cornerstone of my success along every step of my lifelong journey. My parents have demonstrated unconditional love throughout my life, and have demonstrated what love really means over their fifty years of marriage. My father, who went to Georgetown Medical School as a newlywed and barely a nickel in his pocket, never shrank from a challenge! My mother ran his office while raising nine children, embodying the love of family with the care of all their patients. They always have words of encouragement, whether I was struggling or on top of my game; “do the best you can”. My “in-laws” took me in as a son and a brother, I could not have been luckier. Unfortunately my mother-in-law, Chris, was diagnosed and died within six months of her diagnosis of lung cancer in 2002. This was a blow that shook us all, to lose her at such a young age. She is missed. Bill has defined the entrepreneurial spirit,

and has allowed me to participate in the successful “family business” he created. Colleen is the best friend of my best friend, which makes her a special sister-in-law.

I save my last comments for “my family”, the ones I hold closest in my heart no matter where I go or what I do. Gabby provides me with the inspiration to face any challenge with a good disposition and eager attitude. However, she allows me to be silly and entertaining – anything for a laugh! Despite her many physical and medical challenges, she makes everyday a special day. Macky, with his baseball always at the ready, has understood when we have to do “our homework” often competing for the printer. His love of geography and history are truly inspiring and has left me awestruck on many occasions. Cameron, who always wants to tackle the biggest Lego set available, has been patient and is satisfied with the “smaller ones”. “Walking in the woods” will always be our theme. Sharon has put up with the piles of books, papers and last minute trips to the library to get a copy of the “needed” article. Yes, you can have the back bedroom back – I will move my books! This eight year endeavor is a small portion of more than twenty year effort to gain knowledge. My family has not only been supportive in my school endeavors, but they have sacrificed first hand during my many deployments. I am truly blessed!

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## Abstract

The purpose of this study was to identify health and emotional-related issues of service members after a deployment to Iraq. Secondary data analysis and a cross-sectional descriptive design, were used to analyze data from the Department of Defense Post Deployment Health Assessment (PDHA) database. The cognitive appraisal model of stress and coping (Lazarus and Folkman, 1984) guided this study. Several statistical techniques were used including: frequency distributions cross tab evaluations, factor analysis, reliability calculations, regression analysis and tests for mediation.

The study sample included 510,352 service members (49,998 females, 460,349 males) with a mean age of 29 years. The sample represented all components and branches of the military. Of the total sample, 51.9% ( $n=264,777$ ) saw wounded, killed or dead individuals and 22.1% ( $n=112,620$ ) discharged their weapon in combat. Environmental exposures were an important source of stress. Exposures to sand and dust were the largest complaint (89.8% of the sample). Multiple physical symptoms were identified and 40% of the sample reported four or more symptoms (e.g. diarrhea, back pain, headache, fatigue). PTSD symptoms were identified in 11.8% ( $n = 60,200$ ) and depressive symptoms in 26.5%, ( $n=123,808$ ) of participants. Results of the study indicated that age, gender, rank, race/ethnicity, military component and branch were important predictors of emotional and health-related concerns in this sample. Appraisal variables (danger of being killed and exposure concerns) mediated the relationship between immediate (physical and depressive symptoms) and long term outcomes (health perception, PTSD symptoms) for the majority of the analyses; supporting the study hypothesis. However, length of deployment did not have a significant impact on stress-related outcomes in this study. Implications for practice, policy and future research are discussed.

## Chapter I

### Introduction

Stress related to combat exposure is difficult, if not impossible, for most to imagine. With recent world events and the Global War on Terrorism, it has come to the forefront for all to observe in their living rooms. Stress can be defined as an acute threat to one's homeostasis by real or perceived events; stressors may be physiologic or psychologic events (Motzer & Hertig, 2004). In this study, deployment to the active combat zone in Iraq will be considered a stressful event. The context, in this study, which military members experience stress or stressors is within a combat environment (combat stress). Participation in active combat situations creates a high-risk, high stress situation for military members, with survival as the primary goal (Gaylord, 2006). Stress is present in almost all aspects of daily life in combat situations. Many physiological and hormonal changes occur during times of stress, and these changes may have a long lasting impact on military members (Nissenbaum et al., 2000; Boscarino, 2004; Axelrod et al., 2005; Baker et al., 2005). Early routine screening for combat-related health issues in military members deployed to a combat zone may help identify important characteristics that can be further explored and ultimately lead to prompt health care referrals. Military members are routinely screened pre-deployment and are not qualified to deploy unless minimum health requirements are met. Thus one can conclude that military members are in reasonably good health prior to leaving for a combat zone.

The number of wounded transported out of Iraq alone from the spring of 2003 through the winter of 2004 was over 17,000 troops, with over 30% of injuries from improvised explosive device's (Peake, 2005). This hidden and unexpected explosion impacts both body and psyche of those who are involved, as well as the troops who are left behind after their comrade has been

injured. In a sample of 1,709 service members who served in Iraq, 86 - 87% knew someone who was killed or seriously injured, 89-95% were ambushed or attacked, and 94-95% saw dead bodies (Hoge et al., 2004). How an individual military member processes the sights and sounds, as well as the memories of war may be handled differently from one member to the next.

The most widely studied combat stress exposure associated with the psychological impacts of war is post traumatic stress disorder (PTSD). Approximately ten to twenty percent of service personnel deployed to Iraq and Afghanistan may be diagnosed with post traumatic stress disorder (PTSD), this could mean that approximately 5,000 to 10,000 soldiers may be vulnerable to developing PTSD (Schuster, 2005). Physiologic and psychological stresses are important factors to understand and consider as strong contributors to the development of PTSD and other health issues.

Military members that suffer an injury during a conflict, have a significant exposure to combat that places them at great risk for developing PTSD (Hoge, Auchterlonie, & Milliken, 2006; Hoge et al., 2004, Orcutt et al., 2004; Fontana & Rosencheck, 2005). No substantive literature exists that examines the health exposures and sources of stress that military members encounter in Iraq, one of the most hostile combat theaters of modern times. A seminal article from Hoge et al. (2004), examined the direct impact and sequela of the war in Iraq on mental health on marines and army soldiers since the beginning of the ground campaign in 2003. Exposure to direct combat in Iraq led to more psychological issues such as PTSD. However, Hoge et al. only examined male marine and army soldiers, despite the presence of females who were deployed to the same locations.

Gender is another issue important to post-deployment health. Females have not been traditionally on the front lines of an active combat zone; however this has changed with more

recent military events. Females now find themselves in the thick of battle with their male counterparts and may be at greater risk of developing PTSD (Orcutt et al., 2004; Dobie et al., 2004; Benda, 2005).

Minority groups in the military may be more likely to be classified into higher PTSD symptomatic groups (Orcutt et al., 2004; Rosenheck & Fontana, 2002) and may be exposed to negative race-related events while serving in the military (Loo, Fairbank, & Chemtob, 2005). By identifying sources of stress in the combat veteran, interventions can be directed to assist individual service members to participate in care in a non stigmatized manner.

Rona, Hyams, and Wessely (2005) identified the need to articulate a process with usable instruments that will adequately screen military members. The proposed study will describe the assessment of physiological and psychological aspects of post-deployment health assessment (PDHA) of returning military members from the Iraqi combat zone. The purpose of this study is to identify health and emotional-related issues of service men and women after deployment to Iraq. This will be accomplished by secondary data analysis using the data collected through the Department of Defense PDHA (DD 2796) database. This PDHA can be viewed as a clinical tool, assisting in the proper referral and follow up care for returning military members (Trump, 2006). This survey questionnaire offers information regarding the returning military member's deployment experiences regarding certain psychological, physical, environmental exposures and health concerns.

~~The specific aims of this study are to:~~

1. To describe characteristics (age, gender, race/ ethnicity, branch of service, component, pay grade, and marital status) stress sources (length of deployment, see anyone killed, wounded or dead, discharged weapon in combat, number of days in MOPP, number of times in gas mask,

exposure to destroyed vehicles, exposure CBR agents, deployment location, environmental exposure), symptoms (physical, emotional, depressive) and health outcomes (health perception, PTSD) of deployed military members after return from Iraq

2. To examine differences in appraisal (danger of being killed and exposure/health concern), physical symptoms and health outcomes (health perception and PTSD symptoms) by age, gender, race/ethnicity, pay grade and deployment length.

3. To test hypotheses derived from the cognitive appraisal model of stress and coping regarding the relationships between appraisal, symptoms and health outcomes among deployed military members.

The main study hypotheses are:

Hypothesis 1: Long term outcomes (health perception, PTSD) for military members deployed to Iraq will be directly influenced by appraisal of stressful events (danger of being killed and exposure/health concern), emotional concerns and symptoms (physical and depressive).

Hypothesis 2: Appraisal of stressful events (danger of being killed and health exposure concerns) mediates the effect of characteristics (age, gender, race/ethnicity, branch, component, pay grade, marital status) and stress sources (length of deployment, seeing someone, killed, wounded or dead, days in MOPP, times in gas mask, exposure to destroyed vehicles, exposure to CBR) on symptoms (physical and depressive), emotional concerns and long term outcomes (health perception and PTSD symptoms) among deployed military members.

### Background and Significance

Over the last two-hundred years, the instruments of war have changed from musket balls and bayonets to laser guided smart bombs and air campaigns. Although the instruments of war have changed, the impact and toll on the human spirit have not changed. Friedman (2005) felt

that although the current wartime activities may be different in nature, the psychological consequences may have the same anguish as earlier predecessors and attention to the best care, clinical evaluation and intervention is critical. American society has been exposed to the consequences of war in previous combat veterans, and health care should focus on the lessons learned to help a new generation of soldiers. Exposure to combat-related stressors may lead to negative physiological and psychological responses, which may ultimately lead to long term health concerns.

*Policy Issues*

The Department of Defense (DOD) has an obligation as directed by Congress to evaluate and care for combat veterans who may be negatively affected from a deployment to a war zone. In 1997, Congress passed a law to mandate routine screening for troops returning home after deployment to combat zones, approximately seven years after the conclusion of the first Gulf War. Prior to 1997, there was no written policy or guidance from the DOD or Congress on how to handle the health care needs of military members upon their return to home. The DOD addressed this congressional mandate by initiating a pre-deployment and post-deployment general health questionnaire. In 1997 title 10 of the United States code was amended with section 765 of Public Law 105-85 by adding section 1074f. This section mandated a DOD Medical Surveillance System (DMSS).

The Secretary of Defense was directed to establish a system to assess the medical condition of members of the armed forces who are deployed outside the United States as part of a contingency operation or combat operation. In particular, section 1074f mandated a medical tracking system for members deployed overseas. DOD instruction DODI-6490.3 was formulated and based on a 1997 revision of the law, and directed all branches of service to follow these new

guidelines. This assessment was to include the use of pre-deployment and post-deployment medical examinations to accurately record the health condition of the military members. The post-deployment examination should be conducted as soon as possible upon return to home station, less than five days, or just immediately prior to leaving the combat theater. In the spring of 2003 the DOD came under scrutiny and criticism for not fulfilling its obligation under 765 Public Law 105-85 1074f (b) mandated the DOD shall include the use of pre-deployment and post-deployment medical examinations (including an assessment of mental health and the drawing of blood samples). The original two page post-deployment form DD Form 2796 that was put in place after the 1997 law was passed, did not capture what congress had intended. What constituted a medical examination was of congressional concern, and there were no specific mental health questions being asked. That brought about a change and subsequent memorandum from the Under Secretary of Defense for Personnel and Readiness memorandum, “enhanced post-deployment health assessments”, April 22, 2003 (GAO-04-158T). This memorandum requires a face-to-face evaluation by a credentialed military health care provider (physician, physician assistant or nurse practitioner), on a new four page questionnaire that had specific questions about deployment exposures, symptoms and concerns, along with a post-deployment blood serum draw. There were also some key questions added to screen for PTSD symptoms.

#### *Timing of Deployment Screening*

The period immediately before a long combat deployment may not be the best time to measure baseline levels of distress. During the pre-deployment time frame individuals may be already experiencing high levels of stress (Hoge et al., 2004). Wright, Huffman, Adler and Castro (2002) described a mental health screening program overview, where six instruments

were employed, and identified the importance of mental health monitoring for maintaining medical readiness of all military members. Pre-deployment may be logistically difficult and may not offer valid information (Rona et al., 2005; Hoge et al., 2004; Wright et al., 2005). However, it may provide a baseline of information for analysis and comparison when military members return home. A conservative estimate suggests that 9% of soldiers may be at risk for a mental disorder before combat and as many as 11 to 17% may be at risk for disorders three to four months after return from combat (Wright et al., 2005). Therefore, four to six months post-deployment may be optimal for investigating long term health effects of deployment (Hoge et al., 2004). The timing of screening military members is an important consideration for the collection of accurate information and to provide for a timely intervention. Post-deployment assessment should be done immediately after return from the theater of operation, and four to six months afterwards (because this is when symptoms of PTSD can become more evident) (Hoge et al., 2004; Wright et al., 2002).

Currently DOD policy is to complete the PDHA within 5 days of return to home station or immediately prior to leaving the theater of operation. However, there is a new follow-up process that has been initiated (DD 2900). This reassessment should be conducted 90 to 180 days after their return to home station. The purpose of this reassessment is to proactively identify health concerns that emerge over time after a deployment and to facilitate the opportunity for military members to have health care needs addressed by assisting in removing barriers (Winkenwerder, 2005).



*Health Screening using DD2796: The first analysis*

Data from pre and post-deployment health assessments have been collected for many years; but these data have not been systematically analyzed or published. However, Hoge, Auchterlonie, and Milliken (2006) did the first study to evaluate variable relationships based on the information gathered from military members using the DD 2796. Hoge et al. conducted a population based analysis of 303, 905 army soldiers and marines who completed the PDHA (DD 2796) after returning from Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF). The operational names given to military activities identify the time frames and possible locations of a particular military engagement or activity. In their analysis, Hoge et al. identified the locations of the deployment of military members by operational name; OEF included Afghanistan, and OIF included Iraq, Kuwait, and Qatar. Locations identified as other included Bosnia, Kosovo, Turkey and Uzbekistan (Hoge et al).

The PDHA, as noted earlier, changed to a four page format in the spring of 2003, and previous to that it was limited to a one page general health assessment. Yet there was no systematic analysis of the survey itself. The study by Hoge, Auchterlonie, and Milliken (2006) validated several questions used on the post-deployment health assessment 2796. For example, Hoge et al. identified 2 questions on the DD 2796 that were used for depression screening in military members in their study. These questions were modified from a valid instrument, the 2-item Patient Health Questionnaire (Kroenke, Spitzer, & Williams, 2003) that was used in the primary care setting. Hoge et al. asserted that positive responses to these 2 questions could be used as a means to screen for depression-related risk factors in these military members. Hoge et al. also identified that the PDHA included 4-items that screen for PTSD (items measure: re-experiencing trauma, numbing, avoidance, and hyperarousal). Endorsement of any two of the

four PTSD screening items indicated that an individual may be at increased risk for developing PTSD. Hoge et al. also identified four items that measured three mental health risk categories (suicide, interpersonal relationships, and an interest in receiving care). Individuals who selected any one of the four questions related to these categories were at an increased risk for a mental health problem. Hoge and colleagues found that 18.4% of Active Duty, 21.0% of National Guard, and 20.8% of Reserve component members screened positive for one of the mental health concerns. The difference in the percentage was not significant, and demonstrated a small difference in the varied component experience of deployed members.

There is no question on the PDHA survey that identifies those military members who have sustained a combat injury. However, the PDHA included a question about hospitalization during their deployment, which was used as a proxy measure for combat injuries (Hoge, Auchterlonie, & Milliken, 2006). Hospitalization was significantly associated with deployment location and reporting of a mental health concern on the PDHA (Hoge et al., 2006). Among the 14,777 OIF military members who were hospitalized, 35% reported a mental health problem (OR= 2.46; 95% CI, 2.37–2.55; P<.001) and 9.4% were referred (OR=2.53; 95% CI, 2.38–2.69; P<.001) for mental health follow up when compared with the 207,843 OIF members not hospitalized.

Hoge, Auchterlonie and Milliken, (2006) stated “the findings from this article support the construct validity of the items included on this screen, particularly the strong linear relationships of mental health problems with deployment location and combat exposure (p. 1030).”

*Post-Deployment Health Screening in Military Members*

Trump (2006) identified that the prevalence of low self-reported health (1.5%,  $n=339$ ), general health concerns and conditions experienced by deployed military members varied by demographic and deployment characteristics. Trump reported that service members (Army and Air Force) participating in the study ( $n=22,229$ ) had a lower prevalence of low self-reported health than the U.S civilian.(7%) population of comparable age. However, the identified issues in these military members were not explored further or discussed. An association between higher usage rates of ambulatory care services and low self-rated health and health concerns after a military deployment has been identified in military members after combat exposure (Trump, 2006; Trump, 2004).

The current post-deployment health assessment survey (DD 2796) has several questions that may assist in the clinical evaluation of military members. For example on the DD 2796 there is a self-rated general health question based on the Medical Outcomes Study Short Form-36 (SF-36) (Trump, 2006; Ware & Sherbourne, 1992), (*4-1: Would you say your health in general is:... Excellent, Very Good, Good, Fair, Poor*). There are also five screening questions that have been used as a primary care PTSD screen from the Primary care-PTSD screen (PC-PTSD) instrument (Prins et al., 2004) (*3-12: have you ever had any experience that was so frightening, horrible, or upsetting that, in the past month, you ...* (1) Have had any nightmares about it or (2) thought about it when you did not want to? (3) Tried hard not to think about it or went out of your way to avoid situations that remind you of it? (4) Were constantly on guard, watchful, or easily startled? (5) Felt numb or detached from others, activities, or your surroundings?), where a screen is considered positive if two of the four choices are selected (Friedman, 2006; Prins et al, 2004). There are also depression screening questions that have

been used in primary care to assess for depression { 1-little interest in doing things, 2- feeling down, depressed, or hopeless} (Kroenke, Spitzer, & Williams, 2003). Deployers with fair/poor self-reported health had a higher risk for illness related ambulatory care visits (Hazard Ratio =1.8; 95% CI =1.6, 2.1), than those that did not deploy who also had the same reported self-reported health (Trump, 2006). Rona (2006) found that self-perception of health is important for surveillance for military members as it is highly associated with psychological health.

#### *Post-Deployment Physiologic Symptoms in Military Members*

After deployment to an active combat zone, there may be physiological and psychological concerns of possible exposures. The Gulf War was the most recent conflict where a great deal of interest was generated regarding possible exposures to military members and health outcomes. Gray et al. (2002) defined Gulf War illness as having any one of five possible medical related conditions. These conditions included a self-reported physician diagnosis of; chronic fatigue syndrome, posttraumatic stress disorder, multiple chemical sensitivity, inflammatory bowel disease, or the self-reporting of 12 or more identified medical problems (Gray et al.). Out of the 33 items that Gray et al. identified, 18 physical symptoms can be directly found on the post-deployment survey (DD 2796). For example, the following medical issues were identified as contributing to the diagnosis of Gulf War Illness; rash or skin ulcer, muscle weakness, muscle pains, shortness of breath, joint stiffness, sleepiness, diarrhea, cough, joint pain, chest pain, stomach pain/ulcer, headache, joint swelling/redness (Gray et al.).

Knoke et al. (2000) performed cluster analysis on symptoms identified by Gulf War Veterans who were involved with combat, many of which can be found on the current post-deployment health assessment questionnaire (DD 2796). Knoke et al. found that Gulf War Veterans scored higher for various medical symptoms than non deployed Veterans on selected

Hopkins Symptom Checklist (Derogatis, Lipman, Rickles, Uhlenhuth & Covi, 1973) categories.

The development of the physical symptoms that are asked on the PDHA appear to have come from earlier lessons learned related to combat exposure in earlier conflicts.

### *PTSD in Military Members*

PTSD was officially added to the Diagnostic and Statistical Manual for Mental Disorders in 1980 and it has been identified as many things over the years in returning veterans; including shell shock, battle fatigue, and combat stress (Kaimen, 2003). PTSD can be found in many clinical situations, and has been studied in children, women in abusive situations, and after catastrophic events. Military members are in a unique situation that is difficult to replicate (Figley & Nash, 2007). Diagnostic criteria for PTSD include a history of exposure to a traumatic event and symptoms from each of three symptom clusters: intrusive recollections, avoidant/numbing symptoms, and hyper-arousal symptoms (Kaimen, 2003). Screening in the military for psychiatric issues is an important priority, however mass screening prior to a deployment is extremely difficult, and has not been done since World War II, when it was deemed a failure (Rona, Hyams, & Wessely, 2005). The evidence suggests that screening for PTSD or general health issues has not been done for veterans until long after their deployment and combat experience, if done at all (Joellenbeck, Landrigan, & Larson, 1998; Presidential Advisory Committee, 1996).

Nadelson (1999) felt veterans carried the images and stress of the battle home with them, “the continuing suffering of veterans long after their war is over” (p.627). Body armor and Kevlar have protected the soldier’s body from injury, but the mind lies vulnerable. In PTSD forgetting is impaired; the memories are always there (Lamberg, 2004). Symes (1995) evaluated nearly three hundred articles to help define PTSD through concept analysis, concluding that

PTSD is a complex issue with many attributes, antecedents and consequences, as well as related concepts. Stress is an important factor to understand as a strong contributor to the development of PTSD. Stress in any combat situation is ever present, not only dealing with the unknown but the real possibility of danger around every corner. Depression is a major component identified with PTSD (Kang et al., 2003; Baker et al., 2001; Hankin et al., 1999) and Hoge et al. (2004) also identified associations for major depression after deployment to Iraq and Afghanistan. Other psychopathology may be present, along the lines of varied personality disorders (Axelrod et al., 2005; Dunn et al., 2004; Monson et al., 2004), but these characteristics of psychopathology may make the soldiers effective on the battlefield but not at home. The transition to home life and routines must be effectively addressed to ease the adjustments when soldiers return, and turn these war fighting characteristics into successful civilian traits. Hankin, Spiro, Miller, and Kazis (1999) found that screening rates for depression and PTSD were higher in Veterans than in the general population, with 40% of those screened meeting study criteria for at least one mental disorder; 31% for depression, 20% for PTSD and 12 % for alcohol related disorders. Of those who screened positive for depression, 51% screened positive for PTSD (Hankin et al., 1999).

Baker et al. (2001), identified depressive and anxiety disorders as the primary symptom complaints of Gulf War Veterans which were not distinguishable from veterans with only a medical diagnosis; veterans with a psychiatric diagnosis had a slightly higher rate of endorsed physical symptoms. Rates of depression and PTSD in this study were higher than the general population, with the most frequent psychiatric disorders being PTSD (13.3%) and depression (21.7%) (Baker et al., 2001). Rates of PTSD were significantly higher after combat duty in Iraq than before their deployment for Army personnel (OR=2.84, CI= 2.17-3.72) and Marines (OR=2.66, CI=2.01-3.51) (Hoge et al, 2004).

In Hoge, Auchterlonie and Milliken (2006), exposure to combat situations was correlated with screening positive for PTSD among OIF veterans. Of the 21,822 service members who screened positive for PTSD after returning from OIF, 17,364 (79.6%) reported witnessing persons being wounded or killed or engaging in direct combat as compared with 95,894 (47.8%) of 200,798 military members who screened negative for PTSD (OR for PTSD, 4.26; 95% CI, 4.12–4.41;  $P < .001$ ) (Hoge et al.). The prevalence for positive PTSD screens on the DD 2796 were 9.8% for OIF (OR 5.51; 95% CI, 5.20–5.83  $P < .001$ ), 4.7% for OEF (OR 2.52; 95% CI, 2.30–2.76;  $P < .001$ ) when compared with other locations (2.1%) (Hoge et al., 2006). Clearly members deployed to support OIF were at greater risk of developing PTSD.

#### *Stress and Deployment: Combat Exposure*

With modern warfare there is a great deal of discussion about the unique issues that may be encountered on the battlefield by military members such as potential toxic chemical exposures and urban guerrilla warfare. Gulf War Illness has generated a great deal of controversy, and the intricacies of that phenomenon are still being investigated. Kang, Natelson, Mahan, Lee, and Murphy (2003) investigated the issues surrounding deployment-related stress in a veteran population and found an overall pattern that indicated some parallels between chronic fatigue syndrome-like illness and PTSD; both having a relationship to stress. In Kang et al., 10.1% of the entire deployed population of Gulf War military members had PTSD during the previous month of the study, compared to 4.2% of veterans not deployed to the gulf region (Kang et al., 2003).

Combat exposure can have long term and lasting effects. Hoge et al. (2004) described that individuals (Army / Marines) returning from Iraq reported higher rates of combat experience (71% / 86%) and contact with the enemy than those Army soldiers returning from Afghanistan

(31%). Orcutt, Erickson, and Wolfe (2004) found that in their study of Gulf War Veterans, one group described fewer PTSD symptoms (57%) and a second group had more PTSD symptoms (43%), with the most robust predictor of group membership was the reported level of combat exposure. Those who reported higher levels of combat exposure were more likely to be classified into a more symptomatic group (Orcutt et al., 2004).

The traumatic experience from active combat can be seen in several studies. Pereira (2002) found a statistically significant correlation between the levels of exposure to combat stress and the level of PTSD symptomatology (OR 1.1158,  $p < 0.001$ ). Benda (2005) found that combat experience, combat related PTSD and employment related problems were significantly associated with suicidal thoughts (experience OR=1.34,  $p < .01$ ; PTSD OR=1.56,  $p < .01$ ) and suicide attempts (experience OR=1.43,  $p < .01$ ; PTSD OR=1.86,  $p < .01$ ) for male combat veterans. Fontana and Rosencheck (2005) identified PTSD as being influenced by traumatic war zone exposure, as well as the nature of the homecoming reception for the returning combat veteran.

Combat related traumatic exposure was strongly associated with a higher risk for developing a mental disorder (OR 1.49, CI 1.25-1.79) (Hankin, Spiro, Miller, & Kazis, 1999). Those military members that suffer an injury and have significant exposure to combat are at great risk for developing psychological sequela (Orcutt et al., 2004; Fontana & Rosencheck, 2005; Hoge et al., 2004).

Hoge, Auchterlonie and Milliken (2006) found a higher prevalence rate for mental health problems and combat experiences following deployment to OIF (OR 2.72; 95% CI, 2.63–2.80;  $p < .001$ ) than to OEF (OR, 1.55; 95% CI, 1.46–1.64;  $p < .001$ ) or other locations. This emphasizes the relationship of combat exposure to the development of mental health issues which appears to be concentrated in the OIF deployment. Soldiers and Marines who returned from OIF met the



risk criteria for a mental health concern (19.1%) as compared with 11.3% of soldiers and marines that returned from OEF and 8.5% for other locations. This suggests that location, Iraq in particular, has a higher exposure to some type of stress that leaves military members in need of mental health follow up.

### *Gender and Deployment Health*

Females have not been traditionally on the front lines of an active combat zone. However this is no longer the case as women find themselves in roles of pilots of combat aircraft and embedded in infantry units. In 1949, Congress passed the Women's Armed Services Integration Act that put several limits on the role and function of women in the military (Harrell & Miller, 1997). This Congressional mandate restricted the total number of women allowed in the military, as well as it limited their rank capabilities and clearly restricted their ability to engage in combat missions (Harrell & Miller, 1997). As women gained more career mobility in the civilian arena, the military lagged behind. In 1994, the naval combatant exclusion law was passed by Congress, which led to further DOD guidance to expand career opportunities previously out of reach to women (Harrell & Miller). Since the mid 1990's, female military members have been assigned to combat supported missions (Harrell & Miller).

Orcutt et al. (2004) found that gender was a robust predictor of PTSD symptoms with females ( $n=240$ ) having a higher probability of being in the higher PTSD symptom group than men ( $n=2702$ ). In Pereira (2002), men ( $n=56$ ) were 3.4 times more likely to be diagnosed with PTSD than women ( $n=54$ ) despite the same symptomatology for men and women. However, female veterans may be under-diagnosed with PTSD, as males scored higher than women on all five instruments used in the study (Pereira, 2002). Male military members were clearly exposed

to and experienced a significantly ( $p < 0.001$ ) higher level of combat than female members (Orcutt et al., 2004).

Dobie et al. (2004) found that there was a PTSD screening prevalence of 21% for combat veterans over the previous month for those women who participated in their study. Screening positive for PTSD was associated with many health problems and impairments such as smoking, substance abuse, and sexual practices in female combat veterans (Dobie et al., 2004). Dobie noted that PTSD symptoms were associated with a poor health-related quality of life as measured by the SF-36-V subscales, as well as an association with increased PTSD symptoms and increased obesity in female combat veterans (OR=1.78, CI=1.34-2.35). Hoge, Auchterlonie and Milliken (2006) noted that 23.6% of women reported a mental health concern when compared with 18.6% of men who deployed. However this small percentage difference may be related to the actual location of the military members. There was no breakdown indicating where the females were deployed. It is an important variable to know, if there were a higher percentage of women stationed in Qatar for example, their combat experience and perceived stress may be less than their male counterparts in Iraq. There are few formal reports of gender-related issues in the combat literature. However, the issue with sexual assault of females is an important one since it may contribute to PTSD symptoms (Orcutt, Erickson & Wolfe, 2004; Benda, 2005; Dobie et al. 2004; Pereira, 2002). Kang and colleagues (2005) reported that of the females deployed during the Gulf War (N=2,2131), 24 % reported sexual harassment and 3.3% reported a sexual assault.

#### *Minorities and Deployment Health*

Orcutt et al. (2004) reported that members of minority groups were more likely to be classified into higher PTSD symptomatic groups. Rosenheck and Fontana (2002) described black combat veterans (48.8%) who reported less severe PTSD symptoms and fewer suicide

attempts than Hispanic combat veterans (58.9%) who had a greater number of comorbid psychiatric diagnoses, and suicide attempts ( $p < 0.05$ ). Black combat veterans (68.2%) were found to have a more severe substance abuse problem but less PTSD symptoms than both Hispanics (57.6%) and whites (56.1%) ( $p < 0.05$ ) (Rosenheck & Fontana, 2002). Ortega and Rosenheck (2000) found that after adjusting for premilitary and military risk factors for PTSD, Puerto Rican and Mexican American veterans had significantly higher probabilities of PTSD than white veterans ( $p < 0.05$ ). Puerto Rican veterans reported higher probability of PTSD and more severe symptoms than the other groups. Despite their more severe symptoms, Puerto Rican veterans showed consistently less functional impairment than non-Hispanic white veterans, suggesting the observed difference in symptom reporting may reflect features of expressive style rather than different levels of disabling illness (Ortega & Rosenheck, 2000). Loo, Fairbank, and Chemtob (2005) found that 77% of Asian combat veterans reported exposure to one or more negative race related events while in the military, of those exposed 23.8% experienced one event, and 76.2% experienced two or more events. Loo et al (2005) identified that exposures to adverse race-related traumatic events can be profound, with 65% of their sample meeting the full criteria for PTSD. The increased frequency of exposure to adverse racial events in combat veterans is associated with an increased risk of PTSD ( $p < 0.01$ ) (Loo et al, 2005).

### Sequela of Veterans Issues: Long Term Health

#### *Risk Behavior After Combat Exposure*

Risk behavior in combat veterans has been studied over the years. Both legal and illegal behaviors have been observed and immortalized in Hollywood films. Hartl, Rosen, Drescher, Lee, and Gusman (2005) found that 71.6% of their sample of combat veterans ( $N=630$ ) had a history of incarceration, 98.4% served in a war zone, and 50.2% attempted suicide in the past.

Recent behavior is the strongest predictor of future behavior, as individuals accustomed to a certain level of chronic distress may become more likely to engage in high-risk behaviors at times when their PTSD symptoms worsen (Hartl et al., 2005). Buckley, Mozley, Bedard, Dewulf, and Grief (2004) found the average level of self-care and physical morbidity in treatment-seeking combat veterans with PTSD was poor. Combat veterans had an increased rate of high-risk behaviors and engaged in activities that put them at risk, with a low frequency of preventative health behaviors (Buckley et al.). Buckley et al. went on to further describe combat veterans who smoked twice as much as the general population, exercised less frequently, and had lower health care visits. One-third of the combat veterans were found to be in an abuse category score for alcohol and 10% for drugs (Buckley et al.). Hoge et al. (2004) identified the misuse of alcohol as significantly higher in all groups post-deployment from a combat zone, when compared to pre-deployment.

Beckham, Gehrman, McClernon, Collie, and Feldman (2004) described Veterans with PTSD to have a higher heart rate (adjusted mean 73.9 vs. 70.6,  $p < 0.0001$ ), higher anger hostility scores (adjusted mean 1.7 vs. 1.3,  $p < 0.001$ ), and higher anxiety and depression ratings (adjusted mean 2.0 vs. 1.6,  $p < 0.001$ ). PTSD combat smokers demonstrated an increased diastolic blood pressure (DBP) (adjusted mean 81.1) and mean arterial pressure (MAP) (adjusted mean 98.2), while smokers without PTSD had a significantly lower DBP (adjusted mean 76.9,  $p < 0.001$ ) and MAP (adjusted mean 93.4,  $p < 0.0001$ ) (Beckham).

Johnson, Fontana, Lubin, Corn, and Rosenheck (2004) found that the mortality rate among Vietnam veterans was nearly five times higher than that expected among American men, this high mortality rate is associated with self-destructive or high risk behaviors. Combat-related PTSD in Vietnam veterans is a severe and chronic condition with some lethality; however

combat exposure, PTSD symptoms, and substance abuse were not predictors of death (Johnson et al., 2004).

### *Incarceration and Violence After Combat Exposure*

Black et al. (2005) described Gulf War veterans who had been incarcerated at some point in their lives had a higher prevalence of mental health, addictive and medical conditions than did nonincarcerated veterans. Those that were involved with combat were at a modestly greater risk for subsequent incarceration, and they were three times more likely to report PTSD, with more dysthymia, alcohol abuse and anxiety than those not involved with combat (Black et al.).

Freeman and Kimbrell (2004) found a relationship between current alcohol cravings and current self-reported symptoms of PTSD, past reports of combat exposure, depression, or other general psychopathology. Gerlock (2004) found that 90% of study participants had PTSD symptoms, of those 30% identified military only trauma, 39% identified civilian only trauma, 30% identified a combination of military and civilian trauma as a source of PTSD symptoms. Gerlock (2004) found there was a relationship between the severity of PTSD and domestic violence severity and PTSD. Kang, Dalager, Mahan, and Ishii (2005) identified that male combat veterans in their study demonstrated slightly less PTSD than females combat veterans (11.2% vs. 15.8%); however the association of PTSD with assault or harassment was noteworthy for both genders. The magnitude of the risk of PTSD associated with sexual assault in military members was similar to that associated with high combat exposure in both male and female (Kang et al., 2005).

Taft et al. (2005) described findings that combat veterans were higher on all risk factors for PTSD including psychiatric relationship, and war zone variables. The PTSD violent group was exposed to more atrocities than the non-violent PTSD group, suggesting that trauma related experiences, comorbid psychopathology, and relationship problems were associated with PTSD,

and serve as risk factors for partner violence (Taft et al., 2005). Substance abuse may be an intermediary between PTSD and partner violence in combat veterans (Taft et al., 2005).

#### *Gender Issues After Combat Exposure*

Benda (2005) found that homeless female combat veterans were more likely to have contemplated suicide (OR =2.31) within the past five years than homeless male combat veterans (OR=1.89) (48.7% vs. 44.4%) and have attempted suicide (OR=2.48 and 1.90 respectively) in that same time frame (36.5% vs. 26.7%). Homeless male veterans have higher scores on alcohol and other drug abuse scales, with more aggression than their female counterparts (Benda, 2005). Gray et al. (2002) found that female, Reserve, and enlisted personnel were most likely to meet the case definition of Gulf War illness.

#### *Combat Exposure and Other Serious Mental Illness*

Axelrod, Morgan, and Southwick (2005) found that pre war features of borderline personality disorder predicted variability in postwar PTSD. These findings suggest that adulthood traumatic experiences and post traumatic stress sequela may contribute to the development of borderline personality disorder. It is possible that individuals with borderline personality disorder features, such as impulsivity and uncontrolled anger are more likely to engage in situations where they are exposed to trauma, putting them at risk for developing PTSD (Axelrod et al., 2005). Fontana and Rosencheck (2005) surmised that the postmilitary antisocial behaviors represent a current manifestation of a lifetime history of antisocial behavior more than it reflects the impact of war zone stress. Combat veterans who reported experiencing a traumatic event in their lifetime were twice as likely to meet the criteria for alcohol related disorder, than those who did not experience a traumatic event (Hankin et al., 1999).

Dunn et al. (2004) found that 45.2% of military combat veterans who participated in their study (N=115) had one or more identifiable personality disorders. Character traits of obsessive compulsive and paranoid personality disorders are adaptive in combat and may enhance survival by demonstrating traits such as pervasive distrust of others motives and intentions, hypervigilance for perceived danger, rigidity, adherence to rules and extreme attention to detail; these same traits that are beneficial in combat may be detrimental in a noncombat situation (Dunn et al., 2004). Monson, Price, Rodriguez, Ripley, and Warner (2004) found that externally oriented thinking and negative affectivity consistently emerged to predict PTSD symptoms. Combat veterans who are prone to direct their thinking to superficial, external events, instead of internal emotional experiences have more severe PTSD symptoms, with depression being the only noteworthy associated emotion variable (Monson et al., 2004).

### Potential Barriers to Self-Identify Mental Health Issues

Stigma and fear may prevent military members from seeking follow up from medical providers. It is also a concern that veterans seeking benefits for service connected to PTSD must discuss military-related trauma in a nontherapeutic context, which may cause more concern for the returning veterans not to seek out Veterans Affairs assistance (Sayer, Spont, Nelson, 2005). Scannell-Desch (1996) suggested that education should focus on the emotional sequela of catastrophic events such as serving in a war zone, as the memories of the particular event may be extremely painful and disruptive for years after the event has passed. Perceived barriers to adequately addressing PTSD may not be the symptoms, but the lack of skills and confidence in being able to successfully manage those PTSD symptoms (Hartl et al., 2005).

Individuals returning from Iraq were more likely to report they were experiencing a mental health problem and express an interest in receiving help (Army 78%, Marines 86%)

(Hoge et al., 2004) compared with those who did not deploy. Among those who met screening criteria for a mental disorder only 43% of Army and 45% of Marines were interested in receiving help. Concern about stigma was disproportionately higher in those in most need of mental health service (Hoge et al., 2004).

### Summary

Military members deployed to the combat zone in Iraq have been exposed to unique war time stressors that are difficult for the general public to fully comprehend. Military members deployed to Iraq may exhibit physiological and psychological symptoms related to their deployment. Congressional inquiry has brought about some recent policy changes regarding how post-deployment health assessments are conducted. With more than 2,607 soldiers killed in action, 24,314 soldiers seriously wounded (DMDC, 2007) and more than one million soldiers exposed to the intense hostile Iraqi environment, efforts on improving the post-deployment health assessment have been made; but no systematic evaluation has been conducted to date. Hoge et al (2006) is the first to look at some of the psychologic issues, however there is no substantive literature to describe both the physiological and psychological issue that may develop from deployment to a combat zone.

How an individual responds to combat experiences may differ based on certain inherent personal characteristics. For example gender, race or ethnicity, and length of deployment may influence short and long term outcomes experienced by returning military members. How the individual military member responds to stressful environmental and combat experiences may be influenced by several factors. How an individual appraises any given event, and how they respond to that event is highly individual. No substantive literature exists that examines the relationship between combat exposures and physical and psychological outcomes. This study



will help identify health and emotional related issues of service members after deployment to Iraq. This study will also attempt to evaluate the relationship between identified characteristics and sources of stress and identified outcomes.

## Chapter II

### Theoretical Framework

#### Introduction

Stress, appraisal, and coping theory (Lazarus & Folkman, 1984) will be used as the theoretical framework for this study. Interestingly, the evolution of coping and stress theory can be traced back to the effects and impact of the stressors of war with military members who served in combat conditions (Lazarus & Folkman, 1984). Lazarus and Folkman (1984) describe coping as a constantly changing process involving both cognitive and behavioral aspects. This cognitive appraisal consists of the individual's assessment of a given situation or phenomena based on elements of primary and secondary appraisals with interactions with cognition and environment (Lazarus & Folkman, 1984). Appraisal and coping processes shape the stress reaction, these processes, in turn, are influenced by variables in the environment and within the person (Lazarus, 1993a). Lazarus (1993b) felt there were grounds in theory and research for believing that the coping process is linked specifically to the kind of emotion (stress emotions) experienced in an adaptational encounter, and the conditions that elicit it. Lazarus (1993b) went on to say "Taking into account the specific emotions, general goals (or ends), and situational intentions (or means) to attain goals in stressful encounters would, I believe, facilitate our understanding of the basis on which coping strategies are selected and acted on" (p.245).

Stress, appraisal, and coping theory has been used in research with a wide array of medical illnesses. Populations that have been studied include: HIV/AIDS (Bova, 2001; Plattner & Meiring, 2006; Pakenham & Rinaldis, 2001; Park, Folkman & Bostrom, 2001), cancer (Belleau, Hagan & Masse, 2001; Miedema, Hamilton & Easley, 2007; Reynolds et al., 2000; Silver-Aylaian & Cohen, 2001), arthritis (Sinclair, 2001), parenting issues of ill or disabled

children (McCleary, 2002; Lau & Morse, 2001; Tunali & Power, 2002; Larose & Bernier, 2001), elderly issues (Frazier, Waid & Fincke, 2002), caregivers of dementia patients (Perodeau, Lauzon, Levesque & Lachance, 2001), abdominal Pain (Walker, Smith, Garber & Claar, 2007), urinary continence issues (Valerius, 1997), brain injury (Rutterford & Wood, 2006), bullying (Hunter & Boyle, 2004), and post-partum depression (Faisal-Cury, Tedesco, Kahhale, Menezes & Zugaib, 2004). Nicholls and Polman (2007) did a review on the use of Lazarus and Folkman's theory in sports literature as a legitimate theoretical framework. No research to date is available looking at the use of this theoretical framework in military members and deployment related issues.

Deployment to a war zone is a transformative process for both the warrior and their families (Figley & Nash, 2007). In adapting to stress, genetics and chemical processes are influenced by conscious coping choices, personality styles and interpersonal relationships (Nash, 2007). The mental and behavioral responses to stress are a product of learning and choices and are unlimited in their variety and capacity to change over time (Nash, 2007). Clearly training and prior combat exposure may play a part in the military combat experiences. Nash (2007) went on to further propose three phases of adaptation in military members to include; dread, in the groove, and rebound fatigue. Dread may begin prior to deployment in anticipation of combat or separation from loved ones lasting well into the deployment. In the groove phase the military member is focused on their jobs and perceptions are sharp. In the rebound phase the individual emerges from the emotional and physical numbness of their experience. This time phase evaluation may explain how soldiers operate in extremely stressful situations and perform their jobs well. How the individual who is encountering a heavy firefight operates his weapon with keen accuracy can be seen "in the groove" with a low perceived stress during the actual

encounter. However, the concern is rebound fatigue, when the firefight is over and the coping mechanisms that make the military member successful in battle may be more prone to other outside stressors. When rebound fatigue starts is not clear, it may be when the individual soldier leaves the combat zone, returns to their homestation or after an intense firefight.

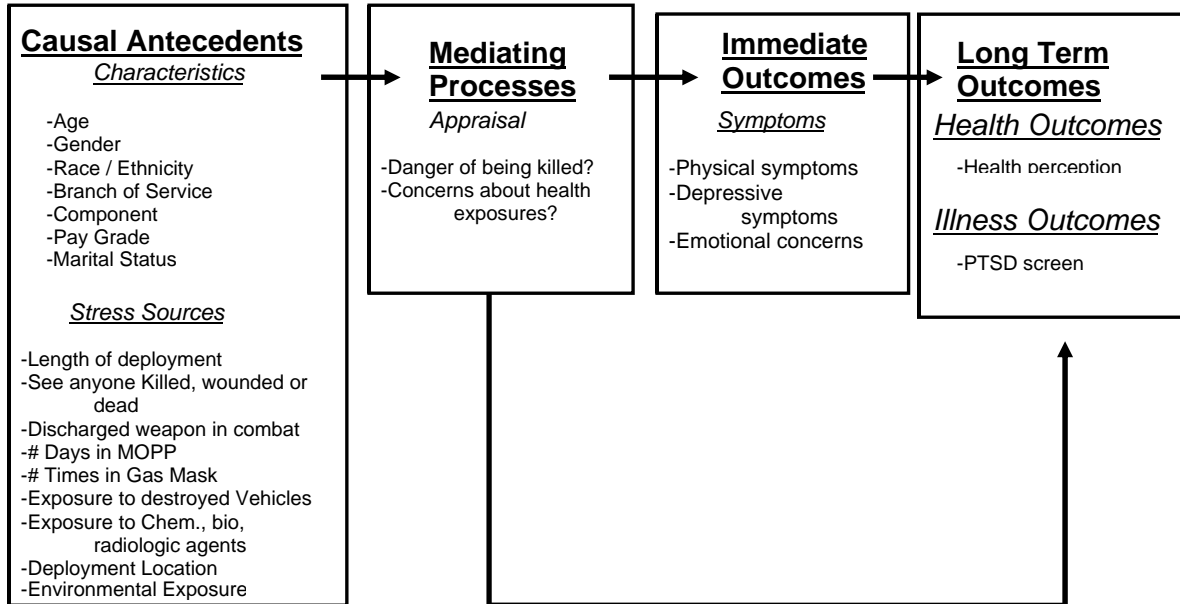
Whether or not individuals perceive a given set of circumstances as stressful depends upon their own life experiences. These life experiences take into account their personal, social, and biological resources and vulnerabilities. Predisposing biological and psychosocial resources and vulnerability factors play a dual role in processes linking stress and health (Marshall, Davis, & Sherbourne, 2000) When there is intense, perceived stress it may activate physiological, behavioral, and psychological processes that place individual military members at heightened risk for health problems or illness behavior. How an individual appraises and responds to the demands placed on them depends on whether they have exceeded their adaptive capacities.

According to Lazarus and Folkman's (1984) theory, stress is a significant risk factor for poor health and illness. Symptom clusters as somatic representation of stress may explain how an individual deals with stress by presenting with particular physiological and psychological responses. Important areas addressed in the framework relate to antecedents {characteristics / sources of stress}, mediating processes {appraisals}, and outcomes {immediate: symptom burden; long term: health/ illness outcome}. Refer to Figure 1 for variable breakdown.

Figure 1  
*Organizing Theoretical Framework for Post-Deployment Health Assessment*

# Framework

*Post-Deployment Health Appraisal in United States Service Members after Iraq deployment*



Adapted from Lazarus and Folkman (1984)

## Category Development

In working with the theoretical model, categories were developed to evaluate the variables of interest. Identifying the variables and defining their association within the model will provide for a systematic evaluation of the proposed relationships of the variables to each other and to outcomes.

*Causal Antecedents*

Military member's characteristics will make up the first portion of this category of the framework. Characteristics will include the military members: age, gender, race / ethnicity, branch of service, component, pay grade, and marital status. These characteristics help define the military member.

A stress source is the second component within this category. Stress sources are composed of: length of deployment, if they saw anyone killed, wounded or dead, if they discharged weapon in combat, the number of days they were in protective chemical gear (MOPP), the number of times they were in their protective gas mask, if they had been exposed to destroyed vehicles, if they were concerned about exposure to chemical, biological, or radiological warfare agents, environmental exposures and their actual deployment location in Iraq. These items can clearly be sources of stress. Some of these items are related to actual combat exposure (for example: seeing wounded or dead, discharging weapon) and some are environmental concerns (for example: chemical exposures, environmental exposures).

*Mediating Processes*

Individual military member's appraisal of his/her health and a component of combat exposure contribute to this category. The appraisal questions consists of: asking if they feel they were in danger of being killed, and if they had concerns about health exposures and impact on health.

*Immediate Outcomes*

The immediate outcomes category is based on the responses (symptoms) to the physical and depressive questions on the survey. The symptoms are categorized into the total number of

physical symptoms, and if there are depressive symptoms present. The military members identify these symptoms that are present at time of completion (or during deployment).

### *Long Term Outcomes*

In the proposed theory (Stress, appraisal and coping) , the long term health outcomes would include health perception, illness outcomes (PTSD) and emotional concerns. Health perception on this survey was measured by a question taken from the SF-36. Illness outcomes were measured by PTSD screening questions. Emotional concerns made up the next area in long term outcomes category. This area consisted of; do they need help with problems, do they have concerns about conflicts, do they feel they may lose control or hurt someone, have they sought out mental health advice, have they had any suicidal thoughts.

### *Theoretical Perspectives*

According to Lazarus and Folkman (1984), causal antecedents directly influence the mediating processes and in turn the mediating processes directly influence the immediate and long term outcomes. For example if the member felt in great danger of being killed, they may have a positive PTSD screen with poor health perception and higher mental health problems. The influence of causal antecedents (e.g. age) influences outcomes only after they are mediated by appraisal of the event (e.g. danger of being killed). For example, according to this theory, age alone would not influence whether a member develops mental health problems. Instead, the influence of age on developing suicidal thoughts for example, would be mediated by an appraisal variable, such as perceiving that he/she was in danger of being killed. The perception of danger accounts for at least part of the association between age and mental health

One concept (variable) not addressed in the proposed study, that is important to mention is social support. According to Lazarus and Folkman (1984) social support is theorized to

mediate immediate and long term outcomes. Unfortunately, there is no measure of social support in the PDHA, so it can not be evaluated in the proposed study. Even with this caveat, this theoretical framework will be useful for organizing the data, generating hypotheses, and addressing the proposed specific aims.

The main study hypotheses are:

Hypothesis 1: Long term outcomes (health perception, PTSD) for military members deployed to Iraq will be directly influenced by appraisal of stressful events (danger of being killed and exposure/health concern), emotional concerns and symptoms (physical and depressive).

Hypothesis 2: Appraisal of stressful events (danger of being killed and health exposure concerns) mediates the effect of characteristics (age, gender, race/ethnicity, branch, component, pay grade, marital status) and stress sources (length of deployment, seeing someone, killed, wounded or dead, days in MOPP, times in gas mask, exposure to destroyed vehicles, exposure to CBR) on symptoms (physical and depressive), emotional concerns and long term outcomes (health perception and PTSD symptoms) among deployed military members.

### Summary

The stress, appraisal, and coping theory (Lazarus & Folkman, 1984) is an excellent fit for the proposed study. The variables of interest (available in the PDHA) fit nicely into this framework. Taking into account the individual's cognitive appraisal of the situation and environmental interaction /exposures along with personal resources (physical, psychological, problem-solving and social skills) will impact outcomes (Lazarus & Folkman, 1984). Appraisal and coping processes shape the stress reaction, and these processes, in turn, are influenced by variables in the environment and within the person (Lazarus, 1993a). Important areas that have



been described and are addressed in the framework relate to antecedents, mediating processes and outcomes. The stress, appraisal, and coping theory (Lazarus & Folkman, 1984) will provide the necessary framework and theoretical perspective for meaningful analysis of the study data.

## Chapter III

## Methods

*Introduction*

This study used existing data from the DOD (DD 2796) post deployment health assessment questionnaire<sup>1</sup> to describe the health status of 510,352 military members upon return from Iraq. This study will help identify health and emotional related issues of service members after deployment to Iraq. This study will also attempt to evaluate the relationship between identified characteristics and sources of stress and identified outcomes. This secondary analysis used a cross-sectional descriptive design. Several statistical techniques were employed to examine relationships among survey questions.

*Measures - DD 2796*

The survey questions analyzed (DD 2796) were broken down into an organized numbering sequence for easy reference. The first part of the sequence was the page number of the four page survey, and the subsequent number was the question number. Some general thematic categories were developed and used for this analysis. Refer to Appendix A for numbering sequence and assigned category for pertinent variables.

*Sample and Setting*

United States Military personnel deployed to Iraq from May 2003 (initiation of four page survey) until March 1, 2007 were included in this study. March 1, 2007 was selected as an end date, as it was prior to the start of the U.S. military surge; the deployment of troops back into Baghdad per presidential order. The estimated accessible population was approximately 900,000 military members (based on the total number of military members deployed to Iraq until March

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<sup>1</sup> The DD 2796 is administered to all United States DOD personnel after a deployment to any location, just prior to leaving a theater of operation or within five days of return to home station.

1, 2007). Information published from the Defense Medical Surveillance System (DMSS) concerning PDHA (DD Form 2796) from 1 January 2003 to 30 June 2006, included 947,110 military members with 594,735 Active Duty members and 352,375 Guard and Reservists. There were 840,640 males and 106,469 females listed. Of the composition there were 163,085 black non-Hispanic, 93,344 Hispanic, 2,336 classified as other, and 621,732 white non-Hispanic. Officer versus enlisted breakdown consisted of predominately enlisted members at 824,746 and Officers at 122,355 (The Medical Surveillance Monthly Report, 2006). These reported numbers were inclusive of all areas of responsibility for deployed military members throughout the world. Refer to Table 1 for makeup of DOD military members.

Inclusion criteria for this study were:

- Only military members

- Deployed to support Operation Iraqi Freedom in South West Asia (SWA)

- Time frame 2002 (many forces were pre-positioned) to March 2007

- Completed new four page questionnaire after implementation in May 2003

- First deployment to Iraq

- All services (Army, Air Force, Marine, Navy)

- All components (Active Duty, National Guard, and Reserves)

- All age groups (18 to 60 years old)

- All gender

- All races

Table 1  
*Department of Defense 2005 Demographic Report*

<b>Demographic Variable</b>	<b>Active Duty</b>	<b>Reserve and Guard</b>
Total Number	1,373,534	829,005
Ratio of officers to enlisted	1 to 5.1	1 to 5.6
% women	14.60%	17.20%
% minorities	35.90%	30.40%
% located in U.S.	85.30%	96.90%
% 25 years old or younger	46.60%	31.20%
% with bachelor's degree or higher	17.70%	19.70%
% married	54.60%	51.40%
% in dual-military marriages	6.90%	2.60%
Number of separations from military	217,598	160,882
Number of family members	1,865,058	1,141,735
Number of spouses	679,738	415,548
% with children	43.20%	43.00%
% single parents	5.40%	8.20%

Only the first post-deployment form (DD 2796) completed were included for those members who may have deployed on more than one occasion during the study time frame, subsequent post-deployment forms were excluded. The reason for this was to assess the individual's first deployment to Iraq and avoid any potential influence of previous deployments may have on deployment experiences. A power analysis was not necessary, as the detection of significant results with such a large sample was easily achieved. So the magnitude of the

differences / associations (clinical or scientific significance) was examined with regression models, as well as odds ratios. Regression models, including logistic regression and binary logistic regression, were employed during the analysis to evaluate associations and mediation.

### *Procedures*

The PI obtained IRB approval for secondary analysis on deidentified data from UMass Medical School. Army Medical Surveillance Activity (AMSA) permitted data release after the initial approval from the UMass Medical School IRB. Data obtained from AMSA was based on requested and submitted queries (inclusion criteria): only military members (all branches), deployed to support OIF in SWA during the specified time frame, and first deployment to Iraq (if multiple deployments completed). The PI obtained the data layout code books for how the surveys were coded upon export to the text file by AMSA. The data were transferred to a secure military server by File Transfer Protocol (FTP) in a compressed text file (.txt). The data file was extracted then burned on to a compact disc (CD) and transferred to a secure server at UMass Medical School. Data integrity has been maintained by use of data on password protected computers by the PI and the dissertation committee. Data were reviewed for completeness. Missing data were documented and evaluated for each variable and the overall study population. No variables were found to have a high percent of missing data, with the highest percent missing from the race and health perception categories at 0.3%. Data codes provided by AMSA were reviewed and were re-coded for ease of analysis by the PI.

### Data Analysis Plan

#### *Data management and control*

The PI worked with the assigned AMSA analysts (assigned at data extraction), along with the program director (Col. Cox) and Air Force Liaison Officer (Lt Col. Sean Moore), who

oversaw the running of all queries on the selected database. Dr. Moore was given a comprehensive prospectus of this study and queries were developed based on this information. Multiple communications, both written and via phone were conducted in order to ensure the study extraction protocols were clear (see email communications). A letter of agreement with AMSA outlined the study procedures and responsibilities (see email correspondence Appendix - G). Rosters on all deployed personnel are kept and maintained by the Defense Manpower Data Center (DMDC), who maintains the actual data repository, and will generate the information to be examined. The AMSA analysts selected, as part of the query, those individuals who were deployed to South West Asia (SWA) during Operation Iraqi Freedom within the specified timeframe. This information was further queried for the specific location to Iraq after it was sent to the PI to obtain the final sample. The entire DD 2796 was part of the prospectus and requested variables to be exported. However, AMSA did not release information on pre-deployment vaccinations and the number of nights hospitalized. As this information was not critical to the specific aims or hypotheses for this study, these variables were removed from the analysis plan.

The DMDC supports the Defense Enrollment Eligibility Reporting System (DEERS), which is the computerized database of military sponsors, families and others worldwide who are entitled under the law to certain benefits. All military members are enrolled in DEERS, which houses demographic information. The DEERS information allowed the addition of the individual's race and marital status to be included in the data for analysis, as these questions are not asked on the DD 2796. To determine subjects' age, only the year of birth was requested to enhance anonymity.

During data extraction, data were de-identified by AMSA staff prior to release to the PI by substituting a nine-digit study ID number for the social security number (SSN's). The name

fields were also excluded from the export. Each individual was given a unique study ID number, to maximize anonymity of the individual. Only DD 2796's implemented after May 2003 (four page survey initiated) through March 2007 were included in the analysis and extraction.

Analysts using structured query language (SQL) performed the data extractions and the large data set was submitted to the PI in .txt files (data were arranged in columns) along with a record layout in Excel format. The Statistical Package for the Social Sciences (SPSS) version 16.0 was used to analyze these data. The code book provided by the AMSA analyst was used to ensure the data integrity of matching each question and corresponding responses.

### *Data Analysis*

Several statistical techniques were used in the analyses of the data and included: frequency distributions, standard deviations, contingency tables, chi-square statistics, multivariate analyses, logistic regression, ANCOVA, path analysis and comparing unadjusted associations between variables and outcomes. Variables to be included in the final analyses in this study are listed in Table 2.

Exploratory factor analysis was done to evaluate physical symptom groupings. Exploratory factor analysis was also done to evaluate possible groupings of the environmental exposure items. Great care was taken to evaluate the fit of the model based on the grouping of variables. Cronbach alphas were calculated to estimate the reliability of the physical symptom and environmental exposure subscales. Cronbach alphas was also calculated for the three item depressive symptom scale, PTSD symptoms, and emotional concern scales.

Some continuous variable (age, deployment length, days in MOPP, days in mask, exposure scores, physical symptom scores) were categorized to look for non-linear associations. With this large dataset there were sufficient observations for each category.

Table 2  
*Variable Types for Analysis*

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Table 2

Assigned #	Item Description	Data Type / Original
NEW(N-1)	Race / Ethnicity	Categorical
NEW (N-2)	Marital Status	Categorical
1-7	YEAR OF BIRTH  <i>CALCULATED AGE AT COMPLETION</i>	Continuous
1-8	Date of arrival in theater	Continuous
1-9	Date of departure from theater  ( <i>CALCULATED TOUR LENGTH</i> )	Continuous
1-10	Gender	Categorical
1-11	Service Branch	Categorical
1-12	Component	Categorical
1-13	Location of Operation	Categorical
1-14	To what areas were you mainly deployed	Categorical
1-15	Pay Grade (Enlisted / Officer)	Categorical
2-6	Do you have any of these symptoms now or did you develop them anytime during this deployment?	Categorical
2-7	Did you see anyone wounded, killed or dead during this deployment?	Categorical
2-8	Were you engaged in direct combat where you discharged your weapon?	Categorical

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Table 2

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Assigned #	Item Description	Data Type / Original
2-9	During this deployment, did you ever feel that you were in great danger of being killed?	Categorical/ Dichotomous
2-10	Are you currently interested in receiving help for a stress, emotional, alcohol or family problem?	Categorical/ Dichotomous
2-11	Over the LAST 2 WEEKS, how often have you been bothered by any of the following problems?	Categorical
3-12	Have you ever had any experience that was so frightening, horrible, or upsetting that, IN THE PAST MONTH, you ....	Categorical
3-13	Are you having thoughts or concerns that ...	Categorical
3-14	While you were deployed, were you exposed to:	Categorical.
3-15	On how many days did you wear your MOPP over garments?	Continuous
3-16	How many times did you put on your gas mask because of alerts and NOT because of exercises?	Continuous
3-17	Were you in or did you enter or closely inspect any destroyed military vehicles?	Categorical/ Dichotomous
3-18	Do you think you were exposed to any	Categorical/

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Table 2

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Assigned #	Item Description	Data Type / Original
	chemical, biological, or radiological warfare agents during this deployment?	Dichotomous
4-1	Would you say your health in general is:	Ordinal categorical
4-4	During this deployment have you sought, or do you now intend to seek, counseling or care for your mental health?	Categorical/ Dichotomous
4-5	Do you have concerns about possible exposures or events during this deployment that you feel may affect your health?	Categorical/ Dichotomous

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### Specific Aim 1

To describe characteristics (age, gender, race/ ethnicity, branch of service, component, pay grade, and marital status) stress sources (length of deployment, see anyone killed, wounded or dead, discharged weapon in combat, number of days in MOPP, number of times in gas mask, exposure to destroyed vehicles, exposure to chemical, biological, radiologic agents, deployment location, environmental exposure), symptoms (physical and emotional) and health outcomes of deployed military members after return from Iraq. For descriptive analysis, frequency distributions were used for categorical variables, and means and standard deviations were calculated for continuous variables. The full sample was described; however comparisons of different subgroups (military branch for example) were done using contingency tables and unadjusted associations.

### Specific Aim 2

To examine differences in appraisal, symptoms and health outcomes by age, gender, race/ethnicity, pay grade and deployment length. To estimate bivariate (unadjusted ) associations for categorical predictors (such as gender) contingency tables / Chi-Square statistics were used for categorical outcomes and ANOVA for continuous outcomes. For continuous predictors (such as age) logistic regression for categorical outcomes and correlation for continuous outcomes were used. For multivariate analyses, logistic regression for categorical outcomes, ANCOVA / Linear regression for continuous outcomes were used. Linear regression models could not be used as planned, as the statistical assumptions were violated (violation of linearity) and could not be satisfied. Normally distributed residuals could not be obtained or transformed

### Specific Aim 3

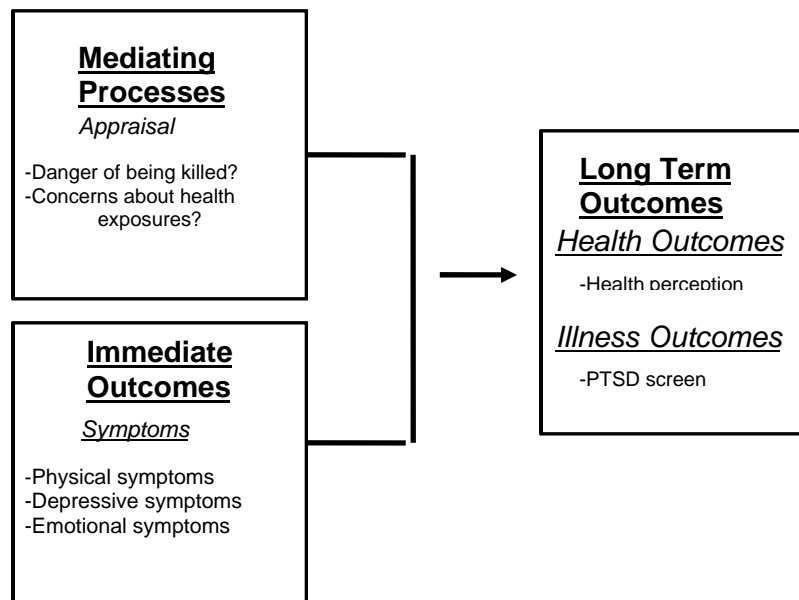
To test hypotheses derived from the cognitive appraisal model of stress and coping regarding the relationships between appraisal, symptoms and health outcomes among deployed military members. Path analysis and tests for mediation were used to examine the following two hypotheses.

~~Hypothesis 1:~~ Hypothesis 1: Long term outcomes (health perception, PTSD) for military members deployed to Iraq will be directly influenced by appraisal of stressful events (danger of being killed and exposure/health concern), emotional concerns and symptoms (physical and depressive). See Figure 2.

Figure 2.  
Theoretical Framework for Hypothesis 1

# Framework

Post-Deployment Health Appraisal in United States Service Members after Iraq deployment.



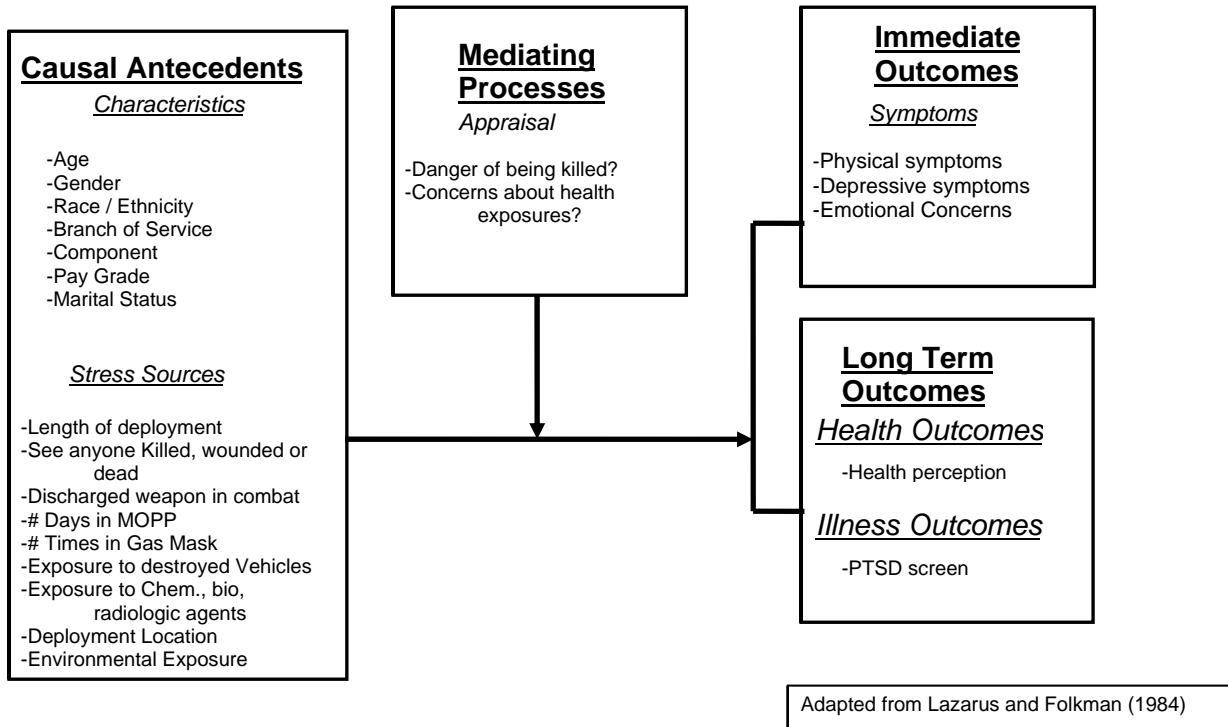
Adapted from Lazarus and Folkman (1984)

Hypothesis 2: Appraisal of stressful events (danger of being killed and exposure/health concern) mediates the effect of characteristics (age, gender, race/ethnicity, branch, component, pay grade, marital status) and stress sources (length of deployment, seeing someone killed, wounded or dead, days in MOPP, times in gas mask, exposure to destroyed vehicles, exposure to CBR) on symptoms (physical and depressive), emotional problems and long term outcomes (health perception and PTSD symptoms) among deployed military members. See Figure 3.

Figure 3.  
Theoretical Framework Hypothesis 2

# Framework

*Post-Deployment Health Appraisal in United States Service Members after Iraq deployment.*



Descriptive statistics and multivariate analysis were used to evaluate the relationships among variables. The PI closely examined these data for any statistical evidence among symptoms (responses) and other identified variables such as length of deployment, social status (officer /enlisted), gender, and race. The PI kept a log of missing data by variable analysis, due to the large sample size. Odds ratios were calculated as appropriate on selected relationships. All appropriate analysis graphs were run and tables were reviewed and synthesized for findings.

### Limitations

Some potential issues with this dataset included the fact that data were missing in some key fields. For example individuals were excluded from the study if they did not have accurate or complete arrival dates in theater or dates of birth, as these two fields were critical in the analysis. This resulted in the exclusion of 5,816 participants. However, the overall percentage of missing data for the final sample of 510,352 did not exceed 0.3% in any variable category (race and health perception only) and found to be within an acceptable range. Issues surrounding data accuracy and lack of control the researcher had over the collection process is something the researcher kept in mind (Nicoll & Beyea, 1999). The data set only contained the limited amount of information that was collected, and there was no way to expand or further clarify these data. Another limiting factor was the inability to measure PTSD directly; however some questions were from a valid PTSD screening instrument and offered some insight into the mental health concerns of deployed members. One area that was not addressed in this study was social support. Social support is an important mediator of stress, and integral to the stress, appraisal, and coping theory (Lazarus & Folkman, 1984). No variables were used in the collection of PDHA that measured social support, and no proxy measures were available to evaluate this concept (limitation of secondary data analysis).

### *Reflexivity*

The Primary Investigator (PI) has extensive experience in deployment medicine as the Chief of deployment medicine for his Air National Guard Wing for more than ten years. The PI has also earned the Kosovo Campaign Medal, Operation Iraqi Freedom Campaign medal and overseas short tour campaign medal for his overseas deployments. He has deployed in both overseas contingencies (Kosovo Campaign and Operation Iraqi Freedom) and those on US soil

(Hurricane Katrina support). As a member of deployment health team the PI had the opportunity to work directly with deploying personnel for more than ten years. He spent six months home station preparing military members to leave for combat, and in-processing them upon their return from combat. During that time frame, he implemented the use of the new four page PDHA (DD 2796). He has completed interviews and reviewed over a thousand pre and post deployment health assessments. The PI has also deployed twice to Iraq during the Iraqi conflict as a nurse practitioner (and conducted most of these analysis while deployed for a second tour in Iraq). The PI's understanding of the data collection and milieu of the combat zone potentially offset some of the identified limitations.

#### Human Subjects Considerations

##### *Human Subjects Research - Deidentified Data / Ethical Concerns*

This study qualified for exempt status because the study involved the use of deidentified data which was collected for clinical purposes. AMSA deidentified data prior to release of the data. The study was approved by the UMass Medical School IRB. There was no adverse risk to participants. The information obtained was part of a routine screening process of all military members. Disclosure information, as well as an explanation of the principal purpose and routine use descriptions are given on page 1 of the PDHA.

After the data set was obtained from AMSA, it was protected by multiple layers of password required access. All printouts remained in a secured locked file cabinet in the investigator's office. All of the electronic data will be deleted and erased from any electronic media after the conclusion of analysis and publication of results, not to exceed five years.

### Summary

This study was a secondary analysis of a descriptive survey. Data from the survey questionnaire (DD 2796) was closely scrutinized and analyzed using multiple statistical techniques. Descriptive statistics and multivariate analysis were used to evaluate the relationships among variables. Path analysis on stated hypothesis was used to validate the Stress, Appraisal, and Coping Theory (Lazarus & Folkman, 1984) model as a good fit with the selected variables in this study. Information gleaned from this research will assist in the future screening of military members by validating this instrument with a theoretical framework.



## Chapter IV

## Results

*Introduction*

This chapter presents findings that describe the characteristics, stress sources, and health outcomes of deployed military members after return from Iraq. In addition, findings related to differences in appraisal, symptoms and health outcomes by age, gender, race/ethnicity, pay grade and deployment length are described. Finally, the results of hypotheses derived from the cognitive appraisal model of stress and coping (Lazarus and Folkman, 1984) are presented.

Several statistical techniques were used and include frequency distributions, cross tab evaluations, factor analysis on selected variables (environmental exposures and physical symptoms), reliability calculations (Cronbach's alpha) on questions used for scale development and regression analysis. Linear regression models could not be used as planned, as the statistical assumptions were violated (violation of linearity) and could not be satisfied. Normally distributed residuals could not be obtained or transformed. The hope for path analysis also had to be abandoned for this reason. However, logistic regression was run to evaluate relationships; both binomial logistic and ordinal regressions were used in the final analysis. The results of binomial logistic and ordinal models were consistent when run on selected analyses, so in the interest of a more concise summary ordinal logistic regression will be reported. Results from the linear regression models were also similar in terms of estimated associations and significance. The Goodness of Fit Test and test of parallel lines were run and found to be significant in many of the models, reflecting the very large sample size.

Tests for mediation were conducted to test the hypotheses and theoretical framework. The model was run and results evaluated for each variable, then the appraisal variables were

added to the same model. Mediation was detected if there was an observed change in the magnitude of the coefficient, that it was smaller or closer to zero.

The sample for these analyses was obtained by first applying the inclusion criteria:

- Only military members \*
- Deployed to support Operation Iraqi Freedom (OIF) in South West Asia (SWA) \*
- First deployment to SWA in support of OIF \*
- Time frame including up to March 2007\*
- No earlier than 2002 (many forces were pre-positioned prior to conflict)
- Completed new four page questionnaire after implementation in May 2003\*
- Deployment to Iraq
- All services (Army, Air Force, Marine, Navy)
- All components (Active Duty, National Guard, and Reserves)
- All age groups (18 to 60 years old)
- Men and Women
- All races

\* Export criteria placed on data base by Army Medical Surveillance Activity (AMSA)

Data obtained from AMSA ( $N= 713,557$ ) was further queried to verify deployment to Iraq (physically) in support of Operation Iraqi Freedom (OIF). This resulted in a sample size of 516,166 participants. Next, the sample was further refined by evaluating missing and erroneous data on key variables (age and arrival date). For example, 62 subjects were removed from the sample because the data put their age at less than 17 years of age or older than 65 years of age, which for the most part is not possible. Some arrival dates ( $n = 195$ ) preceded the start of the

build up for the Iraq war (before 2002) and therefore these subjects were excluded. There were also some arrival dates that were blank ( $n = 5,107$ ) and some that were after the military member's departure date ( $n = 452$ ) so these subjects were also excluded. The final sample analyzed consisted of 510,352 participants. Because of the large sample size, the significance level was set at  $p < .01$  for all of the following analyses.

### *Specific Aim 1*

To describe characteristics (age, gender, race/ ethnicity, branch of service, component, pay grade, and marital status) stress sources (length of deployment, see anyone killed, wounded or dead, discharged weapon in combat, number of days in MOPP, number of times in gas mask, exposure to destroyed vehicles, exposure CBR agents, deployment location, environmental exposure), symptoms (physical, emotional, depressive) and health outcomes (health perception, PTSD) of deployed military members after return from Iraq.

### *Characteristics*

Participant demographic characteristics are summarized in Table 3. The mean age of the sample was 28.9 (median was 26.0), 45% were less than twenty-five years old, and 91.5% less than forty-one years old. The majority of the study sample were male (90.2%), with nearly an even split with married (50.3%) and single (44.9%) members. The sample was mostly white (65%), with a good representation of minority groups consistent with the characteristics of the Armed Services. The Army was the largest branch represented (75%) followed by the Marine Corps (13.2%). Most participants were Active Duty (70%) followed by the National Guard (18.7%) and Reserves (11.4%). Junior enlisted made up half the sample (49.9%), with most (80.8%) being less than a junior Non Commissioned Officer (e.g., pay grades were organized by rank). Classifications of those who were the lowest ranks are junior enlisted, sergeants are

considered to have more responsibilities and Non Commissioned Officers (NCO) are considered the highest of the enlisted members. Warrant officers are the rank for some services that are in between the officer core and enlisted core. Officers are further broken down into Junior, Senior and the most senior officers.

Table 3  
*Study Sample Characteristics*

(Table 3)	Variable	N	%	Mean	SD
	Age at Completion of Survey	510352		28.9	7.9
	18 – 21	80632	15.8		
	22-25	151833	29.8		
	26-29	86217	16.9		
	30-33	58282	11.4		
	34-37	50853	10		
	38-41	39218	7.7		
	42-45	22887	4.5		
	46-49	11002	2.2		
	50-53	5320	1		
	54-57	3123	0.6		
	58-60	985	0.2		
	Gender				
	Male	460349	90.2		
	Female	49998	9.8		
	Missing	5	<0.01		
	Race / Ethnicity				
	Asian	18996	3.7		
	Black	95018	18.6		

(Table 3)	Variable	N	%	Mean	SD
	Hispanic	52641	10.3		
	American Indian / Alaska Native	6407	1.3		
	Other	909	0.2		
	White	334674	65.6		
	Missing	1707	0.3		
	<b>Service Branch</b>				
	Army	383419	75.1		
	Air Force	46481	9.1		
	Marine Corps	67605	13.2		
	Navy	12847	2.5		
	Missing	0	0.0		
	<b>Service Component</b>				
	Active Duty	357167	70.0		
	National Guard	95207	18.7		
	Reserves	57978	11.4		
	Missing	0	0.0		
	<b>Pay Grade</b>				
	Junior Enlisted - E01, E02, E03, E04	251500	49.9		
	Sergeant- E05, E06	157619	30.9		
	Senior Non Commissioned Officers - E07, E08, E09	38554	7.6		
	Junior Warrant Officer- W01, W02, W03	36507	7.2		
	Senior Warrant Officer- W04, W05	16715	3.3		

(Table 3)	Variable	N	%	Mean	SD
	Junior / Company Grade Officer – O01, O02, O03	1717	0.3		
	Senior / Field Grade Officer – O04,O05	4463	0.9		
	Senior / Colonel & GO's – O06, O07, O08,O09	3110	0.6		
	Missing	167	0.03		
<b>Marital Status</b>					
	Married	256722	50.3		
	Single	229017	44.9		
	Other	24199	4.7		
	Missing	414	0.08		

### *Sources of Stress*

The sources of stress included a mean length of deployment of 260 days (range = 1 to 1,744, Median 310 days), 52% seeing someone killed, 22% discharging their weapon, 31% exposed to destroyed vehicles and few subjects needing to use either MOPP (88% = no days), masks (87% = no days) or exposed to chemical, biological or radiological agents (71.3%). Refer to Table 4 for more information.

Table 4

### *Breakdown of Stress Sources*

(Table 4)	Variable	N	%	Mean	SD
	Length of deployment (days)	510352		260.5	107
	1 thru 120	70118	13.7		
	121 thru 240	133821	26.2		

(Table 4) Variable	N	%	Mean	SD
241 thru 360	257541	50.5		
361 thru 480	44758	8.8		
481 thru 600	1545	0.3		
601 thru 720	2089	0.4		
721 thru 840	352	0.1		
841 thru 960	69	<0.00		
960 thru 1080	29	<0.00		
1081 and greater	30	<0.00		
See anyone killed, wounded or dead	510352			
Yes	264777	51.9		
No	245572	48.1		
Missing	3	<0.00		
Yes – Coalition	179976	35.3		
Yes – Enemy	159211	31.2		
Yes – Civilians	133003	26.1		
Discharged Weapon in Combat	510352			
Yes	112620	22.1		
No	397724	77.9		
Missing	8	<0.00		
Days in MOPP	510352			
Missing	0	0.0		
0	452567	88.7		
1 thru 5	15366	3.0		
6 thru 10	6269	1.2		
11 thru 15	7724	1.5		

(Table 4) Variable	N	%	Mean	SD
16 thru 30	22802	4.5		
31 or greater	5624	1.1		
Days in Mask	510352			
Missing	0	0.0		
0	444789	87.2		
1 thru 5	30142	5.9		
6 thru 10	11957	2.3		
11 thru 15	6453	1.3		
16 thru 30	12276	2.4		
31 or greater	4735	.9		
Exposure to Destroyed Vehicles	510351			
Yes	157251	30.8		
No	353100	69.2		
Missing	1	<0.00		
Exposure to Chemical, Biological, Radiological Agent	510351			
Yes	11313	2.2		
No	363676	71.3		
Don't Know	135362	26.5		
Missing	1	<0.00		

### *Environmental Exposures*

There were multiple environmental exposures identified by deployed military members, (see Table 5 for further breakdown). There were a total of twenty-two environmental exposure questions. Individuals identified if they were not exposed at all (0), or exposed sometimes (1) or



exposed often (2) to identified items. The mean score was 10.5 (median 10.0), SD 6.8, the reported minimum exposure score was zero and the maximum score was 44, with higher scores equaling greater exposures. Total environmental exposures were recoded into no (0) and yes (1 – combined sometimes and often) for each of the twenty-two exposure items in order to run the logistic regression. The rationale to combine sometimes and often was based on the individual's positive response. In this study the presence of an exposure was of interest, and not frequency. The total number of exposures ranged from 0 to 22 with a mean and median of 7.0 (SD = 4.2). Exposure to sand /dust was the largest complaint with 89.8% of the sample identifying this as an exposure. The other top six environmental issues included: loud noises (75.3%), vehicle truck exhaust (73.1%), smoke from trash or feces (71.2%), JP8 or other fuels (62.3%) and DEET (51.3%).

Principal components factor analysis with varimax rotation (using the scree plot and eigenvalues >1 to estimate the number of factors) was done on the twenty-two environmental exposures reported by military members (data not shown). The symptoms loaded nicely into five categories that explained 51.6% of the variance. The factors could be classified into five distinct sub-scales: every day living exposures (n=6), pulmonary and high risk exposures (n=6), high risk wave exposures (n=3), insect-bourn illness prophylactic exposure (5) and lower risk chemical exposures (n=2). However, the calculated Cronbach's alpha for a few of the individual sub-scales were lower than the total scale (range was 0.602 to 0.839), so the total score was used for these analyses (Cronbach's alpha = 0.867).

Table 5  
*Identified Environmental Exposures*

Table 5 Environmental Exposure	No		Sometimes		Often	
	N	%	N	%	N	%
DEET	248510	48.7	187554	36.7	74285	14.6
Pesticide Uniforms	298247	58.4	102414	20.1	109688	21.5
Environmental Pesticides	410807	80.5	76158	14.9	23384	4.6
Flea and Tick Collar	466311	91.4	36032	7.1	8006	1.6
Pesticide Strips	449526	88.1	44684	8.8	16139	3.2
Smoke From Oil Fires	357534	70.1	105973	20.8	46842	9.2
Smoke From Trash or Feces	147038	28.8	187331	36.7	175980	34.5
Vehicle or truck Exhaust	137322	26.9	171232	33.6	201795	39.5
Tent heater smoke	460931	90.3	37991	7.4	11427	2.2
JP8 or other fuels	192361	37.7	151919	29.8	166069	32.5
Fog oils	468757	91.8	31812	6.2	9780	1.9
Solvents	389885	76.4	86198	16.9	34266	6.7
Paints	391176	76.6	101945	20.0	17228	3.4
Ionizing Radiation	491476	96.3	12543	2.5	6330	1.2
Radar / Microwave	456517	89.5	38992	7.6	14840	2.9
Laser	456517	89.5	38992	7.6	14840	2.9
Loud Noises	125816	24.7	159352	31.2	225181	44.1
Excessive Vibration	300331	58.8	94909	18.6	115109	22.6

Table 5 Environmental Exposure	No		Sometimes		Often	
	N	%	N	%	N	%
Pollution	356199	69.8	81463	16.0	72687	14.2
Sand / Dust	52048	10.2	73491	14.4	384810	75.4
Depleted Uranium	490740	96.2	14386	2.8	5223	1.0
Other exposures	480260	94.1	13941	2.7	16148	3.2

### *Physical Symptoms*

There were multiple physical symptoms identified by deployed military members. See Table 6 for further breakdown. Over one quarter (28.8%) of the sample reported no symptoms while deployed or at the time of completion of the survey. Nearly 40% (n= 203,365) of the sample had four or more symptoms. A total symptom score was calculated after recoding (no=0, yes at any time=1) the variables by adding the number of individual symptoms reported during deployment or at the time of the post-deployment assessment (reported range = 0 to 21), with higher scores indicating a greater number of different symptoms. The mean score for the sample was 3.8 (median 2.0), SD 4.2. The most frequent physical symptom described was diarrhea (35.2%), followed by back pain (34.9%), headache (33.6%), runny nose (31.8%), tired (28.1%) and muscle ache (24.8%).

Principal components factor analysis with varimax rotation (using the scree plot and eigenvalues >1 to estimate the number of factors) was also performed on the reported physical symptoms (results not shown). The symptoms loaded into four sub-scales that explained 44% of the variance. However, conceptually the variables that loaded into the four factors could not be

reconciled at this juncture. In light of the total scale’s strong reliability statistic (Cronbach’s alpha of 0.881), it was decided to use the total score for the analysis.

Table 6  
*Physical Symptoms*

Table 6	No		Yes During		Yes Now		Yes During & Yes Now	
Physical Symptoms	N	%	N	N	%	%	N	%
Cough	427371	83.7	59904	11.7	12577	2.5	10492	2.1
Runny Nose	347808	68.2	121381	23.8	24208	4.7	16950	3.3
Fever	437319	85.7	70000	13.7	1941	0.4	1080	0.2
Weakness	432895	84.8	65355	12.8	5655	1.1	6433	1.3
Headache	338876	66.4	132488	26.0	15029	2.9	23950	4.7
Joint Pain	390216	76.5	67972	13.3	20805	4.1	31353	6.1
Back Pain	332397	65.1	102478	20.1	28859	5.7	46613	9.1
Muscle	383890	75.2	90714	17.8	15013	2.9	20727	4.1
Numbness	427331	83.7	52098	10.2	12176	2.4	18739	3.7
Rash	439724	86.2	47158	9.2	11136	2.2	12324	2.4
Tearing	456117	89.4	44144	8.6	3879	0.8	6204	1.2
Vision	493131	96.6	13043	2.6	1793	0.4	2376	0.5
Chest Pain	466565	91.4	35032	6.9	3568	0.7	5178	1.0
Dizzy	450805	88.3	51725	10.1	3315	0.6	4499	0.9
Breathing	463781	90.9	36697	7.2	3837	0.8	6029	1.2
Tired	366844	71.9	84086	16.5	24428	4.8	34989	6.9

Table 6	No		Yes During		Yes Now		Yes During & Yes Now	
	N	%	N	N	%	%	N	%
Physical Symptoms								
Memory	457292	89.6	28269	5.5	10100	2.0	14682	2.9
Diarrhea	330909	64.8	163752	32.1	6144	1.2	9540	1.9
Indigestion	457661	89.7	38122	7.5	5224	1.0	9337	1.8
Vomiting	465033	91.1	43301	8.5	1116	0.2	893	0.2
Ringling	427795	83.8	55939	11.0	10470	2.1	16141	3.2

#### *Depressive Symptoms*

A total depressive symptom score was calculated by adding the scores of the two depression questions (Over last 2 wks had little interest/pleasure in doing things; Over last 2 wks feeling down, depressed, or hopeless). These questions were scored from 0 (no symptoms - none) to 4 (a lot), with higher scores equaling greater depressive symptoms. These items and scoring procedures were used previously and reported by Hoge (2006) to assess depressive symptoms using the PDHA data. The mean depressive symptom score was 0.46 (median = 0.0), SD 0.89, with a reported score rang from 0 to 4. Of the total sample 73.5 % did not have any depressive symptoms. However, 12.5% ( $n = 63,608$ ) of the study participants had one symptom, 14% ( $n = 60,200$ ) had two or more symptoms. See Table 7 for summary.

Table 7  
*Depressive Screen*

Results*	N	%
Negative	375 012	73.5
Positive**	135 337	26.5
Total	510 349	
Missing	3	

\* *Based on Hoge, Auchterlonie and Milliken, 2006 criteria .*

\*\**One or more depressive questions positive*

### *Health Perception*

The majority of subjects reported positive health perception (91.5%), with more than half (55%) ( $n = 280,338$ ) indicating that their health was either very good or excellent. Individuals that reported fair to poor health made up 8.3% of the sample ( $n = 42,585$ ). Those with excellent health reported a score of one, where those with fair to poor health reported higher scores (up to 5). The mean score was 2.33 (median 2.0), SD 0.91. See Table 8 for complete breakdown of health assessment. To facilitate conducting the regression analyses the health assessment variable was recoded to combine poor and fair health. This was done to enhance regression model fit, as poor health had an overall small percentage (0.6% of the sample). The new mean remained consistent with original at 2.33 (median 2.0), SD 0.89.

Table 8  
*Health Perception*

Would you say your health in general is:	N	%
Excellent	104895	20.6
Very Good	175443	34.4
Good	186097	36.5
Fair	39286	7.7
Poor	3299	0.6
Missing	1332	0.3

*Illness Outcomes: PTSD Symptoms*

Four questions on the PDHA related to PTSD symptoms. Once again these same questions were used and reported by Hoge (2006) to screen for PTSD using data from the PDHA. See Table 9 for more details. PTSD items were combined for a total PTSD score with a calculated Cronbach's alpha of 0.762. Individuals who answered no to all four questions had a score of zero; where as each positive answer added one to the total score. The higher the score, the more PTSD symptoms were present. The reported symptoms and calculated scores ranged from zero to four with a mean of 0.43 (median=0.0), SD 0.94. More than three quarters of the study population (77.6%,  $n=395,795$ ) had no PTSD symptoms. Of the total sample, 11.8 % ( $n = 60,200$ ) of individuals reported two or more PTSD symptoms.

Table 9  
*Questions related to PTSD Symptoms*

PTSD Symptoms	No		Yes	
	<i>N</i>	%	<i>N</i>	%
Past month had nightmares/thoughts when did not want to	453137	88.8	57212	11.2
Past month, tried hard NOT to think about it or avoided situations	467537	91.6	42812	8.4
Past month, constantly on guard, watchful or easily startled	429596	84.2	80753	15.8
Past month, felt numb, detached from others, activities, or surroundings	471389	92.4	38960	7.6

#### *Emotional Concerns*

Emotional concerns were assessed by five separate items that evaluated mental health and specific emotional concerns. Hoge (2006) also used these five questions to evaluate emotional concerns. Those that answered no to all of the questions had a score of zero; however those that answered yes added one point to the overall score and those answering unsure/ missing / a lot, added two points to the score. This was how data was exported by AMSA, it was not possible to differentiate those that were missing from unsure/ a lot; however based on the overall missing in this study it was more than likely low. The higher the score, the more emotional concerns the individual reported. The reported range of scores were from zero to eight, with a mean of 0.34 (median = 0.0), SD 0.93. See Table 10 for further information. More than 80% ( $n=430,242$ ) had a reported score of zero, indicating no reported emotional concerns. However, 9.9% ( $n = 49,103$ ) of participants reported two or more emotional concerns. It is important to note that the Cronbach's alpha with this study sample was minimally acceptable at 0.59. See Table 10 for summary of emotional concern scores.





Table 11  
*Appraisal Variables*

	No		Yes	
	N	%	N	%
<u>Danger</u>				
Ever felt that you were in great danger of being killed?	249499	48.9	260842	51.1
<u>Health / Exposure Concerns</u>				
Do you have concerns about possible exposures or events during this deployment that you feel may affect your health?	411602	80.7	98750	19.3

### *Scales*

Cronbach's alpha was calculated for the primary scales used in the analysis (See Table 12). These scales were built upon separate questions on the PDHA. Hoge (2006) used three of these scales in his earlier research. Certain questions from the PDHA were used in a scale format; however Hoge did not report the reliability of these scales in his sample, which was a descriptive study using portions of the PDHA with only Marines and Army soldiers (male and female) returning from a deployment from overseas. The final sample that potentially deployed to Iraq was 222,620 members that deployed to support Operation Iraqi Freedom (Hoge et al., 2006). Factor analysis was done for both the symptom and environmental exposure scales as noted earlier; however, the reliability on some of the sub scales were low and the decision was made to use total scores in the analysis of this study.

Table 12  
*Calculated Cronbach's alpha for Scales used in analysis*

Scale	N	Number of Items	Cronbach's Alpha	Reported Range	Mean	SD
PTSD Symptoms	510349	4	0.762	0 to 4	0.43	0.94
Emotional Concerns	510349	5	0.588	0 to 8	0.34	0.93
Depressive Symptoms	510349	2	0.747	0 to 4	0.46	0.89
Physical Symptoms	510322	21	0.881	0 to 21	3.77	4.25
Environmental Exposures	510349	22	0.867	0 to 22	7.05	4.18

### Specific Aim 2

To examine differences in appraisal (danger of being killed and exposure/health concern), physical symptoms and health outcomes (health perception and PTSD symptoms) by age, gender, race/ethnicity, pay grade and deployment length.

#### *Appraisal - Danger of being killed*

The first appraisal variable that was examined in the analysis was the member's reported feelings regarding the danger of being killed. Refer to Table 13 for complete breakdown and further details. There were significant differences in the appraisal of danger in being killed by age (ages 22 to 53), as well as gender with males reporting significantly more danger. There were significant differences by race/ethnicity, with white military members less likely to report feelings of danger (statistically significant) than all other racial/ethnic groups with the exception of those identified as other. In addition, lower ranking military members were the most likely to report feelings of danger than higher ranking military members. Finally, members deployed for less than 240 days were the least likely to report a danger of being killed. Those members

deployed more than 241 days in theater were the most likely to report feeling in danger of being killed, however not statistically significant.

Table 13

*Adjusted binomial regression model for Appraisal item - Danger of being killed*  
 Table 13 Appraisal -Danger

		95 % CI		
	Coeff	Lower	Upper	P-Value
<b>Variable Danger of Being Killed*</b>				
<b>Age</b>				
18-21	0.18	0.04	0.31	0.01
22-25	0.21	0.08	0.35	0.00**
26-29	0.28	0.15	0.41	0.00**
30-33	0.35	0.22	0.49	0.00**
34-37	0.39	0.26	0.52	0.00**
38-41	0.38	0.25	0.52	0.00**
42-45	0.39	0.26	0.53	0.00**
46-49	0.40	0.26	0.53	0.00**
50-53	0.38	0.24	0.52	0.00**
54-57	0.13	-0.02	0.28	0.10
58-60	0a	.	.	.
<b>Gender</b>				
Male	0.51	0.49	0.53	0.00**
Female	0a	.	.	.

Table 13 Appraisal -Danger		95 % CI		
	Coeff	Lower	Upper	P-Value
<b>Race</b>				
Asian	0.12	0.09	0.15	0.00**
Black	0.27	0.25	0.28	0.00**
Hispanic	0.27	0.25	0.28	0.00**
American Indian / Alaska Native	0.24	0.19	0.29	0.00**
Other	0.04	-0.10	0.17	0.61
White	0a	.	.	.
<b>Pay Grade</b>				
Junior Enlisted – E01, E02, E03, E04	0.82	0.71	0.92	0.00**
Sergeant- E05, E06	0.82	0.71	0.93	0.00**
Senior Non Commissioned Officers E07, E08, E09	0.61	0.50	0.71	0.00**
Junior Warrant Officer- W01, W02, W03	0.45	0.33	0.58	0.00**
Senior Warrant Officer- W04, W05	0.41	0.28	0.54	0.00**
Junior / Company Grade Officer – O01, O02, O03	0.60	0.49	0.71	0.00**
Senior / Field Grade Officer –	0.23	0.12	0.34	0.00**

Table 13 Appraisal -Danger		95 % CI		
	Coeff	Lower	Upper	P-Value
O04,O05				
Senior / Colonel & GO's –	0a	.	.	.
O06, O07, O08,O09				
Days in Theater				
1 thru 120	-0.75	-1.48	-0.03	0.04
121 thru 240	-0.18	-0.90	0.54	0.62
241 thru 360	0.19	-0.53	0.92	0.60
361 thru 480	0.47	-0.25	1.19	0.20
481 thru 600	0.19	-0.54	0.92	0.61
601 thru 720	0.11	-0.62	0.84	0.77
721 thru 840	0.36	-0.40	1.11	0.35
841 thru 960	0.34	-0.53	1.21	0.44
961 thru 1080	0.79	-0.28	1.87	0.15
1081 and greater	0a	.	.	.

<sup>a</sup> Set to zero because this parameter is redundant.

\*The reference category is Danger of being Killed - No (not shown).

\*\*p< 0.01

<sup>1</sup>All results are adjusted for all other variables in the table

*Appraisal – Concern about Health Exposures*

Health exposure concerns in deployed military members were identified (Table 14).

Younger members (age 49 or younger) and males reported significantly fewer health exposure concerns; while Hispanics and those in the lower pay grades reported significantly more health

exposure concerns. It is important to note that no significant differences were found in reported health exposure concerns by length of deployment. However, those deployed less than 121 days were the least likely to identify a health exposure concern.

Table 14  
*Adjusted binomial regression model for Appraisal item - Exposure / Health Concern<sup>1</sup>*

Table 14 Appraisal – Exposure		95 % CI		
Variable*	Coeff	Lower	Upper	P-Value
<b>Age</b>				
18 – 21	-1.698	-1.834	-1.562	0.00**
22-25	-1.397	-1.532	-1.263	0.00**
26-29	-1.185	-1.32	-1.05	0.00**
30-33	-1.009	-1.144	-0.874	0.00**
34-37	-0.802	-0.937	-0.667	0.00**
38-41	-0.595	-0.73	-0.461	0.00**
42-45	-0.413	-0.548	-0.277	0.00**
46-49	-0.262	-0.401	-0.124	0.00**
50-53	-0.129	-0.273	0.016	0.08
54-57	-0.083	-0.235	0.069	0.28
58-60	0a	.	.	.
<b>Gender</b>				
Male	-0.267	-0.29	-0.244	0.00**
Female	0a	.	.	.
<b>Race</b>				
Asian	-0.05	-0.088	-0.011	0.01

Table 14 Appraisal – Exposure		95 % CI		
Variable*	Coeff	Lower	Upper	P-Value
Black	0.009	-0.009	0.028	0.34
Hispanic	0.092	0.068	0.115	0.00**
American Indian / Alaska Native	0.017	-0.049	0.083	0.62
Other	-0.098	-0.297	0.101	0.34
White	0a	.	.	.
Pay Grade				
Junior Enlisted –				
E01, E02, E03, E04	0.795	0.671	0.92	0.00**
Sergeant-				
E05, E06	0.768	0.645	0.891	0.00**
Senior Non Commissioned Officers				
E07, E08, E09	0.477	0.353	0.601	0.00**
Junior Warrant Officer-				
W01, W02, W03	0.571	0.429	0.714	0.00**
Senior Warrant Officer-				
W04, W05	0.644	0.5	0.788	0.00**
Junior / Company Grade Officer –				
O01, O02, O03	0.611	0.485	0.737	0.00**
Senior / Field Grade Officer –				
O04,O05	0.398	0.271	0.525	0.00**
Senior / Colonel & GO’s –	0a	.	.	.



Table 14 Appraisal – Exposure		95 % CI		
Variable*	Coeff	Lower	Upper	P-Value
O06, O07, O08,O09				
Days in Theater				
1 thru 120	-0.057	-1.116	1.003	0.92
121 thru 240	0.169	-0.89	1.228	0.76
241 thru 360	0.674	-0.386	1.733	0.21
361 thru 480	0.816	-0.244	1.875	0.13
481 thru 600	0.698	-0.367	1.764	0.20
601 thru 720	0.696	-0.368	1.76	0.20
721 thru 840	0.535	-0.554	1.623	0.34
841 thru 960	0.442	-0.767	1.652	0.47
961 thru 1080	1.341	0.04	2.642	0.04
1081 and greater	0a	.	.	.

<sup>a</sup> Set to zero because this parameter is redundant.

\*The reference category is Exposure / health concern - No (not shown).

\*\*p< 0.01

<sup>1</sup>All results are adjusted for all other variables in the table

### *Physical Symptoms*

Physical symptom scores differed by age, gender, race/ethnicity, pay grade and days in theater; see Table 15 for more detail. Younger members (ages 18-29) reported significantly fewer physical symptoms when compared to the oldest group; while those between ages 46 and 53 reported significantly higher symptom scores. Males reported significantly fewer symptoms than females. Asians, Hispanics, American Indians /Alaska Natives reported significantly more symptoms compared with Whites; while Blacks reported significantly lower symptom scores.

Individuals in the lower pay grades (less than senior field grade) reported significantly higher symptom scores. The shortest deployments (<121 days) resulted in the lowest (statistically significant) physical symptoms scores.

Table 15  
*Adjusted binomial regression model for Physical Symptom Scores<sup>1</sup>*

Table 15 Physical Symptom	95 % CI			
Variable*	Coeff	Lower	Upper	P-Value
<b>Age</b>				
18 - 21	-0.392	-0.505	-0.278	0.00**
22-25	-0.273	-0.386	-0.16	0.00**
26-29	-0.214	-0.327	-0.101	0.00**
30-33	-0.144	-0.257	-0.03	0.01
34-37	-0.058	-0.171	0.055	0.31
38-41	0.064	-0.049	0.177	0.27
42-45	0.138	0.025	0.252	0.02
46-49	0.183	0.066	0.299	0.00**
50-53	0.193	0.072	0.314	0.00**
54-57	0.087	-0.041	0.214	0.18
58-60	0a	.	.	.
<b>Gender</b>				
Male	-0.405	-0.421	-0.389	0.00**
Female	0a	.	.	.
<b>Race</b>				
Asian	0.045	0.019	0.071	0.00**

Table 15 Physical Symptom		95 % CI		
Variable*	Coeff	Lower	Upper	P-Value
Black	-0.11	-0.123	-0.097	0.00**
Hispanic	0.083	0.067	0.099	0.00**
American Indian / Alaska Native	0.145	0.102	0.189	0.00**
Other	0.054	-0.061	0.169	0.36
White	0a	.	.	.
Pay Grade				
Junior Enlisted –				
E01, E02, E03, E04	0.652	0.563	0.74	0.00**
Sergeant-				
E05, E06	0.614	0.526	0.702	0.00**
Senior Non Commissioned Officers				
E07, E08, E09	0.498	0.409	0.586	0.00**
Junior Warrant Officer-				
W01, W02, W03	0.364	0.262	0.466	0.00**
Senior Warrant Officer-				
W04, W05	0.398	0.292	0.504	0.00**
Junior / Company Grade Officer –				
O01, O02, O03	0.264	0.174	0.354	0.00**
Senior / Field Grade Officer –				
O04,O05	0.125	0.034	0.216	0.01
Senior / Colonel & GO’s –	0a	.	.	.

Table 15 Physical Symptom		95 % CI		
Variable*	Coeff	Lower	Upper	P-Value
O06, O07, O08,O09				
<i>Days in Theater</i>				
1 thru 120	-0.995	-1.619	-0.372	0.00**
121 thru 240	-0.672	-1.296	-0.048	0.04
241 thru 360	-0.363	-0.987	0.26	0.25
361 thru 480	-0.2	-0.824	0.424	0.53
481 thru 600	-0.33	-0.96	0.3	0.3
601 thru 720	-0.547	-1.175	0.081	0.09
721 thru 840	-0.369	-1.018	0.281	0.27
841 thru 960	-0.314	-1.064	0.435	0.41
961 thru 1080	-0.357	-1.248	0.535	0.43
1081 and greater	0a	.	.	.

<sup>a</sup> Set to zero because this parameter is redundant.

\*The reference category is Physical Symptom Score – Highest (not shown).

\*\*p<.01

<sup>1</sup>All results are adjusted for all other variables in the table

*Health Perception*

Military members who deployed to Iraq reported various levels of health perception. Refer to Table 16 for more information. Members under age 46, as well as males reported significantly better health perception. Asians, Blacks, Hispanics and American Indians /Alaska Natives and those in the lower pay grades reported poorer health perception. No differences in health perception were found for length of deployment, however those deployed less than 121 days were the least likely to report fair or poor health.

Table 16  
*Adjusted binomial regression model for Health Perception<sup>1</sup>*

Table 16 Health Perception		95 % CI		
Variable*	Coeff	Lower	Upper	P-Value
<b>Age</b>				
18 – 21	-1.263	-1.383	-1.143	0.00**
22-25	-1.162	-1.281	-1.043	0.00**
26-29	-1.012	-1.131	-0.892	0.00**
30-33	-0.861	-0.98	-0.741	0.00**
34-37	-0.665	-0.784	-0.546	0.00**
38-41	-0.436	-0.555	-0.317	0.00**
42-45	-0.272	-0.392	-0.151	0.00**
46-49	-0.123	-0.246	0	0.05
50-53	-0.006	-0.134	0.121	0.92
54-57	0.06	-0.074	0.195	0.38
58-60	0a	.	.	.
<b>Gender</b>				
Male	-0.413	-0.431	-0.396	0.00**
Female	0a	.	.	.
<b>Race</b>				
Asian	0.116	0.089	0.143	0.00**
Black	0.118	0.105	0.132	0.00**
Hispanic	0.111	0.095	0.128	0.00**
American Indian / Alaska Native	0.144	0.098	0.189	0.00**

Table 16 Health Perception		95 % CI		
Variable*	Coeff	Lower	Upper	P-Value
Other	-0.163	-0.283	-0.044	0.01
White	0a	.	.	.
<b>Pay Grade</b>				
Junior Enlisted –				
E01, E02, E03, E04	1.984	1.892	2.077	0.00**
Sergeant-				
E05, E06	1.766	1.674	1.858	0.00**
Senior Non Commissioned Officers				
E07, E08, E09	1.35	1.257	1.442	0.00**
Junior Warrant Officer-				
W01, W02, W03	1.202	1.095	1.308	0.00**
Senior Warrant Officer-				
W04, W05	1.165	1.054	1.276	0.00**
Junior / Company Grade Officer –				
O01, O02, O03	0.943	0.849	1.037	0.00**
Senior / Field Grade Officer –				
O04,O05	0.456	0.362	0.551	0.00**
Senior / Colonel & GO's –				
O06, O07, O08,O09	0a	.	.	.
<b>Days in Theater</b>				
1 thru 120	-0.021	-0.677	0.635	0.95

Table 16 Health Perception		95 % CI		
Variable*	Coeff	Lower	Upper	P-Value
121 thru 240	0.129	-0.528	0.785	0.7
241 thru 360	0.504	-0.152	1.161	0.13
361 thru 480	0.57	-0.087	1.226	0.09
481 thru 600	0.571	-0.092	1.233	0.09
601 thru 720	0.628	-0.033	1.289	0.06
721 thru 840	0.536	-0.148	1.221	0.13
841 thru 960	0.585	-0.204	1.374	0.15
961 thru 1080	1.162	0.217	2.107	0.02
1081 and greater	0a	.	.	.

<sup>a</sup> Set to zero because this parameter is redundant.

\*The reference category is Health Perception - Poor (not shown).

\*\*p < 0.01

<sup>1</sup>All results are adjusted for all other variables in the table

### *Specific Aim 3*

To test hypotheses derived from the cognitive appraisal model of stress and coping regarding the relationships between appraisal, symptoms and health outcomes among deployed military members. Tests for mediation were used to examine the following two hypotheses.

#### **Hypothesis 1:**

**Hypothesis 1:** Long term outcomes (health perception, PTSD) for military members deployed to Iraq will be directly influenced by appraisal of stressful events (danger of being killed and exposure/health concern), emotional concerns and symptoms (physical and depressive).

*Long Term Outcome: Health Perception*

As hypothesized, health perception was significantly influenced by appraisal (danger of being killed and exposure concerns) physical symptoms, depressive symptoms and emotional health (reflected in lower emotional concern scores) (Refer to Table 17). More specifically, more positive health perceptions were found for those military members who reported no health exposure concerns, no danger of being killed and had lower depression, physical symptom and emotional concern scores.

Table 17  
*Adjusted binomial regression model for Health Perception<sup>1</sup>*

Table 17 Health Perception		95 % CI		
Variable*	Coeff	Lower	Upper	P-Value
<b>Depressive Symptom Score</b>				
0	-0.90	-0.95	-0.85	0.00**
1	-0.61	-0.66	-0.56	0.00**
2	-0.44	-0.49	-0.39	0.00**
3	-0.22	-0.27	-0.16	0.00**
4	0a	.	.	.
<b>Physical Symptom Score</b>				
0	-2.02	-2.06	-1.98	0.00**
1 thru 3	-1.51	-1.55	-1.47	0.00**
4 thru 6	-1.08	-1.12	-1.04	0.00**
7 thru 9	-0.84	-0.88	-0.80	0.00**



Table 17 Health Perception		95 % CI		
Variable*	Coeff	Lower	Upper	P-Value
10 thru 12	-0.59	-0.63	-0.55	0.00**
13 thru 15	-0.34	-0.39	-0.29	0.00**
> 16	0a	.	.	.
Emotional Concern Score				
0	-1.53	-2.27	-0.78	0.00**
1	-1.13	-1.87	-0.38	0.00**
2	-1.16	-1.90	-0.42	0.00**
3	-0.95	-1.69	-0.20	0.01
4	-0.98	-1.72	-0.24	0.01
5	-0.79	-1.54	-0.05	0.04
6	-0.56	-1.30	0.19	0.15
7	-0.32	-1.10	0.46	0.42
8	0a	.	.	.
Danger of being Killed – No	-0.18	-0.19	-0.17	0.00**
Danger of being Killed – Yes	0a	.	.	.
Exposure Concern – No	-0.67	-0.69	-0.66	0.00**
Exposure Concern – Yes	0a	.	.	.

<sup>a</sup> Set to zero because this parameter is redundant.

\*The reference category is Health Assessment - Poor (not shown).

\*\*p < 0.01

<sup>1</sup>All results are adjusted for all other variables in the table

*Long Term Outcome– PTSD Symptoms*

As hypothesized, PTSD symptoms were influenced by appraisal of stressful events (danger of being killed and health exposure concerns), emotional concerns, physical symptoms and depressive symptoms. (Refer to Table 18). Specifically, fewer PTSD symptoms were found for those with no health exposure concerns as well as those with lower depression, physical symptom, and emotional concern scores. Those that reported a higher PTSD symptom score were significantly more likely to have reported a feeling of danger in being killed.

Table 18  
*Adjusted binomial regression model for PTSD Symptoms<sup>1</sup>*

Table 18 PTSD Symptoms		95 % CI		P-Value
Variable*	Coeff	Low	Up	
<b>Depressive Symptom Score</b>				
0	-1.74	-1.78	-1.69	0.00**
1	-1.07	-1.12	-1.02	0.00**
2	-0.70	-0.74	-0.65	0.00**
3	-0.41	-0.46	-0.35	0.00**
4	0a	.	.	.
<b>Physical Symptom Score</b>				
0	-1.64	-1.69	-1.60	0.00**
1 thru 3	-1.20	-1.24	-1.16	0.00**
4 thru 6	-0.89	-0.93	-0.85	0.00**
7 thru 9	-0.66	-0.70	-0.62	0.00**
10 thru 12	-0.49	-0.53	-0.44	0.00**
13 thru 15	-0.31	-0.36	-0.27	0.00**

Table 18 PTSD Symptoms		95 % CI		
Variable*	Coeff	Low	Up	P-Value
> 16	0a	.	.	.
Emotional Concern Score				
0	-3.52	-4.36	-2.68	0.00**
1	-2.70	-3.54	-1.86	0.00**
2	-2.54	-3.38	-1.70	0.00**
3	-2.14	-2.98	-1.30	0.00**
4	-2.12	-2.96	-1.28	0.00**
5	-1.71	-2.55	-0.87	0.00**
6	-1.45	-2.30	-0.61	0.00**
7	-1.29	-2.15	-0.42	0.00**
8	0a	.	.	.
Danger of being Killed – No	-1.60	-1.62	-1.58	0.00**
Danger of being Killed – Yes	0a	.	.	.
Exposure Concern – No	-0.22	-0.24	-0.21	0.00**
Exposure Concern – Yes	0a	.	.	.

<sup>a</sup> Set to zero because this parameter is redundant.

\*The reference category is PTSD – Highest (not shown).

\*\*p < 0.01

<sup>1</sup>All results are adjusted for all other variables in the table

**Hypothesis 2:**

Hypothesis 2: Appraisal of stressful events (danger of being killed and health exposure concerns)

mediates the effect of characteristics (age, gender, race/ethnicity, branch, component, pay grade,

marital status) and stress sources (length of deployment, seeing someone, killed, wounded or dead, days in MOPP, times in gas mask, exposure to destroyed vehicles, exposure to CBR) on symptoms (physical and depressive), emotional concerns and long term outcomes (health perception and PTSD symptoms) among deployed military members.

### Mediation

Mediation was evaluated by comparing the binomial regression models of selected variables based on the stated hypothesis. The first analysis run was without the appraisal variables, and then the appraisal variables were added to the model and re-run. Mediation was detected if the coefficient in the model with the appraisal variables was smaller (closer to zero) than the coefficient without the appraisal variable. The hypothesis was supported if there was mediation (improvement) on the impact of stressful events on selected model variables.

### Mediation and Physical Symptoms

Adding the appraisal mediators to the physical symptoms model to test the hypothesis, there were similar findings of significance before and after the mediation variables were added. See Table 19. Supporting the hypothesis, appraisal mediated the effects of age (<46 years of age), gender, race, branch (Army), component, marital status, pay grade (enlisted only), seeing someone killed, wounded or dead, days in MOPP, use of gas mask (all but 11-15 days), inspecting destroyed vehicles, exposure scores and CBR exposure. In addition to the items noted above, appraisal did not mediate the effect of days in theater or discharging a weapon in combat on physical symptoms.

Table 19  
*Adjusted binomial regression model comparison and mediation evaluation for Physical Symptoms<sup>1</sup>*

Variable*	Table 19 Phys Without Mediator				Table 19 Phys With Mediator				
	Coeff	95 % CI		P-Value	Coeff	95 % CI		P-Value	
		Low	Up			Low	Up		
<b>Age</b>									
18- 21	-0.47	-0.59	-0.35	0.00**	-0.34	-0.46	-0.22	0.00**	8
22-25	-0.40	-0.52	-0.29	0.00**	-0.29	-0.41	-0.17	0.00**	8
26-29	-0.39	-0.51	-0.27	0.00**	-0.29	-0.41	-0.17	0.00**	8
30-33	-0.38	-0.50	-0.26	0.00**	-0.29	-0.41	-0.17	0.00**	8
34-37	-0.30	-0.42	-0.19	0.00**	-0.24	-0.36	-0.12	0.00**	8
38-41	-0.17	-0.29	-0.05	0.01	-0.12	-0.24	0.00	0.05	8
42-45	-0.06	-0.18	0.06	0.30	-0.03	-0.15	0.09	0.60	8
46-49	0.00	-0.12	0.12	0.96	0.01	-0.11	0.13	0.88	
50-53	0.05	-0.07	0.18	0.42	0.06	-0.07	0.18	0.37	
54-57	0.05	-0.09	0.18	0.51	0.05	-0.09	0.18	0.48	
58-60	0a	.	.	.	0a	.	.	.	
<b>Gender</b>									
Male	-0.71	-0.73	-0.69	0.00**	-0.69	-0.71	-0.67	0.00**	8
Female	0a	.	.	.	0a	.	.	.	
<b>Race</b>									
Asian	0.22	0.19	0.24	0.00**	0.19	0.16	0.22	0.00**	8
Black	0.14	0.12	0.15	0.00**	0.07	0.06	0.08	0.00**	8

Post-Deployment Health

Table 19 Phys		Without Mediator			With Mediator				
Variable*	Coeff	95 % CI		P-Value	95 % CI		P-Value		
		Low	Up		Low	Up			
Hispanic	0.19	0.17	0.20	0.00**	0.14	0.12	0.16	0.00**	8
AI / AN	0.10	0.06	0.15	0.00**	0.08	0.04	0.13	0.00**	8
Other	0.19	0.07	0.31	0.00**	0.14	0.02	0.27	0.02	8
White	0a	.	.	.	0a	.	.	.	
Branch									
Army	0.26	0.23	0.30	0.00**	0.24	0.20	0.27	0.00**	8
A. F.	-0.03	-0.06	0.01	0.20	0.04	0.00	0.08	0.06	
Marine	0.27	0.24	0.31	0.00**	0.29	0.26	0.33	0.00**	
Navy	0a	.	.	.	0a	.	.	.	
Component									
A. D.	-0.15	-0.17	-0.13	0.00**	-0.07	-0.09	-0.05	0.00**	8
N.G.	-0.19	-0.21	-0.17	0.00**	-0.17	-0.19	-0.15	0.00**	8
Res.	0a	.	.	.	0a	.	.	.	
M. Status									
Mar.	-0.01	-0.03	0.02	0.67	0.00	-0.03	0.03	0.98	8
Single	-0.11	-0.14	-0.09	0.00**	-0.10	-0.12	-0.07	0.00**	8
Other	0a	.	.	.	0a	.	.	.	
Pay Grade									
Jr E.	0.44	0.35	0.54	0.00**	0.33	0.23	0.42	0.00**	8

Post-Deployment Health

Table 19 Phys		Without Mediator			With Mediator				
Variable*	Coeff	95 % CI		P-Value	95 % CI		P-Value		
		Low	Up		Low	Up			
Sgt.	0.30	0.20	0.39	0.00**	0.19	0.10	0.28	0.00**	8
Sr NCO	0.21	0.11	0.30	0.00**	0.13	0.04	0.23	0.01	8
Jr WO	-0.08	-0.18	0.03	0.17	-0.14	-0.25	-0.03	0.01	
SrWO	-0.11	-0.22	0.00	0.06	-0.17	-0.29	-0.06	0.00**	
Jr CGO	0.01	-0.08	0.11	0.79	-0.08	-0.17	0.02	0.11	
Sr FGO	0.02	-0.07	0.12	0.62	-0.04	-0.13	0.06	0.47	
Col/ GO's	0a	.	.	.	0a	.	.	.	
Days in Theater									
1-120	-0.62	-1.27	0.03	0.06	-0.68	-1.33	-0.03	0.04	
121-240	-0.50	-1.14	0.16	0.14	-0.57	-1.22	0.08	0.08	
241-360	-0.29	-0.94	0.36	0.39	-0.38	-1.03	0.27	0.25	
361-480	-0.26	-0.91	0.39	0.43	-0.37	-1.02	0.28	0.26	
481-600	-0.26	-0.92	0.39	0.43	-0.37	-1.03	0.29	0.27	
601-720	-0.42	-1.08	0.23	0.20	-0.52	-1.17	0.14	0.12	
721-840	-0.35	-1.03	0.33	0.31	-0.44	-1.11	0.24	0.21	
841-960	-0.21	-0.98	0.58	0.61	-0.25	-1.03	0.53	0.53	
961- 1080	-0.43	-1.36	0.50	0.37	-0.63	-1.56	0.31	0.19	
>1081	0a	.	.	.	0a	.	.	.	

Post-Deployment Health

Table 19 Phys		Without Mediator			With Mediator				
Variable*	Coeff	95 % CI		P-Value	95 % CI		P-Value		
		Low	Up		Low	Up			
<b>Saw Killed- Dead</b>									
No	-0.17	-0.18	-0.16	0.00**	-0.06	-0.07	-0.05	0.00**	8
Yes	0a	.	.	.	0a	.	.	.	
<b>Disch. Weapon</b>									
No	0.06	0.05	0.08	0.00**	0.15	0.13	0.16	0.00**	
Yes	0a	.	.	.	0a	.	.	.	
<b>Days MOPP</b>									
0	0.01	-0.05	0.07	0.80	-0.01	-0.06	0.05	0.86	8
1-5	0.16	0.11	0.22	0.00**	0.16	0.10	0.21	0.00**	8
6-10	-0.07	-0.14	-0.01	0.03	-0.06	-0.13	0.01	0.07	8
11-15	-0.13	-0.20	-0.07	0.00**	-0.13	-0.19	-0.06	0.00**	8
16-30	-0.08	-0.13	-0.03	0.00**	-0.08	-0.13	-0.02	0.00**	8
> 31	0a	.	.	.	0a	.	.	.	
<b>Days Mask</b>									
0	-0.32	-0.39	-0.26	0.00**	-0.28	-0.34	-0.21	0.00**	8
1-5	-0.18	-0.24	-0.13	0.00**	-0.16	-0.22	-0.10	0.00**	8
6-10	-0.10	-0.17	-0.04	0.00**	-0.08	-0.14	-0.01	0.02	8
11-15	0.02	-0.05	0.09	0.59	0.04	-0.03	0.11	0.30	
16-30	-0.06	-0.12	0.00	0.05	-0.05	-0.11	0.02	0.14	8
> 31	0a	.	.	.	0a	.	.	.	



Post-Deployment Health

Table 19 Phys		Without Mediator			With Mediator				
Variable*	Coeff	95 % CI		P-Value	95 % CI		P-Value		
		Low	Up		Low	Up			
<b>Destroyed Veh.</b>									
No	-0.21	-0.23	-0.20	0.00**	-0.17	-0.18	-0.15	0.00**	8
Yes	0a	.	.	.	0a	.	.	.	
<b>Exp Score</b>									
0	-3.44	-3.47	-3.41	0.00**	-3.25	-3.28	-3.22	0.00**	8
1-3	-2.48	-2.51	-2.45	0.00**	-2.29	-2.32	-2.26	0.00**	8
4-6	-2.23	-2.26	-2.20	0.00**	-2.07	-2.10	-2.04	0.00**	8
7-9	-2.02	-2.04	-1.99	0.00**	-1.87	-1.90	-1.84	0.00**	8
10-12	-1.84	-1.87	-1.82	0.00**	-1.71	-1.74	-1.69	0.00**	8
13-15	-1.65	-1.67	-1.62	0.00**	-1.53	-1.55	-1.51	0.00**	8
16-18	-1.45	-1.47	-1.43	0.00**	-1.35	-1.38	-1.33	0.00**	8
19-21	-1.25	-1.27	-1.22	0.00**	-1.16	-1.18	-1.14	0.00**	8
22-24	-1.04	-1.06	-1.02	0.00**	-0.97	-0.99	-0.95	0.00**	8
25-33	-0.69	-0.70	-0.67	0.00**	-0.64	-0.66	-0.63	0.00**	8
> 34	0a	.	.	.	0a	.	.	.	
<b>CBR Exposure</b>									
No	-0.55	-0.56	-0.54	0.00**	-0.44	-0.46	-0.43	0.00**	8
Yes	0a	.	.	.	0a	.	.	.	
<b>Danger Killed</b>									

Table 19 Phys Variable*	Without Mediator				With Mediator			
	95 % CI		P-Value	95 % CI		P-Value		
Coeff	Low	Up		Coeff	Low		Up	
No				-0.45	-0.47	-0.44	0.00**	
Yes				0a	.	.	.	
Exposure Concern								
No				-0.65	-0.66	-0.63	0.00**	
Yes				0a	.	.	.	

<sup>a</sup> Set to zero because this parameter is redundant.

\*The reference category is Physical Symptom Score – Highest (not shown).

\*\*p < 0.01

8 - Mediation

<sup>1</sup>All results are adjusted for all other variables in the table

### Mediation and Depressive Symptoms

Adding the appraisal mediators to the depressive symptom model revealed that appraisal mediated the effect of gender, race/ethnicity, branch (Air Force), component (National Guard), marital status, pay grade, seeing someone killed, wounded or dead, exposure to destroyed vehicles, and CBR exposures. Appraisal also mediated depressive symptoms the effect of length of time in theater (except for 961-1080 days), wearing MOPP (6 to 30 days) and a gas mask for 11 to 30 days. See Table 20 for further information.

In addition to the aforementioned mediation categories, several variables did not consistently demonstrate mediation in subcategories as noted above. There was no mediation detected for discharging a weapon in combat for depressive symptoms, and was detected in only one age category (50-53). The hypothesis was not supported for those identified variables.

Table 20  
*Adjusted binomial regression model comparison and mediation evaluation for Depressive Symptoms<sup>1</sup>*

Table 20 Dep.		Without Mediator			With Mediator				
Variable*	Sympt	95 % CI		P-Value	Coeff	95 % CI		P-Value	
	Coeff	Low	Up		Coeff	Low	Up		
<b>Age</b>									
18- 21	0.17	-0.02	0.36	0.08	0.27	0.09	0.46	0.00**	
22-25	0.16	-0.03	0.34	0.10	0.25	0.06	0.43	0.01	
26-29	0.11	-0.08	0.29	0.26	0.18	-0.01	0.37	0.06	
30-33	0.00	-0.18	0.19	0.98	0.06	-0.12	0.25	0.50	
34-37	-0.02	-0.21	0.17	0.83	0.03	-0.16	0.21	0.79	
38-41	0.03	-0.16	0.21	0.79	0.06	-0.13	0.24	0.56	
42-45	0.13	-0.06	0.32	0.18	0.14	-0.04	0.33	0.13	
46-49	0.17	-0.02	0.36	0.07	0.17	-0.02	0.36	0.08	
50-53	0.23	0.03	0.43	0.02	0.22	0.03	0.42	0.03	8
54-57	0.24	0.04	0.45	0.02	0.24	0.04	0.45	0.02	
58-60	0a	.	.	.	0a	.	.	.	
<b>Gender</b>									
Male	-0.43	-0.45	-0.40	0.00**	-0.41	-0.43	-0.39	0.00**	8
Female	0a	.	.	.	0a	.	.	.	
<b>Race</b>									
Asian	0.32	0.29	0.35	0.00**	0.28	0.25	0.32	0.00**	8
Black	0.37	0.35	0.38	0.00**	0.29	0.27	0.31	0.00**	8

Post-Deployment Health

Table 20 Dep.		Without Mediator			With Mediator				
Variable*	Sympt	95 % CI		P-Value	95 % CI		P-Value		
	Coeff	Low	Up		Coeff	Low	Up		
Hisp.	0.22	0.19	0.24	0.00**	0.16	0.14	0.18	0.00**	8
AI / AN	0.18	0.12	0.23	0.00**	0.15	0.10	0.21	0.00**	8
Other	0.40	0.25	0.55	0.00**	0.36	0.21	0.51	0.00**	8
White	0a	.	.	.	0a	.	.	.	
Branch									
Army	-0.05	-0.09	-0.01	0.03	-0.07	-0.11	-0.02	0.00**	
A. F.	-0.72	-0.77	-0.66	0.00**	-0.64	-0.69	-0.59	0.00**	8
Marine	0.03	-0.02	0.07	0.24	0.05	0.00	0.09	0.05	
Navy	0a				0a				
Component									
A. D.	0.08	0.05	0.10	0.00**	0.14	0.12	0.16	0.00**	
N.G.	-0.06	-0.08	-0.03	0.00**	-0.04	-0.07	-0.02	0.00**	8
Res.	0a	.	.	.	0a	.	.	.	
M. Status									
Mar.	-0.03	-0.06	0.01	0.11	-0.02	-0.06	0.01	0.15	
Single	-0.09	-0.13	-0.06	0.00**	-0.08	-0.11	-0.05	0.00**	
Other	0a	.	.	.	0a	.	.	.	
Pay Grade									
Jr E.	1.58	1.40	1.77	0.00**	1.47	1.29	1.66	0.00**	8

Post-Deployment Health

Table 20 Dep.		Without Mediator			With Mediator				
Variable*	Sympt	95 % CI		P-Value	Coeff	95 % CI		P-Value	
	Coeff	Low	Up		Coeff	Low	Up		
Sgt.	1.20	1.02	1.39	0.00**	1.10	0.92	1.29	0.00**	8
Sr NCO	0.76	0.57	0.94	0.00**	0.68	0.50	0.87	0.00**	8
Jr WO	0.65	0.44	0.85	0.00**	0.59	0.38	0.79	0.00**	8
SrWO	0.51	0.31	0.72	0.00**	0.46	0.25	0.67	0.00**	8
Jr CGO	0.73	0.54	0.91	0.00**	0.64	0.46	0.83	0.00**	8
Sr FGO	0.49	0.30	0.68	0.00**	0.43	0.24	0.62	0.00**	8
Col/ GO's	0a	.	.	.	0a	.	.	.	
Days in Theater									
1-120	0.43	-0.48	1.33	0.35	0.38	-0.52	1.29	0.41	8
121-240	0.41	-0.49	1.32	0.37	0.34	-0.57	1.24	0.46	8
241-360	0.51	-0.40	1.41	0.27	0.42	-0.48	1.32	0.36	8
361-480	0.37	-0.53	1.28	0.42	0.27	-0.63	1.17	0.56	8
481-600	0.67	-0.24	1.58	0.15	0.59	-0.32	1.50	0.21	8
601-720	0.59	-0.32	1.50	0.21	0.51	-0.40	1.42	0.27	8
721-840	0.55	-0.38	1.49	0.25	0.47	-0.47	1.40	0.33	8
841-960	0.94	-0.10	1.98	0.08	0.89	-0.15	1.92	0.09	8
961- 1080	-0.20	-1.56	1.17	0.78	-0.46	-1.83	0.91	0.51	
>1081	0a	.	.	.	0a	.	.	.	

Post-Deployment Health

Table 20 Dep.		Without Mediator			With Mediator				
Variable*	Sympt	95 % CI		P-Value	Coeff	95 % CI			
	Coeff	Low	Up		Coeff	Low	Up	P-Value	
<b>Saw Killed- Dead</b>									
No	-0.22	-0.23	-0.20	0.00**	-0.07	-0.09	-0.06	0.00**	8
Yes	0a	.	.	.	0a	.	.	.	
<b>Disch. Weapon</b>									
No	0.08	0.06	0.09	0.00**	0.17	0.16	0.19	0.00**	
Yes	0a	.	.	.	0a	.	.	.	
<b>Days MOPP</b>									
0	-0.16	-0.23	-0.09	0.00**	-0.18	-0.24	-0.11	0.00**	
1-5	-0.10	-0.17	-0.03	0.01	-0.11	-0.18	-0.04	0.00**	
6-10	-0.14	-0.22	-0.06	0.00**	-0.14	-0.22	-0.05	0.00**	8
11-15	-0.03	-0.10	0.05	0.49	-0.02	-0.10	0.06	0.61	8
16-30	-0.01	-0.07	0.06	0.88	0.00**	-0.07	0.06	0.91	8
> 31	0a	.	.	.	0a	.	.	.	
<b>Days Mask</b>									
0	0.12	0.05	0.20	0.00**	0.17	0.09	0.24	0.00**	
1-5	0.16	0.09	0.23	0.00**	0.18	0.11	0.25	0.00**	
6-10	0.01	-0.07	0.08	0.84	0.03	-0.05	0.10	0.44	
11-15	-0.01	-0.09	0.07	0.78	0.00	-0.09	0.08	0.95	8
16-30	-0.08	-0.15	-0.01	0.04	-0.07	-0.14	0.01	0.08	8
> 31	0a	.	.	.	0a	.	.	.	

Post-Deployment Health

Table 20 Dep.		Without Mediator			With Mediator				
Variable*	Sympt	95 % CI		P-Value	Coeff	95 % CI		P-Value	
	Coeff	Low	Up		Coeff	Low	Up		
<b>Destroyed Veh.</b>									
No	-0.22	-0.24	-0.21	0.00**	-0.17	-0.18	-0.15	0.00**	8
Yes	0a	.	.	.	0a	.	.	.	
<b>Exp Score</b>									
0	-2.20	-2.25	-2.16	0.00**	-1.99	-2.03	-1.94	0.00**	8
1-3	-1.62	-1.67	-1.57	0.00**	-1.41	-1.46	-1.36	0.00**	8
4-6	-1.38	-1.42	-1.34	0.00**	-1.20	-1.24	-1.16	0.00**	8
7-9	-1.21	-1.25	-1.18	0.00**	-1.06	-1.10	-1.02	0.00**	8
10-12	-1.09	-1.12	-1.06	0.00**	-0.96	-0.99	-0.93	0.00**	8
13-15	-0.92	-0.95	-0.89	0.00**	-0.81	-0.83	-0.78	0.00**	8
16-18	-0.80	-0.83	-0.77	0.00**	-0.71	-0.73	-0.68	0.00**	8
19-21	-0.66	-0.69	-0.64	0.00**	-0.58	-0.61	-0.56	0.00**	8
22-24	-0.53	-0.55	-0.50	0.00**	-0.47	-0.49	-0.44	0.00**	8
25-33	-0.31	-0.33	-0.29	0.00**	-0.27	-0.29	-0.25	0.00**	8
> 34	0a	.	.	.	0a	.	.	.	
<b>CBR Exposure</b>									
No	-0.40	-0.41	-0.39	0.00**	-0.30	-0.32	-0.29	0.00**	8
Yes	0a	.	.	.	0a	.	.	.	

Table 20 Dep.		Without Mediator			With Mediator			
Variable*	Sympt	95 % CI		P-Value	Coeff	95 % CI		P-Value
	Coeff	Low	Up		Coeff	Low	Up	
<b>Danger Killed</b>								
No					-0.59	-0.60	-0.57	0.00**
Yes					0a	.	.	.
<b>Exposure Concern</b>								
No					-0.41	-0.42	-0.39	0.00**
Yes					0a	.	.	.

<sup>a</sup> Set to zero because this parameter is redundant.

\*The reference category is Depression Score – Highest (not shown).

\*\*p< 0.01

8 - Mediation

<sup>1</sup>All results are adjusted for all other variables in the table

Mediation and Emotional Concerns

Adding the appraisal mediators to the emotional concern model, mediation was detected in almost all areas (see Table 21). Similar findings and trends in statistical significance was observed with and without mediators. Supporting the hypothesis, appraisal mediated the effect on emotional concerns in age (18 to 41), gender, race, service branch, component, marital status (single), pay grade, those who reported seeing someone killed, wounded or dead, days in MOPP, CBR exposure, inspecting destroyed vehicles and exposure scores. However, appraisal did not mediate the effect of days in theater, discharging weapon in combat or consistently perform in days in the gas mask (0 to 15 only)



Table 21  
*Adjusted binomial regression model comparison and mediation evaluation for Emotional Concerns<sup>1</sup>*

Table 21 Emotion		Without Mediator			With Mediator				
Variable*	Sympt	95 % CI		P-Value	Coeff	95 % CI		P-Value	
	Coeff	Low	Up			Low	Up		
<b>Age</b>									
18- 21	-0.21	-0.42	-0.01	0.04	-0.08	-0.29	0.13	0.44	8
22-25	-0.17	-0.37	0.04	0.11	-0.05	-0.26	0.15	0.61	8
26-29	-0.13	-0.33	0.08	0.23	-0.03	-0.24	0.18	0.78	8
30-33	-0.15	-0.35	0.06	0.16	-0.07	-0.27	0.14	0.53	8
34-37	-0.11	-0.32	0.09	0.29	-0.05	-0.26	0.16	0.64	8
38-41	-0.05	-0.26	0.15	0.60	-0.01	-0.22	0.20	0.92	8
42-45	0.11	-0.10	0.31	0.31	0.13	-0.08	0.33	0.23	
46-49	0.12	-0.09	0.33	0.28	0.12	-0.09	0.33	0.27	
50-53	0.15	-0.07	0.37	0.18	0.14	-0.07	0.36	0.20	
54-57	0.17	-0.05	0.40	0.13	0.18	-0.05	0.41	0.13	
58-60	0a	.	.	.	0a	.	.	.	
<b>Gender</b>									
Male	-0.52	-0.55	-0.49	0.00**	-0.50	-0.52	-0.47	0.00**	8
Female	0a	.	.	.	0a	.	.	.	
<b>Race</b>									
Asian	0.19	0.15	0.23	0.00**	0.16	0.11	0.20	0.00**	8
Black	0.42	0.39	0.44	0.00**	0.34	0.32	0.36	0.00**	8

Table 21 Emotion		Without Mediator			With Mediator				
Variable*	Sympt	95 % CI		P-Value	Coeff	95 % CI		P-Value	
	Coeff	Low	Up			Low	Up		
Hispanic	0.27	0.24	0.29	0.00**	0.21	0.19	0.24	0.00**	8
AI / AN	0.19	0.12	0.26	0.00**	0.17	0.10	0.24	0.00**	8
Other	0.32	0.12	0.53	0.00**	0.29	0.08	0.49	0.01	8
White	0a	.	.	.	0a	.	.	.	
Branch									
Army	0.08	0.02	0.13	0.01	0.05	-0.01	0.11	0.09	8
A. F.	-0.90	-0.97	-0.83	0.00**	-0.82	-0.89	-0.75	0.00**	8
Marine	-0.08	-0.14	-0.02	0.01	-0.06	-0.12	0.00	0.04	8
Navy	0a	.	.	.	0a	.	.	.	
Component									
A. D.	-0.17	-0.20	-0.15	0.00**	-0.09	-0.11	-0.06	0.00**	8
N.G.	-0.10	-0.13	-0.08	0.00**	-0.08	-0.11	-0.06	0.00**	8
Res.	0a	.	.	.	0a	.	.	.	
M. Status									
Mar.	0.11	0.07	0.15	0.00**	0.11	0.07	0.15	0.00**	
Single	-0.30	-0.34	-0.26	0.00**	-0.29	-0.33	-0.25	0.00**	8
Other	0a	.	.	.	0a	.	.	.	
Pay Grade									
Jr E.	1.89	1.65	2.13	0.00**	1.78	1.53	2.02	0.00**	8

Table 21 Emotion		Without Mediator			With Mediator				
Variable*	Sympt	95 % CI		P-Value	95 % CI		P-Value		
	Coeff	Low	Up		Coeff	Low	Up		
Sgt.	1.43	1.19	1.67	0.00**	1.32	1.08	1.56	0.00**	8
Sr NCO	0.87	0.63	1.11	0.00**	0.79	0.55	1.03	0.00**	8
Jr WO	0.48	0.21	0.74	0.00**	0.41	0.14	0.68	0.00**	8
SrWO	0.49	0.22	0.76	0.00**	0.43	0.16	0.70	0.00**	8
Jr CGO	0.79	0.54	1.03	0.00**	0.69	0.45	0.94	0.00**	8
Sr FGO	0.54	0.29	0.79	0.00**	0.48	0.23	0.72	0.00**	8
Col/ GO's	0a	.	.	.	0a	.	.	.	
Days in Theater									
1-120	-1.10	-1.88	-0.32	0.01	-1.20	-1.98	-0.43	0.00**	
121-240	-1.07	-1.85	-0.29	0.01	-1.19	-1.97	-0.42	0.00**	
241-360	-0.88	-1.66	-0.10	0.03	-1.02	-1.79	-0.24	0.01	
361-480	-0.99	-1.77	-0.21	0.01	-1.15	-1.93	-0.38	0.00**	
481-600	-0.59	-1.38	0.20	0.14	-0.73	-1.52	0.05	0.07	
601-720	-0.74	-1.53	0.05	0.07	-0.88	-1.66	-0.09	0.03	
721-840	-0.85	-1.68	-0.03	0.04	-0.99	-1.81	-0.17	0.02	
841-960	-0.11	-1.05	0.83	0.82	-0.22	-1.16	0.72	0.65	
961- 1080	-0.29	-1.41	0.84	0.62	-0.58	-1.71	0.55	0.32	
>1081	0a	.	.	.	0a	.	.	.	

Table 21 Emotion		Without Mediator			With Mediator				
Variable*	Sympt	95 % CI		P-Value	Coeff	95 % CI		P-Value	
	Coeff	Low	Up		Coeff	Low	Up		
Saw Killed- Dead									
No	-0.32	-0.34	-0.30	0.00**	-0.19	-0.21	-0.17	0.00**	8
Yes	0a	.	.	.	0a	.	.	.	
Disch. Weapon									
No	-0.10	-0.12	-0.08	0.00**	-0.02	-0.04	0.00	0.08	
Yes	0a	.	.	.	0a	.	.	.	
Days MOPP									
0	0.09	0.00**	0.17	0.06	0.08	-0.01	0.17	0.08	8
1-5	0.03	-0.06	0.12	0.45	0.03	-0.06	0.12	0.58	8
6-10	-0.04	-0.14	0.07	0.47	-0.03	-0.14	0.07	0.54	8
11-15	-0.11	-0.21	-0.01	0.03	-0.10	-0.20	0.00	0.05	8
16-30	-0.09	-0.17	-0.01	0.04	-0.08	-0.16	0.00	0.05	8
> 31	0a	.	.	.	0a	.	.	.	
Days Mask									
0	0.13	0.03	0.22	0.01	0.18	0.09	0.28	0.00**	
1-5	0.14	0.05	0.23	0.00**	0.17	0.07	0.26	0.00**	
6-10	-0.01	-0.10	0.09	0.92	0.03	-0.07	0.12	0.60	
11-15	0.00	-0.11	0.11	0.95	0.01	-0.10	0.12	0.87	
16-30	-0.05	-0.15	0.05	0.31	-0.03	-0.13	0.06	0.49	8
> 31	0a	.	.	.	0a	.	.	.	

Table 21 Emotion		Without Mediator			With Mediator				
Variable*	Sympt	95 % CI		P-Value	Coeff	95 % CI		P-Value	
	Coeff	Low	Up			Low	Up		
Destroyed Veh.									
No	-0.29	-0.30	-0.27	0.00**	-0.23	-0.25	-0.21	0.00**	8
Yes	0a	.	.	.	0a	.	.	.	
Exp Score									
0	-1.47	-1.52	-1.41	0.00**	-1.21	-1.26	-1.15	0.00**	8
1-3	-1.15	-1.21	-1.09	0.00**	-0.90	-0.96	-0.84	0.00**	8
4-6	-1.03	-1.08	-0.98	0.00**	-0.82	-0.87	-0.77	0.00**	8
7-9	-0.93	-0.97	-0.88	0.00**	-0.75	-0.79	-0.70	0.00**	8
10-12	-0.83	-0.87	-0.79	0.00**	-0.67	-0.71	-0.63	0.00**	8
13-15	-0.73	-0.76	-0.69	0.00**	-0.59	-0.62	-0.55	0.00**	8
16-18	-0.64	-0.67	-0.61	0.00**	-0.52	-0.56	-0.49	0.00**	8
19-21	-0.52	-0.56	-0.49	0.00**	-0.43	-0.46	-0.40	0.00**	8
22-24	-0.45	-0.48	-0.41	0.00**	-0.37	-0.40	-0.34	0.00**	8
25-33	-0.28	-0.30	-0.25	0.00**	-0.23	-0.25	-0.21	0.00**	8
> 34	0a	.	.	.	0a	.	.	.	
CBR Exposure									
No	-0.43	-0.44	-0.41	0.00**	-0.31	-0.33	-0.29	0.00**	8
Yes	0a	.	.	.	0a	.	.	.	

Table 21 Emotion		Without Mediator			With Mediator			
Variable*	Sympt Coeff	95 % CI		P-Value	Coeff	95 % CI		P-Value
		Low	Up			Low	Up	
<b>Danger Killed</b>								
No					-0.58	-0.60	-0.56	0.00**
Yes					0a	.	.	.
<b>Exposure Concern</b>								
No					-0.56	-0.58	-0.54	0.00**
Yes					0a	.	.	.

<sup>a</sup> Set to zero because this parameter is redundant.

\*The reference category is Emotional Symptoms – Highest (not shown).

\*\*p< 0.01

8 - Mediation

<sup>1</sup>All results are adjusted for all other variables in the table

Mediation and Health Perception

As suggested by the hypothesis, appraisal mediated health perception and the effect of age (except those ages 54 to 57), gender, race, branch (Air Force and Army), component, marital status (single), pay grade, days in theater, days in mask, inspecting destroyed vehicles, exposure scores and CBR exposure. Appraisal did not mediate the effect of seeing someone killed, wounded or dead, discharging a weapon in combat, days in MOPP thus not supporting the hypothesis for those categories. See Table 22 for further information.

Table 22  
*Adjusted binomial regression model comparison and mediation evaluation for Health Assessment<sup>1</sup>*

Table 22 Health Variable*	Without Mediator				With Mediator				
	Coeff	95 % Low	CI Up	P-Value	Coeff	95 % Low	CI Up	P-Value	
<b>Age</b>									
18- 21	-1.11	-1.23	-0.99	0.00**	-0.98	-1.11	-0.86	0.00**	8
22-25	-1.05	-1.17	-0.92	0.00**	-0.94	-1.06	-0.81	0.00**	8
26-29	-0.94	-1.06	-0.82	0.00**	-0.84	-0.96	-0.72	0.00**	8
30-33	-0.84	-0.96	-0.71	0.00**	-0.75	-0.87	-0.63	0.00**	8
34-37	-0.66	-0.78	-0.54	0.00**	-0.59	-0.71	-0.47	0.00**	8
38-41	-0.44	-0.56	-0.32	0.00**	-0.39	-0.51	-0.27	0.00**	8
42-45	-0.28	-0.40	-0.16	0.00**	-0.24	-0.37	-0.12	0.00**	8
46-49	-0.15	-0.27	-0.03	0.02	-0.13	-0.26	-0.01	0.04	8
50-53	-0.04	-0.17	0.09	0.57	-0.03	-0.16	0.10	0.70	8
54-57	0.06	-0.07	0.20	0.36	0.07	-0.06	0.21	0.30	
58-60	0a	.	.	.	0a	.	.	.	
<b>Gender</b>									
Male	-0.53	-0.54	-0.51	0.00**	-0.50	-0.52	-0.48	0.00**	8
Female	0a	.	.	.	0a	.	.	.	
<b>Race</b>									
Asian	0.17	0.15	0.20	0.00**	0.16	0.13	0.18	0.00**	8
Black	0.19	0.17	0.20	0.00**	0.14	0.13	0.16	0.00**	8

Post-Deployment Health

Table 22 Health		Without Mediator			With Mediator				
Variable*	Coeff	95 % CI		P-Value	Coeff	95 % CI		P-Value	
		Low	Up			Low	Up		
Hispanic	0.13	0.11	0.15	0.00**	0.09	0.08	0.11	0.00**	8
AI / AN	0.15	0.10	0.20	0.00**	0.14	0.09	0.19	0.00**	8
Other	0.06	-0.07	0.18	0.38	0.03	-0.10	0.15	0.67	8
White	0a	.	.	.	0a	.	.	.	
Branch									
Army	0.55	0.52	0.59	0.00**	0.53	0.50	0.57	0.00**	8
A. F.	-0.21	-0.24	-0.17	0.00**	-0.17	-0.20	-0.13	0.00**	8
Marine	0.18	0.15	0.22	0.00**	0.20	0.16	0.23	0.00**	
Navy	0a	.	.	.	0a	.	.	.	
Component									
A. D.	-0.21	-0.23	-0.19	0.00**	-0.13	-0.14	-0.11	0.00**	8
N.G.	-0.14	-0.16	-0.12	0.00**	-0.12	-0.14	-0.10	0.00**	8
Res.	0a	.	.	.	0a	.	.	.	
M. Status									
Mar.	0.002	-0.02	0.03	0.90	0.004	-0.02	0.03	0.74	
Single	-0.06	-0.09	-0.03	0.00**	-0.05	-0.08	-0.02	0.00**	8
Other	0a	.	.	.	0a	.	.	.	
Pay Grade									
Jr E.	1.83	1.74	1.93	0.00**	1.76	1.67	1.86	0.00**	8



Post-Deployment Health

Table 22 Health		Without Mediator			With Mediator				
Variable*	Coeff	95 % CI		P-Value	Coeff	95 % CI		P-Value	
		Low	Up			Low	Up		
Sgt.	1.58	1.48	1.67	0.00**	1.51	1.42	1.61	0.00**	8
Sr NCO	1.20	1.11	1.30	0.00**	1.16	1.07	1.25	0.00**	8
Jr WO	0.92	0.82	1.03	0.00**	0.88	0.78	0.99	0.00**	8
SrWO	0.86	0.75	0.97	0.00**	0.81	0.70	0.93	0.00**	8
Jr CGO	0.79	0.70	0.89	0.00**	0.73	0.63	0.82	0.00**	8
Sr FGO	0.40	0.30	0.50	0.00**	0.35	0.26	0.45	0.00**	8
Col/ GO's	0a	.	.	.	0a	.	.	.	
Days in Theater									
1-120	0.35	-0.31	1.01	0.30	0.30	-0.37	0.96	0.38	8
121-240	0.33	-0.34	0.99	0.33	0.26	-0.40	0.92	0.44	8
241-360	0.37	-0.29	1.04	0.27	0.29	-0.38	0.95	0.39	8
361-480	0.39	-0.27	1.05	0.25	0.29	-0.38	0.95	0.39	8
481-600	0.53	-0.14	1.20	0.12	0.44	-0.23	1.11	0.20	8
601-720	0.53	-0.13	1.20	0.12	0.45	-0.22	1.12	0.19	8
721-840	0.42	-0.28	1.11	0.24	0.36	-0.33	1.05	0.31	8
841-960	0.55	-0.25	1.35	0.18	0.51	-0.29	1.31	0.21	8
961- 1080	1.11	0.16	2.06	0.02	0.92	-0.03	1.88	0.06	8
>1081	0a	.	.	.	0a	.	.	.	
Saw Killed- Dead									

Post-Deployment Health

Table 22 Health

Variable*	Without Mediator				With Mediator				
	Coeff	95 % CI		P-Value	Coeff	95 % CI		P-Value	
		Low	Up			Low	Up		
No	0.00	-0.01	0.01	0.96	0.07	0.06	0.08	0.00**	
Yes	0a	.	.	.	0a	.	.	.	
Disch. Weapon									
No	-0.04	-0.05	-0.02	0.00**	0.01	-0.01	0.02	0.27	
Yes	0a	.	.	.	0a	.	.	.	
Days MOPP									
0	-0.13	-0.19	-0.07	0.00**	-0.15	-0.21	-0.09	0.00**	
1-5	-0.08	-0.14	-0.02	0.01	-0.09	-0.15	-0.03	0.00**	
6-10	-0.14	-0.21	-0.07	0.00**	-0.14	-0.21	-0.07	0.00**	
11-15	-0.10	-0.16	-0.03	0.00**	-0.09	-0.16	-0.03	0.01	
16-30	-0.08	-0.13	-0.02	0.01	-0.07	-0.13	-0.02	0.01	
> 31	0a	.	.	.	0a	.	.	.	
Days Mask									
0	-0.07	-0.13	0.00	0.05	-0.02	-0.08	0.05	0.60	8
1-5	-0.02	-0.08	0.05	0.61	0.01	-0.05	0.07	0.75	8
6-10	-0.06	-0.13	0.00	0.07	-0.03	-0.10	0.04	0.36	8
11-15	-0.06	-0.13	0.02	0.12	-0.04	-0.11	0.03	0.29	8
16-30	-0.06	-0.13	0.00	0.05	-0.05	-0.11	0.01	0.12	8
> 31	0a	.	.	.	0a	.	.	.	

Post-Deployment Health

Table 22 Health

Variable*	Without Mediator				With Mediator				
	Coeff	95 % CI		P-Value	Coeff	95 % CI		P-Value	
		Low	Up			Low	Up		
<b>Destroyed Veh.</b>									
No	-0.11	-0.13	-0.10	0.00**	-0.08	-0.09	-0.07	0.00**	8
Yes	0a	.	.	.	0a	.	.	.	
<b>Exp Score</b>									
0	-0.96	-0.98	-0.93	0.00**	-0.77	-0.80	-0.75	0.00**	8
1-3	-0.92	-0.95	-0.89	0.00**	-0.73	-0.77	-0.70	0.00**	8
4-6	-0.83	-0.86	-0.80	0.00**	-0.66	-0.69	-0.64	0.00**	8
7-9	-0.73	-0.76	-0.70	0.00**	-0.58	-0.61	-0.55	0.00**	8
10-12	-0.66	-0.69	-0.64	0.00**	-0.53	-0.55	-0.50	0.00**	8
13-15	-0.57	-0.60	-0.55	0.00**	-0.45	-0.47	-0.43	0.00**	8
16-18	-0.52	-0.55	-0.50	0.00**	-0.41	-0.44	-0.39	0.00**	8
19-21	-0.42	-0.44	-0.40	0.00**	-0.33	-0.35	-0.30	0.00**	8
22-24	-0.35	-0.37	-0.33	0.00**	-0.27	-0.29	-0.25	0.00**	8
25-33	-0.22	-0.23	-0.20	0.00**	-0.16	-0.18	-0.15	0.00**	8
> 34	0a	.	.	.	0a	.	.	.	
<b>CBR Exposure</b>									
No	-0.49	-0.50	-0.48	0.00**	-0.39	-0.40	-0.37	0.00**	8
Yes	0a	.	.	.	0a	.	.	.	

Table 22 Health Variable*	Without Mediator				With Mediator			
	Coeff	95 % CI		P-Value	Coeff	95 % CI		P-Value
		Low	Up			Low	Up	
<b>Danger Killed</b>								
No					-0.26	-0.27	-0.25	0.00**
Yes					0a	.	.	.
<b>Exposure Concern</b>								
No					-0.74	-0.75	-0.73	0.00**
Yes					0a	.	.	.

<sup>a</sup> Set to zero because this parameter is redundant.

\*The reference category is Health Assessment – Poor (not shown).

\*\*p< 0.01

8 - Mediation

<sup>1</sup>All results are adjusted for all other variables in the table

Mediation and PTSD

Appraisal variables were also added to the model to test for mediation within the PTSD symptom category. (Refer to Table 23 for details). Similar findings and trends for statistical significance were noted with and without the appraisal mediators. Appraisal mediated the effect of age (18 to 41 and 50 to 57), race/ethnicity, branch (Air Force and Marine), component (National Guard), marital status, pay grade, , seeing someone killed, wounded or dead, discharging a weapon in combat, wearing MOPP ( 11 to-30 days only), days in mask, inspecting destroyed vehicles, exposure scores and exposure to CBR agents on PTSD symptoms. Taking into account the aforementioned mediation, adding the appraisal variables did not mediate the effect of gender or days in theater on PTSD symptoms. Thus the hypothesis was not supported for these variables

Table 23  
Adjusted binomial regression model comparison and mediation evaluation for PTSD symptoms<sup>1</sup>

Table 23 PTSD		Without Mediator			With Mediator				
Variable*	Coeff	95 % CI		P-Value	Coeff	95 % CI		P-Value	
		Low	Up			Low	Up		
<b>Age</b>									
18- 21	-0.47	-0.64	-0.29	0.00**	-0.36	-0.54	-0.18	0.00**	8
22-25	-0.40	-0.58	-0.22	0.00**	-0.31	-0.49	-0.13	0.00**	8
26-29	-0.35	-0.53	-0.18	0.00**	-0.28	-0.46	-0.10	0.00**	8
30-33	-0.36	-0.53	-0.18	0.00**	-0.30	-0.49	-0.12	0.00**	8
34-37	-0.31	-0.49	-0.13	0.00**	-0.27	-0.46	-0.09	0.00**	8
38-41	-0.25	-0.42	-0.07	0.01	-0.23	-0.42	-0.05	0.01	8
42-45	-0.13	-0.31	0.05	0.15	-0.14	-0.32	0.05	0.15	
46-49	-0.05	-0.23	0.13	0.56	-0.08	-0.26	0.11	0.43	
50-53	0.01	-0.17	0.20	0.89	-0.01	-0.20	0.18	0.92	8
54-57	0.10	-0.10	0.29	0.34	0.09	-0.12	0.29	0.40	8
58-60	0a	.	.	.	0a	.	.	.	
<b>Gender</b>									
Male	-0.56	-0.59	-0.54	0.00**	-0.58	-0.60	-0.55	0.00**	
Female	0a	.	.	.	0a	.	.	.	
<b>Race</b>									
Asian	0.12	0.08	0.15	0.00**	0.04	0.00**	0.08	0.04	8
Black	0.32	0.30	0.34	0.00**	0.18	0.16	0.19	0.00**	8
Hisp.	0.20	0.18	0.23	0.00**	0.11	0.08	0.13	0.00**	8

Table 23 PTSD		Without Mediator			With Mediator				
Variable*	Coeff	95 % CI		P-Value	Coeff	95 % CI		P-Value	
		Low	Up			Low	Up		
AI / AN	0.18	0.12	0.24	0.00**	0.14	0.08	0.20	0.00**	8
Other	0.24	0.07	0.42	0.01	0.17	-0.01	0.35	0.06	8
White	0a	.	.	.	0a	.	.	.	
Branch									
Army	-0.06	-0.11	-0.01	0.02	-0.08	-0.13	-0.03	0.00**	
A. F.	-0.59	-0.65	-0.54	0.00**	-0.42	-0.48	-0.37	0.00**	8
Marine	-0.23	-0.27	-0.18	0.00**	-0.21	-0.26	-0.16	0.00**	8
Navy	0a	.	.	.	0a	.	.	.	
Component									
A. D.	-0.02	-0.04	0.00	0.09	0.08	0.05	0.10	0.00**	
N.G.	-0.07	-0.10	-0.04	0.00**	-0.05	-0.08	-0.02	0.00**	8
Res.	0a	.	.	.	0a	.	.	.	
M. Status									
Mar.	-0.05	-0.08	-0.02	0.00**	-0.05	-0.08	-0.01	0.01	8
Other	-0.21	-0.24	-0.17	0.00**	-0.19	-0.22	-0.15	0.00**	8
Single	0a	.	.	.	0a	.	.	.	
Pay Grade									
Jr E.	1.22	1.05	1.39	0.00**	1.02	0.85	1.19	0.00**	8
Sgt.	0.92	0.76	1.09	0.00**	0.73	0.56	0.90	0.00**	8

Table 23 PTSD		Without Mediator			With Mediator				
Variable*	Coeff	95 % CI		P-Value	Coeff	95 % CI		P-Value	
		Low	Up			Low	Up		
Sr NCO	0.54	0.38	0.71	0.00**	0.40	0.23	0.57	0.00**	8
Jr WO	0.25	0.07	0.44	0.01	0.13	-0.06	0.32	0.18	8
SrWO	0.17	-0.02	0.37	0.08	0.07	-0.12	0.27	0.47	8
Jr CGO	0.53	0.36	0.70	0.00**	0.38	0.20	0.55	0.00**	8
Sr FGO	0.36	0.19	0.53	0.00**	0.27	0.09	0.44	0.00**	8
Col/ GO's	0a	.	.	.	0a	.	.	.	
Days in Theater									
1-120	-1.05	-1.77	-0.33	0.01	-1.14	-1.88	-0.40	0.00**	
121-240	-1.04	-1.76	-0.31	0.01	-1.20	-1.93	-0.46	0.00**	
241-360	-1.05	-1.77	-0.32	0.01	-1.23	-1.96	-0.49	0.00**	
361-480	-1.09	-1.81	-0.36	0.00**	-1.29	-2.03	-0.56	0.00**	
481-600	-0.74	-1.48	-0.01	0.05	-0.92	-1.66	-0.17	0.02	
601-720	-0.85	-1.58	-0.12	0.02	-1.02	-1.76	-0.28	0.01	
721-840	-0.89	-1.65	-0.13	0.02	-1.08	-1.85	-0.30	0.01	
841-960	-0.50	-1.39	0.39	0.27	-0.61	-1.51	0.30	0.19	
961- 1080	-1.38	-2.56	-0.20	0.02	-1.73	-2.91	-0.54	0.00**	
>1081	0a	.	.	.	0a	.	.	.	

Table 23 PTSD		Without Mediator			With Mediator				
Variable*	Coeff	95 % CI		P-Value	Coeff	95 % CI		P-Value	
		Low	Up			Low	Up		
<b>Saw Killed- Dead</b>									
No	-0.85	-0.87	-0.83	0.00**	-0.59	-0.60	-0.57	0.00**	8
Yes	0a	.	.	.	0a	.	.	.	
<b>Disch. Weapon</b>									
No	-0.52	-0.53	-0.50	0.00**	-0.34	-0.36	-0.33	0.00**	8
Yes	0a	.	.	.	0a	.	.	.	
<b>Days MOPP</b>									
0	0.40	0.32	0.48	0.00**	0.40	0.33	0.48	0.00**	
1-5	0.25	0.17	0.33	0.00**	0.26	0.17	0.34	0.00**	
6-10	0.10	0.01	0.19	0.03	0.12	0.03	0.22	0.01	
11-15	-0.10	-0.18	-0.01	0.03	-0.07	-0.16	0.02	0.11	8
16-30	-0.06	-0.13	0.01	0.10	-0.06	-0.13	0.02	0.14	8
> 31	0a	.	.	.	0a	.	.	.	
<b>Days Mask</b>									
0	-0.10	-0.18	-0.01	0.02	-0.04	-0.12	0.05	0.38	8
1-5	-0.02	-0.10	0.07	0.69	0.00	-0.08	0.08	0.98	8
6-10	-0.14	-0.23	-0.06	0.00**	-0.12	-0.21	-0.03	0.01	8
11-15	-0.04	-0.14	0.06	0.41	-0.03	-0.13	0.07	0.54	8
16-30	-0.10	-0.18	-0.01	0.03	-0.08	-0.16	0.01	0.08	8
> 31	0a	.	.	.	0a	.	.	.	



Table 23 PTSD		Without Mediator			With Mediator				
Variable*	Coeff	95 % CI		P-Value	Coeff	95 % CI		P-Value	
		Low	Up			Low	Up		
<b>Destroyed Veh.</b>									
No	-0.46	-0.47	-0.44	0.00**	-0.37	-0.38	-0.35	0.00**	8
Yes	0a	.	.	.	0a	.	.	.	
<b>Exp Score</b>									
0	-1.81	-1.86	-1.76	0.00**	-1.42	-1.47	-1.37	0.00**	8
1-3	-1.44	-1.50	-1.38	0.00**	-1.08	-1.14	-1.02	0.00**	8
4-6	-1.22	-1.27	-1.17	0.00**	-0.93	-0.98	-0.88	0.00**	8
7-9	-1.08	-1.12	-1.04	0.00**	-0.83	-0.87	-0.79	0.00**	8
10-12	-1.00	-1.03	-0.96	0.00**	-0.79	-0.82	-0.75	0.00**	8
13-15	-0.85	-0.88	-0.82	0.00**	-0.68	-0.71	-0.65	0.00**	8
16-18	-0.75	-0.77	-0.72	0.00**	-0.62	-0.64	-0.59	0.00**	8
19-21	-0.63	-0.65	-0.60	0.00**	-0.53	-0.55	-0.50	0.00**	8
22-24	-0.50	-0.53	-0.47	0.00**	-0.42	-0.45	-0.39	0.00**	8
25-33	-0.32	-0.34	-0.30	0.00**	-0.27	-0.29	-0.25	0.00**	8
> 34	0a	.	.	.	0a	.	.	.	
<b>CBR Exposure</b>									
No	-0.49	-0.51	-0.48	0.00**	-0.34	-0.36	-0.33	0.00**	8
Yes	0a	.	.	.	0a	.	.	.	

Table 23 PTSD Variable*	Without Mediator				With Mediator			
	95 % CI				95 % CI			
	Coeff	Low	Up	P-Value	Coeff	Low	Up	P-Value
<b>Danger Killed</b>								
No					-1.34	-1.36	-1.32	0.00**
Yes					0a	.	.	.
<b>Exposure Concern</b>								
No					-0.46	-0.48	-0.44	0.00**
Yes					0a	.	.	.

<sup>a</sup> Set to zero because this parameter is redundant.

\*The reference category is PTSD – Highest (not shown).

\*\*p< 0.01

8 - Mediation

<sup>1</sup>All results are adjusted for all other variables in the table

### Summary

This chapter reported results of multiple analyses done on variables identified on the PDHA and other obtained characteristics. Several statistical techniques were employed to evaluate the data and relationships. For items that were combined to form scales, reliability calculations were performed and reported. Unadjusted evaluations on relationships were performed to confirm findings before model analysis. Linear regression models were employed to evaluate relationships and interaction. Adjusted models which evaluated impact of variable interactions were described. Mediation was evaluated on appraisal variables and hypothesis testing using selected framework (stress, appraisal, and coping theory).

## Chapter V

## Discussion

*Introduction*

This chapter reviews study findings related to the characteristics, stress sources and health outcomes of military members after returning from their first deployment in Iraq. These findings will be compared to statistics available through the Department of Defense (DOD) (DOD, 2005 Demographics Report), as well as other published reports of Iraq-related deployments (Hoge et al., 2004; Hoge, Auchterlonie & Milliken, 2006; Lapierre, Schwegler & LaBauve, 2007; Milliken; Auchterlonie & Hoge, 2007; Martin, 2007). Additionally, the usefulness of the Lazarus and Folkman (1984) theoretical framework for guiding military post-deployment health research will be discussed. Finally, the study limitations and implications for practice, policy and future research will be presented.

*Sample Characteristics*

Table 24 compares the study sample characteristics with data reported by the DOD (DOD, 2005 Demographics Report), on the age, gender, race/ethnicity, component, pay grade and marital status of military members. These data suggest that the present study sample was fairly representative of the U.S. military as reported by the DOD with the following exceptions: gender, officer to enlisted ratio, age and marital status. The percentage of females in this sample was lower than statistics reported by the DOD. This is most likely due to the fact that this study sample included military members deployed to Iraq only and fewer women may be assigned to combat theaters. Studies reporting deployments to Iraq and Afghanistan describe similar demographics for females, ranging from 6 to 7% (Lapierre, Schwegler & LaBauve, 2007), 8.7% to 10.6% (Hoge, Auchterlonie & Milliken, 2006), 9.2% (Milliken, Auchterlonie & Hoge, 2007)

and 10% (Martin, 2007) of their study populations. The ratio of officers to enlisted personnel, in the present study was 1 to 7.1 (officer to enlisted) compared with the DOD reported ratio of 1 to 5.1. These data suggest that there are more enlisted to officer deployed in the combat zone. This is probably the result of needing more ground troops in an active combat zone. The age of the study sample is younger for Active Duty (AD) only; which reflected the need to fill deployment positions with relatively new recruits. The Reserve component is consistent with reported DOD statistics. The AD members were less likely to be married ; which is consistent with the younger age of this group. See Table 25 for further examples of demographic comparisons to recent studies.

Table 24  
*Comparison of Reported DOD demographics and Study Sample*

Demographic Variable	DOD		Current Study	
	AD	Reserves	AD	Reserves
Total	1 373 534	829 005	357 167	153 185
%	62.36%	37.64%	70.0%	30.0%
Ratio of officers to enlisted	1 to 5.1	1 to 5.6	1 to 6.9	1 to 7.9
% women	14.60%	17.20%	9.74%	9.94%
% minorities	35.90%	30.40%	36.65%	28.51%
% 25 years old or younger	46.60%	31.20%	51.5%	31.69%
% married	54.60%	51.40%	48.9%	51.84%

\* *Reserve and National Guard combined = Reserves*

Table 25  
*Comparison of Demographic information of recent Deployment studies*

Table 25	Current Study	Hoge (2006)	Hoge (2004)*
<b>Gender</b>			
Female	49 998 (9.8%)	32 500 (10.7%)	14 (0.8%)**
Male	460 349 (90.2%)	271 404 (89.3%)	1 694 (99.1%)
<b>Age</b>			
18-24	201 166 (39.4%)	126 123 (41.5%)	1180 (69.0%)
25-29	117 516 (23.0%)	61 925 (20.4%)	320 (18.7%)
30-39	130 664 (25.6%)	78 199 (25.7%)	188 (11.0%)
>40	61 006 (12.0%)	37 758 (12.4%)	17 (1.0%)
<b>Marital Status</b>			
Married	256 722 (50.3%)	149 977 (49.3%)	542 (31.7%)
Single	229 017 (44.9%)	139 739 (46.0%)	810 (47.4%)
Other	24 199 (4.7%)	13 980 (4.6%)	150 (8.8%)
<b>Branch</b>			
Army	383 419 (75.1%)	253 929 (83.6%)	894 (52.3%)
Marines	67 605 (13.2%)	49 976 (16.4%)	815 (47.7%)
Air Force	46 481 (9.1%)		
Navy	12 847 (2.5%)		
<b>Component</b>			
AD	357 167 (70%)	188 700 (62.1%)	

Table 25	Current Study	Hoge (2006)	Hoge (2004)*
Guard	95 207 (18.7%)	58 851 (19.4%)	
Reserves	57 978 (11.4%)	56 233 (18.5%)	
<b>Grade</b>			
Junior Enlisted	251 500 (49.3%)	149 899 (49.3%)	1 214 (71.0%)
Sergeant	157 619 (30.9%)	94 160 (31.0%)	305 (17.8%)
SNCO	38 554 (7.6%)	23 683 (7.8%)	31 (1.8%)
Officer / WO	62 512 (12.2%)	36 163 (11.9%)	56 (3.3%)
<b>Race</b>			
White	334 674 (65.6%)		1 075 (62.9%)
Black	95 018 (18.6%)		238 (13.9%)
Hispanic	52 641 (10.3%)		243 (14.2%)
Other	909 (0.2%)		130 (7.6%)
AI/AN	6 407 (1.3%)		
Asian	18 996 (3.7%)		

\*Deployed to Iraq

\*\*Excluded from analysis

### *Age and Pay Grade*

As expected, the study population was relatively young (45.6 % of the sample was younger than twenty-six years old); which is consistent with other recent studies. Multiple studies have reported the following percentages of returning Iraq and Afghanistan Veterans who were less than twenty-five years old: 37.2% (Martin, 2007), 41.5% (Hoge, Auchterlonie, & Milliken, 2006), 63.5% (Killgore et al., 2006) and 64.6% (Cabera et al., 2007). In the current

study, there were significant differences in the appraisal of danger of being killed by age, with those members less than twenty-one being the least likely to report a feeling of danger. Those in the youngest age categories also reported the best health. Adolescents and young adults may have a propensity for impulsivity, risk-taking, and sensation seeking (King, 2007). This may be a reflection of a developmental stage, as more than 50% of those members less than 26 years old discharged their weapon in combat. One would expect that they would be more likely to report a sense of danger. There was no literature available that discussed or evaluated age or pay grade in relation to elements of combat exposure, specifically danger of being killed. Most studies reported age as a demographic or in relation to one specific outcome, for example the relationship of age and PTSD symptoms (discussed later in this chapter).

It was also observed that younger members reported significantly less health exposure concern and significantly fewer physical symptoms, while those between ages 46 and 53 reported significantly higher symptom scores. Younger military members may not have age-related health issues such as hypertension, musculoskeletal and gastrointestinal issues that may be more bothersome in austere conditions.

Pay grade (which reflects military rank) can be thought of as a proxy measure for job responsibility or economic status. The higher the rank the more responsibility and corresponding pay. Pay grade is not age dependent, for example in this study the most junior enlisted (E01 to E04) contained all age categories, however 76% were less than twenty-six years old. Age and rank are related, but not so much that you can absolutely predict one from the other. In this study, lower ranking military members were the most likely to report feelings of danger (noted when adjusted for age and other variables). The reason for this is unclear. One possible explanation is that lower ranking members had greater direct exposure to combat situations and

therefore engaged in more stressful and threatening activities. For example, convoys and security patrols are usually made up of junior enlisted members. Convoys and security patrols are exposed to direct attack and ambush in the heart of the combat zone. However, how the junior enlisted interpret the danger may be a component of their assigned responsibility and decisional impact (themselves versus others). Perhaps this leads to a higher perceived threat and danger. In addition, subjects with lower pay grades reported significantly more health exposure concerns, higher symptom scores and poorer health perception. These data would suggest that it is important to consider pay grade when developing interventions to improve post-deployment health.

#### *Gender and Deployment Health*

In the current study, males reported significantly more danger of being killed than females. This may be a reflection of the direct and consistent combat role that males encounter. In general, it has been reported that female military members may experience less combat exposure (Pereira, 2002), which is consistent with the current study findings. Clearly women have been taken as prisoners of war (Jessica Lynch), but these attacks have taken place as the military member was moving from one location to another, versus having a “job” that includes combat. Additionally, females in the current study reported significantly more health exposure concerns, physical symptoms and worse health perception compared to their male counterparts. This finding is consistent with reports of poorer health status in female Veterans (Dobie et al., 2004). More research is needed to sort out differences between female and male health issues upon return from a combat zone.

#### *Race and Ethnicity*



This study found that race and ethnicity influenced combat exposure and experience. White military members were the least less likely to report feelings of danger or poorer health perception (even controlling for age and other variables). Hispanics reported significantly more health exposure concerns than other race categories. Blacks reported significantly lower symptom scores compared to all racial groups. There may be cultural ties to combat stress responses. For example, based on cultural expression, Hispanics may express emotional responses differently than other races resulting in more expressive responses (Nayback, 2008). In addition, it would have been helpful to have data on the actual job performed by military members to control for the effect of combat positions when evaluating differences by race or ethnicity.

#### *Component / Branch*

The Reserve component had higher physical symptom scores, emotional concerns, poor health perception and more PTSD symptoms than the National Guard and Active Duty components. In contrast, the Active Duty component had significantly higher depressive symptom scores. These results deserve further exploration and suggest that interventions need to be put in place to address the myriad of concerns that returning Reservists may have (which are often managed within the civilian health system). In addition, aggressive, ongoing interventions to screen and treat depression among returning Active Duty members seems warranted.

Likewise, interventions tailored to specific service branches may be useful to consider. For example, Marines had the highest physical and depressive symptom scores; while the Army had higher emotional symptom scores and reported poor health. The Air Force and Marine Core were significantly less likely to have PTSD symptoms. Therefore, specific interventions aimed

at managing these health concerns could be developed at the “branch level” to improve coverage and efficiency.

### Stress Sources

It is clear that there were many sources of stress for the study sample. The majority of the sample saw wounded, killed or dead individuals. Nearly one quarter of the study participants discharged their weapon in combat and many were concerned about possible exposures or events that transpired during their deployment that may impact their future health.

The length of deployment was considered a possible source of stress for this sample. However, there were no significant differences in reported health exposure concerns found by length of deployment. The only significant finding was that those with the shortest deployments (<120 days) had the lowest (statistically significant) physical symptoms scores. It is unclear why deployment length did not have a more significant impact on stress-related outcomes in this study. Ideally, further exploration of the differences in specific length of deployments and interaction or relationships to outcome variables will provide a better understanding about how deployment length actually impacts the military member.

Environmental exposures were considered another important source of stress in this study. There were multiple environmental exposures identified by deployed military members. Exposure to sand /dust was the largest complaint with 89.8% of the sample identifying this as an exposure concern. This is no surprise based on the arid and sandy environment where members lived and worked. There are frequent sand storms that can be as blinding as a northeastern snow storm (<http://www.eosnap.com/?p=635>; Gamel, 2008). The other top six environmental issues included: loud noises, vehicle truck exhaust, smoke from trash or feces, JP8 or other fuels and DEET. Subjects with the highest exposure scores were significantly more likely to have higher

physical symptom scores, depressive symptom scores, emotional concerns, poor health perception and more PTSD symptoms. No studies were found that discussed the impact of environmental exposure on military members while deployed in Iraq. Therefore, future work needs to be done to identify key environmental exposures that can be reduced within the combat zone and then study how these interventions may reduce health concerns (including PTSD-related symptoms).

### *Physical Symptoms*

There were multiple physical symptoms identified by deployed military members. Nearly 40% of the sample had four or more symptoms. The most frequent physical symptoms described by deployed military members were diarrhea, back pain, headache, runny nose, feeling tired and muscle aches. Killgore et al. (2006) described a significant interaction between combat experience and symptom expression in military members. Those with prior combat exposure reported significantly greater somatic complaints relative to the combat-naïve soldiers. Deployment to an austere environment, which military members train for, may have true physiologic impact as the current study suggests. It is imperative that health care providers in primary care be made aware that individuals with prior combat exposures may be inclined to present with physical or somatic concerns (Killgore et al. 2006).

### *Depressive Symptoms*

It was also noted in the current study that 26.5% of the final sample had one or more depressive symptoms. Recent studies that used the same questions to evaluate depressive symptoms reported 4.4% (Milliken, Auchterlonie & Hoge, 2007) to 6.1% (Hoge, Auchterlonie and Milliken, 2006) of those who deployed to Iraq had at least one depressive symptom. Refer to Table 26 for comparison of studies using the PDHA in their studies. The rate of depressive

symptoms was higher in the present study. The reason for this difference may be the longer time frame of the study, the current study spanned four years (2003 to 2007) where the other studies collected data on one year only (Hoge , 2006; Martin, 2007). Also Hoge and colleagues only included Army and Marines in their final analysis which may account for some of the differences. It was noted during the analysis that members of the Air Force were the third most likely to report depressive symptoms after the Marine Core. Similarly, Milliken, Auchterlonie and Hoge (2007) reported a much lower rate of depressive symptoms than the current study, however only Army members were included in that analysis. The reported depressive symptom rate in other studies using different depression screening instruments included: 3.5% (Taubman, 2009), 5% (Seal, et al., 2007, Kolkow et al., 2007; U.S. Department of the Army, 2005), 7% (Office of the Surgeon General, 2003), 7.8% (Cabrera et al., 2007), 8% (U.S. Department of the Army, 2006a), 4 to 9% (U.S. Department of the Army, 2006b), 14% (Schell and Marshall., 2008), 25.0% (Vasterling et al., 2006), 37% to 38% (Lapierre, Schwegler & LaBauve, 2007). Vasterling et al. (2006) reported a higher depression rate, however this study included Army soldiers only. It is important to note that the percent of those with at least one depressive symptom upon immediate return from Iraq includes 123, 808 military members. This represents an enormous challenge for both the military and civilian health care systems.

Table 26  
*Comparison of Current Study results to other studies using the PDHA*

Table 26	Hoge, Auchterlonie and Milliken (2006).	Milliken, Auchterlonie & Hoge (2007)	Martin (2007)	Current Study	
Item	OEF	OIF*			
PTSD screen	4.7%	9.8%	12.1%	10.5%	11.8 %
Positive	(n=762)	(n=21 822)	(n=10 686)	(n= 23 368)	(n = 60 200)
Depressive screen	3.5%	6.1%	4.4% (n=3 884)		26.5%
Positive	(n=577)	(n=13 595)			(n=123 808)
<b>Thoughts/concerns about serious conflicts with spouse, family/friends</b>					
Yes	1.8%	2.8%	3.8%		3.4%
	(n=291)	(n= 6 335)	(n=3 317)		(n=17574)
Unsure	2.5%	3.9%			4.2%
	(n=415)	(n=8646)			(n=21419)
<b>Thoughts/concerns about hurting/losing control with someone</b>					
Yes	1.2%	2.1%	2.1%		2.2%
	(n=189)	(n=4695)	(n=1 876)		(n=11 157)
Unsure	1.6%	3.3%			3.2%
	(n=263)	(n=7379)			(n=16 552)
<b>Over last 2 wks thought would be better off dead/hurting yourself</b>					
Some	0.7%	1.1%	1.1%		1.0%
	(n=107)	(n=2411)	(n=934)		(n=5 238)

Table 26	Hoge, Auchterlonie and Milliken (2006).		Milliken, Auchterlonie & Hoge (2007)	Martin (2007)	Current Study
Item	OEF	OIF*			
A lot	0.1% (n=20)	0.2% (n=467)			0.3% (n=1 281)
Saw Killed	38.1% (n=6 209 )	49.5% (n=110 201)	53.7% (n=47 381)		51.9% (n=264 777)
Discharged Weapon	6.2% (n=1 015)	17.8% (n=39 548)	24.8% (n=21 910)		22.1% (n=112 620)
Danger	24.6% (n=4 007)	50.3% (n=111 966)	51.3% (n=45 270)		51.1% (n=260 842)
Fair / Poor Health			8.4% (n=7 438)		8.3% (n=42 585)

*\*OIF includes Iraq as a possible deployment.*

*Long Term Outcomes and the Appraisal Model*

The health perception of military members in this sample was poorer (8.3% (n = 42,585) of the total sample reporting poor to fair health) than previously reported. Trump (2006) identified a lower prevalence of poor self-reported health (1.5%, n=339) in military members, however this deployment information was obtained prior to the start of Operation Iraqi Freedom and deployment to Iraq. AMSA data (2004) reported post-deployment poor to fair health at 7.3%. Other studies, including those that used data from the PDHA , reported a range of poor health perception from 6.7% (MSMR, 2008) to 8.2% (MSMR, 2009).

Health perception was influenced by appraisal variables (danger of being killed and exposure concerns), physical symptoms, depressive symptoms and emotional health. More specifically, a more positive health perception was found in military members who reported no health exposure concerns, reported fewer depressive and physical symptoms and emotional concerns. Individuals that reported a danger of being killed were more likely to have poorer health. Those members who reported no emotional concerns, physical or depressive symptoms had the best health perception in the model when appraisal items were added. In Hoge, et al. (2007), PTSD was associated with lower perceptions of general health, more sick-call visits, missed workdays, more physical symptoms, and higher somatic symptom severity

#### *PTSD*

PTSD and its impact on returning deployed military members has been a major focus of the lay media for many years (Welch, 2005; Farragher, 2006; Corbett, 2007; Elias, 2008; Jelinek, 2008). Military members in this study reported a broad spectrum of PTSD- type symptoms. The PTSD symptom items (from the Post-Deployment Health Assessment) used in this study were the same as those used by Hoge, Auchterlonie and Milliken (2006). Table 26 compares the results of the present study with those of three recent studies that used questions directly from the PDHA in terms of PTSD, depression, emotional concerns and combat exposure. The rate of PTSD symptoms were higher in the present study (11.8%) than reported by Hoge Auchterlonie and Milliken (2006) . The reasons for this difference may be the longer time frame of the current study and the inclusion of all Military Branches and Components. Additionally, the other researchers used the most recent PDHA at the time of data collection (could have been the member's second or third deployment). For the present study, we used the first PDHA completed upon return from the combat zone after their first deployment to Iraq. Thus, there may

be a “time from deployment factor” that accounts for some of the differences in PTSD symptom presentation. Other studies reported PTSD rates of : 3.7% (Taubman, 2009), 7.3% (Abt Associates Inc, 2006), 8.7% (Smith et al., 2008), 9% ( Kolkow et al., 2007), 10.5% (Martin, 2007), 11.6% (Vasterling et al., 2006), 12% (Erbes et al., 2007), 13% (Seal, et al., 2007), 13.5%, (Cabrera et al., 2007), 14% (Schell and Marshall., 2008), 16.6% (Hoge, et al., 2007), 30% to 31% (Lapierre, Schwegler & LaBauve, 2007), 40.2% (Jakupcak, et. al., 2007) and 45% (Helmer et al., 2007). These data need to be interpreted with caution since some studies focused on Veterans already with a war-related injury (Helmer et al., 2007) or those reporting to a deployment health clinic with deployment related concerns (Jakupcak, et. al, 2007). See Table 26 for comparison of participants in related studies. In all, a total of 60,200 military members in this study screened positive for possible PTSD complications. Therefore, interventions are urgently needed that continue to screen and treat PTSD-related symptoms in returning combat veterans.

As noted earlier, many study participants’ experienced combat exposure. Clearly the rate of PTSD observed in this study was reflective of the reported combat exposure. Hoge, Auchterlonie and Milliken (2006), reported that exposure to combat situations was significantly correlated with screening positive for PTSD among Operation Iraqi Freedom Veterans. Furthermore, several authors identified that PTSD symptoms were influenced by traumatic war zone exposures (Fontana and Rosencheck, 2005; Schnurr, Lunney, & Sengupta, 2004; Grieger et al., 2006; Kolkow et al., 2007). Adler et al. (2008) went on to further describe that individuals reporting fear, helplessness and horror in response to a combat-related event had more PTSD symptoms than those with other emotional responses.



Study results demonstrated that females reported significantly more PTSD symptoms and depressive symptoms. This finding is consistent with other studies which indicated that females reported more PTSD symptoms (Orcutt et al., 2004) and mental health concerns (Hoge, Auchterlonie & Milliken, 2006; Lapierre, Schwegler and LaBauve, 2007). These results are also consistent with the assertion by Bray et al (2006) that being a female in the military is associated with a great deal of stress. More work needs to be done to examine the unique issues of women in the military, especially those deployed to combat areas.

*Appraisal Variables: Danger of Being Killed and Environmental Exposures*

Members who reported a feeling of danger of being killed during their deployment were significantly more likely to have higher physical symptom scores, depressive symptom scores, emotional concerns, poor health perception and more PTSD symptoms. Those members who reported exposure concerns were significantly more likely to have higher physical symptom scores, depressive symptom scores, emotional concerns, poor health perception and more PTSD symptoms. PTSD symptoms were also influenced by appraisal variables (danger of being killed and health exposure concerns) as hypothesized. Emotional concerns, physical and depressive symptoms were influenced by appraisal factors. In particular, fewer PTSD symptoms were detected in those members with no health exposure concerns. In addition, those with fewer depressive, physical symptom, and emotional concerns had the least amount (if any) of PTSD symptoms. It was not surprising to note that those who reported a feeling of danger of being killed were significantly more likely to have higher PTSD symptoms.

These results highlight the importance of the two items on the PDHA (danger of being killed and health exposure concerns) as important predictors of potential health problems in military members returning from a combat zone. More research is needed to examine the

sensitivity and specificity of these items in predicting significant post-combat sequelae (e.g. PTSD).

*Model / Framework Analysis and Mediation*

Appraisal (danger of being killed and exposure concerns) mediated the relationship between immediate (emotional, physical and depressive symptoms) and long term outcomes (health perception, PTSD symptoms) for the majority of the variables and supported the suggested hypothesis. However, there were some inconsistent observations that are worth further discussion. Pay grade was consistently mediated in all categories with the exception of the officer categories for physical symptoms where no mediation was detected. Marines were the most likely not to demonstrate mediation (physical symptoms, depressive symptoms and health assessment). Members of the National Guard consistently demonstrated mediation in all models. Married members did not demonstrate mediation in emotional concerns, depressive symptoms or health perception. Days in theater did not mediate consistently, with the exception of the health assessment category where mediation was observed in all subcategories. Discharging a weapon demonstrated mediation for PTSD symptoms only.

Ultimately, the cognitive appraisal model (Lazarus & Folkman, 1984) was useful for organizing the numerous variables and large amounts of data used in this secondary data analysis. The stress and coping theory provided an opportunity to gain a deeper understanding of the observed relationships that certain emotional, environmental and physical symptoms have with one another. For example, by categorizing variables in an operational context within the framework, the researcher could better organize and interpret relationships for the regression models. The impact of mediating processes (danger of being killed / concerns about health exposure) and immediate (physical and depressive) and long term (health perception and illness

outcomes) outcomes could be evaluated. This theory provided a logical, cohesive and practical approach to a very complex analysis plan. However, one key variable that was missing from the analysis was a measure of social support. Social support is not measured as part of the PDHA. Therefore, an important component of the model could not be tested in this study.

### *Limitations*

There are several limitations to this study that deserve mention. First, there are potential concerns when conducting any secondary data analysis, such as data integrity issues. With such a large data set there was a potential for a large number of empty and erroneous data in key fields. In this study, great care was taken to minimize errors by rigorous review and cleaning of the raw data. Steps were taken to mitigate these errors after running and reviewing the data in a descriptive fashion. This led to the elimination of multiple records from the analysis. The primary investigator had an extensive background and working knowledge of the implementation of the survey (PDHA) in the field, which clearly mitigated some ambiguity in interpreting these data. Published research has validated some questions from the PDHA (Hoge, Auchterlonie & Milliken, 2006), enhancing this analysis. The survey was given at the time of return to home station or immediately before departure from theater, which adds to the timeliness of the data collection. However, there may be some recall bias present based on the length of deployment, as this was completed at the end of the member's tour. The questions were screening questions and not diagnostic of any physical or mental health problem, so caution is warranted and the results should not be interpreted as diagnostic.

Second, there were some possible limitations related to omission of other important data that were not included on the PDHA, including social support, injury status, job description and

sexual assault or harassment. These variables are important because they have the potential to influence stress-related outcomes.

Third, the dataset collected from the PDHA was merged with a demographic database that contained race and other demographic information not captured on the PDHA, which could potentially lead to merging issues. However no merging issues were identified in this dataset, as they were merged by social security number before they were changed to study identifiers and exported.

Fourth, the PDHA was not developed to include multi-item scales. Instead items were combined based on prior research (Hoge, Auchterlonie & Milliken, 2006; Milliken, Auchterlonie & Hoge, 2007). Therefore, the reliability of some of the scales were lower than expected (considering the sample size) including the low alpha coefficient of the emotional concern scale (.59); hence results need to be interpreted with caution

#### *Practice Implications*

There were study results that hold potential practice implications. This study clearly identified that members of the Reserves are at greatest risk for physical, depressive and PTSD symptoms, as well as reporting the poorest health. By the nature of their service, when the Reservists tour is over they will return to their civilian health care provider for any health-related issues. This can have a direct impact on the civilian health care system. Civilian health care providers need to be cognizant of the impact that deployments to Iraq can have on individual military members. Asking patients if they have served in deployed locations is an important factor to consider when caring for patients with physical and emotional symptoms, and should become a standard of practice for civilian health care providers. In addition, significant gender concerns were identified. Females had more health exposure concerns, physical symptoms and

worse health perception compared to their male counterparts. Psychological distress in the general population is higher for females (Center for Disease Control, 2007), and is amplified in a deployment situation. Awareness of these findings is critical for screening and developing appropriate gender-specific interventions for military members.

### *Policy Implications*

There are several policy issues that have been identified in the current study. One important finding is the validation of the PDHA as an important tool to gather post-deployment health exposures. The current research expands previous research using PDHA data (Hoge, Auchterlonie & Milliken, 2006; Milliken, Auchterlonie & Hoge, 2007). However, the DOD should consider adding questions measuring social support to the PDHA. Evaluation of social support could enhance intervention development aimed at the mitigation of adverse outcomes after combat deployment.

Military members in the lower pay grades (lowest ranks) had the highest PTSD, depressive, and physical symptoms as well as the poorest health perception. In addition, adverse outcomes differed by component and military branch. The DOD may want to consider policies that specifically address the unique health concerns of those in the lowest pay grades (ranks), Reserve components, as well as the Army and Marine Corps.

### *Research Implications*

Findings from this study will guide future research related to deployment health in US military members. Several areas should be explored further to gain a better understanding of their impact on deployment health. One area that appeared to be an influential source of stress was environmental exposure concerns. Factor analysis was done for environmental exposures,

with factor analysis loading on five well-defined sub-scales. These data need to be further scrutinized to examine the specific exposures that are amenable to intervention development.

It was expected that length of deployment would be a source of stress in the proposed model; however in the current analysis the length of deployment did not influence outcomes in a significant manner. This needs further analysis and investigation to discern if there are subtle differences that were not readily apparent in the current analysis plan. Another area that also warrants further investigation is the finding of younger age on immediate and long term outcomes. Those in the youngest categories were the least likely to have adverse outcomes and report feeling in danger of being killed; despite having the greatest chance of discharging their weapon in combat. It is unclear whether younger age is protective or rather health concerns show up later in these individuals. Therefore, research that explores the influence of age and health concerns over time is needed. Additionally, Long term outcome sequela of exposures during a combat deployment for all military members needs further exploration. The results of this study identified a high rate of PTSD and depression. Implementation of care and screening at all phases of deployment and re-deployment are important for identifying those at greatest risk for poor health outcomes, so that appropriate and immediate interventions can be put in place.

#### *Study Conclusion*

This study was a secondary data analysis that evaluated deployment-related issues and concerns of U.S. military members deployed to Iraq using the PDHA. The final sample consisted of 510, 352 members, with representation from all services and branches of the military. The demographics of the study sample closely resembled those reported by the DOD. The cognitive appraisal model of stress and coping (Lazarus and Folkman, 1984) was useful for guiding this study. The model identified the importance of the appraisal variables (danger of

being killed, environmental exposure concerns) for explaining stress-related outcomes for military members deployed to Iraq. The absence of a measure of social support was considered an important study limitation. More research is needed to determine the predictive value of the appraisal variables and to uncover gender-specific issues related to combat stress

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## Appendix A

## PDHA -- Theoretical Framework: variable assignment

<b>Assigned #</b>	<b>Item Description</b>	<b>Operational Category</b>
<b>NEW(N-1)</b>	<b>Race / Ethnicity</b>	<b>Characteristic</b>
<b>NEW (N-2)</b>	<b>Marital Status</b>	<b>Characteristic</b>
<b>1-7</b>	<b><del>DOB</del> YEAR OF BIRTH &amp; CALCULATED AGE AT DEPARTURE</b>	<b>Characteristic</b>
<b>1-8</b>	<b>Date of arrival in theater</b>	<b>Characteristic</b>
<b>1-9</b>	<b>Date of departure from theater (WILL ALSO HAVE CALCULATED <u>TOUR LENGTH</u>)</b>	<b>Characteristic</b>
<b>1-10</b>	<b>Gender</b>	<b>Characteristic</b>
<b>A</b>	Male	
<b>B</b>	Female	
<b>1-11</b>	<b>Service Branch</b>	<b>Characteristic</b>
<b>A</b>	Air Force	
<b>B</b>	Army	
<b>C</b>	Coast Guard	
<b>D</b>	Marine Corps	
<b>E</b>	Navy	
<b>F</b>	Other	
<b>1-12</b>	<b>Component</b>	<b>Characteristic</b>
<b>A</b>	Active Duty	
<b>B</b>	National Guard	
<b>C</b>	Reserves	
<b>1-13</b>	<b>Location of Operation</b>	<b>Characteristic</b>
<b>B</b>	SW Asia	
<b>1-14</b>	<b>To what areas were you mainly deployed</b>	<b>Characteristic</b>
<b>F</b>	Iraq	
<b>1-15</b>	<b>Pay Grade (Enlisted / Officer)</b>	<b>Characteristic</b>
<b>1-17</b>	<b>Occupational specialty during this deployment</b>	<b>Characteristic [Comment]</b>
<b>1-18</b>	<b>Combat specialty</b>	<b>Characteristic [Comment]</b>
<b>2-1</b>	<b>Did your health change during this deployment?</b>	<b>Appraisal</b>
<b>A</b>	Health stayed about the same or got better	
<b>B</b>	Health got worse	
<b>2-2</b>	<b>How many times were you seen in sick call during this deployment?</b>	<b>Outcome</b>
<b>A</b>	No. of times	
<b>2-3</b>	<b>Did you have to spend one or more nights in a hospital as a patient during this deployment?</b>	<b>Outcome</b>
<b>A</b>	No	
<b>B</b>	Yes, reason/dates:	

Assigned #	Item Description	Operational Category
<b>2-4</b>	<b>Did you receive any vaccinations just before or during this deployment?</b>	<b>Source of Stress [Comment]</b>
<b>A</b>	Smallpox (leaves a scar on the arm)	
<b>B</b>	Anthrax	
<b>C</b>	Botulism	
<b>D</b>	Typhoid	
<b>E</b>	Meningococcal	
<b>F</b>	Other, list:	
<b>G</b>	Don't know	
<b>H</b>	None	
<b>2-5</b>	<b>Did you take any of the following medications during this deployment?</b>	<b>Source of Stress [Comment]</b>
<b>A</b>	PB (pyridostigmine bromide) nerve agent pill	
<b>B</b>	Mark-1 antidote kit	
<b>C</b>	Anti-malaria pills	
<b>D</b>	Pills to stay awake, such as Dexedrine	
<b>E</b>	Other, please list	
<b>F</b>	Don't know	
<b>2-6</b>	<b>Do you have any of these symptoms now or did you develop them anytime during this deployment?</b>	<b>Immediate Outcome Physiologic</b>
<b>A</b>	Chronic cough	
<b>B</b>	Runny nose	
<b>C</b>	Fever	
<b>D</b>	Weakness	
<b>E</b>	Headaches	
<b>F</b>	Swollen, stiff or painful joints	
<b>G</b>	Back pain	
<b>H</b>	Muscle aches	
<b>I</b>	Numbness or tingling in hands or feet	
<b>J</b>	Skin diseases or rashes	
<b>K</b>	Redness of eyes with tearing	
<b>L</b>	Dimming of vision, like the lights were going out	
<b>M</b>	Chest pain or pressure	
<b>N</b>	Dizziness, fainting, light headedness	
<b>O</b>	Difficulty breathing	
<b>P</b>	Still feeling tired after sleeping	
<b>Q</b>	Difficulty remembering	
<b>R</b>	Diarrhea	
<b>S</b>	Frequent indigestion	



Assigned #	Item Description	Operational Category
T	Vomiting	
U	Ringing of the ears	
2-7	<b>Did you see anyone wounded, killed or dead during this deployment?</b>	<b>Perceived Stress</b>
A	No	
B	Yes - coalition	
C	Yes – enemy	
D	Yes – civilian	
2-8	<b>Were you engaged in direct combat where you discharged your weapon?</b>	<b>Perceived Stress</b>
A	No	
B	Yes	
C	land	
D	sea	
E	Air	
2-9	<b>During this deployment, did you ever feel that you were in great danger of being killed?</b>	<b>Appraisal</b>
A	No	
B	Yes	
2-10	<b>Are you currently interested in receiving help for a stress, emotional, alcohol or family problem?</b>	<b>Appraisal **</b>
A	No	
B	Yes	
2-11	<b>Over the LAST 2 WEEKS, how often have you been bothered by any of the following problems?</b>	<b>Outcome [Depression]</b>
A	Little interest or pleasure in doing things	*
B	Feeling down, depressed, or hopeless	*
C	Thoughts that you would be better off dead or hurting yourself in some way	**
3-12	<b>Have you ever had any experience that was so frightening, horrible, or upsetting that, IN THE PAST MONTH, you ....</b>	<b>Outcome [PTSD]***</b>
A	Have had any nightmares about it or thought about it when you did not want to?	
B	Tried hard not to think about it or went out of your way to avoid situations that remind you of it?	
C	Were constantly on guard, watchful, or easily startled?	
D	Felt numb or detached from others, activities, or your surroundings?	
3-13	<b>Are you having thoughts or concerns that ...</b>	<b>Appraisal</b>

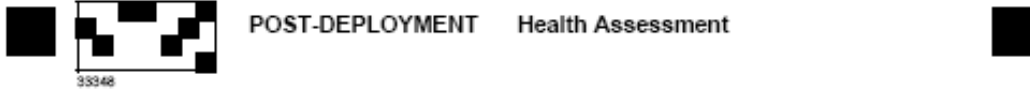
Assigned #	Item Description	Operational Category
A	You may have serious conflicts with your spouse, family members, or close friends?	**
B	You might hurt or lose control with someone?	**
<b>3-14</b>	<b>While you were deployed, were you exposed to:</b>	<b>Perceived Stress</b>
A	DEET insect repellent applied to skin	
B	Pesticide-treated uniforms	
C	Environmental pesticides (like area fogging)	
D	Flea or tick collars	
E	Pesticide strips	
F	Smoke from oil fire	
G	Smoke from burning trash or feces	
H	Vehicle or truck exhaust fumes	
I	Tent heater smoke	
J	JP8 or other fuels	
K	Fog oils (smoke screen)	
L	Solvents	
M	Paints	
N	Ionizing radiation	
O	Radar/microwaves	
P	Lasers	
Q	Loud noises	
R	Excessive vibration	
S	Industrial pollution	
T	Sand/dust	
U	Depleted Uranium (If yes, explain)	
V	Other exposures	
<b>3-15</b>	<b>On how many days did you wear your MOPP over garments?</b>	<b>Perceived Stress</b>
A	No. of days	
<b>3-16</b>	<b>How many times did you put on your gas mask because of alerts and NOT because of exercises?</b>	<b>Perceived Stress</b>
A	No. of days	
<b>3-17</b>	<b>Were you in or did you enter or closely inspect any destroyed military vehicles?</b>	<b>Perceived Stress</b>
A	No	
B	Yes	

Assigned #	Item Description	Operational Category
<b>3-18</b>	<b>Do you think you were exposed to any chemical, biological, or radiological warfare agents during this deployment?</b>	<b>Perceived Stress</b>
A	No	
B	Don't know	
C	Yes, explain with date and location	
<b>Assigned #</b>	<b>Item Description</b>	
<b>4-1</b>	<b>Would you say your health in general is:</b>	<b>Outcome</b>
A	Excellent	
B	Very Good	
C	Good	
D	Fair	
E	Poor	
<b>4-2</b>	<b>Do you have any medical or dental problems that developed during this deployment?</b>	<b>Outcome</b>
A	Yes	
B	No	
<b>4-3</b>	<b>Are you currently on a profile or light duty?</b>	<b>Outcome</b>
A	Yes	
B	No	
<b>4-4</b>	<b>During this deployment have you sought, or do you now intend to seek, counseling or care for your mental health?</b>	<b>Outcome</b>
A	Yes	
B	No	
<b>4-5</b>	<b>Do you have concerns about possible exposures or events during this deployment that you feel may affect your health?</b>	<b>Appraisal</b>
A	Yes	
B	No	
C	Please list concerns:	
<b>4-6</b>	<b>Do you currently have any questions or concerns about your health?</b>	<b>Appraisal</b>
A	Yes	
B	No	
C	Please list concerns:	
<b>4-7</b>	<b>REFERRAL INDICATED FOR:</b>	<b>Outcome [Comment]</b>
A	None	
B	Cardiac	--medical
C	Combat/Operational Stress Reaction	--mental health
D	Dental	--medical
E	Dermatologic	--medical

<b>Assigned #</b>	<b>Item Description</b>	<b>Operational Category</b>
<b>F</b>	ENT	--medical
<b>G</b>	Eye	--medical
<b>H</b>	Family Problems	--mental health
<b>I</b>	Fatigue, Malaise, Multisystem complaint	--medical and mental health
<b>J</b>	Audiology	--medical
<b>K</b>	GI	--medical
<b>L</b>	GU	--medical
<b>M</b>	GYN	--medical
<b>N</b>	Mental Health	--mental health
<b>O</b>	Neurologic	--medical
<b>P</b>	Orthopedic	--medical
<b>Q</b>	Pregnancy	--medical
<b>R</b>	Pulmonary	--medical
<b>S</b>	Other	
<b>4-8</b>	<b>EXPOSURE CONCERNS (During deployment):</b>	<b>Outcome – Provider Assessment [Comment]</b>
<b>A</b>	Environmental	
<b>B</b>	Occupational	
<b>C</b>	Combat or mission related	
<b>D</b>	None	

Appendix B

PDHA (DD2769) Page 1



Authority: 10 U.S.C. 136 Chapter 55. 1074f, 3013, 5013, 6013 and E.O. 9397

Principal Purpose: To assess your state of health after deployment outside the United States in support of military operations and to assist military healthcare providers in identifying and providing present and future medical care to you.

Routine Use: To other Federal and State agencies and civilian healthcare providers, as necessary, in order to provide necessary medical care and treatment.

Disclosure: (Military personal and DoD civilian Employees Only) Voluntary. If not provided, healthcare WILL BE furnished, but comprehensive care may not be possible.

INSTRUCTIONS: Please read each question completely and carefully before marking your selections. Provide a response for each question. If you do not understand a question, ask the administrator.

**Demographics**

Last Name

Today's Date (dd/mm/yyyy)

First Name MI

Social Security Number

Name of Your Unit or Ship during this Deployment

DOB (dd/mm/yyyy)

<b>Gender</b>	<b>Service Branch</b>	<b>Component</b>
<input type="radio"/> Male	<input type="radio"/> Air Force	<input type="radio"/> Active Duty
<input type="radio"/> Female	<input type="radio"/> Army	<input type="radio"/> National Guard
	<input type="radio"/> Coast Guard	<input type="radio"/> Reserves
	<input type="radio"/> Marine Corps	<input type="radio"/> Civilian Government Employee
	<input type="radio"/> Navy	
	<input type="radio"/> Other	

Date of arrival in theater (dd/mm/yyyy)

Date of departure from theater (dd/mm/yyyy)

**Location of Operation**

<input type="radio"/> Europe	<input type="radio"/> Australia	<input type="radio"/> South America
<input type="radio"/> SW Asia	<input type="radio"/> Africa	<input type="radio"/> North America
<input type="radio"/> SE Asia	<input type="radio"/> Central America	<input type="radio"/> Other _____
<input type="radio"/> Asia (Other)	<input type="radio"/> Unknown	

**Pay Grade**

<input type="radio"/> E1	<input type="radio"/> O01	<input type="radio"/> W1
<input type="radio"/> E2	<input type="radio"/> O02	<input type="radio"/> W2
<input type="radio"/> E3	<input type="radio"/> O03	<input type="radio"/> W3
<input type="radio"/> E4	<input type="radio"/> O04	<input type="radio"/> W4
<input type="radio"/> E5	<input type="radio"/> O05	<input type="radio"/> W5
<input type="radio"/> E6	<input type="radio"/> O06	
<input type="radio"/> E7	<input type="radio"/> O07	<input type="radio"/> Other
<input type="radio"/> E8	<input type="radio"/> O08	
<input type="radio"/> E9	<input type="radio"/> O09	
	<input type="radio"/> O10	

To what areas were you mainly deployed:  
 (mark all that apply - list where/date arrived)

Kuwait \_\_\_\_\_

Qatar \_\_\_\_\_

Afghanistan \_\_\_\_\_

Bosnia \_\_\_\_\_

On a ship \_\_\_\_\_

Iraq \_\_\_\_\_

Turkey \_\_\_\_\_

Uzbekistan \_\_\_\_\_

Kosovo \_\_\_\_\_

CONUS \_\_\_\_\_

Other \_\_\_\_\_

Name of Operation:

Occupational specialty during this deployment  
 (MOS, NEC or AFSC)

Combat specialty: \_\_\_\_\_

**Administrator Use Only**

Indicate the status of each of the following:

Yes	No	N/A	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Medical threat debriefing completed
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Medical information sheet distributed
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Post Deployment serum specimen collected

Appendix C

PDHA (DD2769) Page 2

*Please answer all questions in relation to THIS deployment*

1. Did your health change during this deployment?

- Health stayed about the same or got better
- Health got worse

2. How many times were you seen in sick call during this deployment?

--	--

No. of times

3. Did you have to spend one or more nights in a hospital as a patient during this deployment?

- No
- Yes, reason/dates:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

4. Did you receive any vaccinations just before or during this deployment?

- Smallpox (leaves a scar on the arm)
- Anthrax
- Botulism
- Typhoid
- Meningococcal
- Other, list: \_\_\_\_\_
- Don't know
- None

5. Did you take any of the following medications during this deployment?

- (mark all that apply)*
- PB (pyridostigmine bromide) nerve agent pill
  - Mark-1 antidote kit
  - Anti-malaria pills
  - Pills to stay awake, such as dexedrine
  - Other, please list \_\_\_\_\_
  - Don't know

6. Do you have any of these symptoms now or did you develop them anytime during this deployment?

No	Yes During	Yes Now		No	Yes During	Yes Now	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Chronic cough	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Chest pain or pressure
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Runny nose	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Dizziness, fainting, light headedness
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Fever	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Difficulty breathing
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Weakness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Still feeling tired after sleeping
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Headaches	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Difficulty remembering
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Swollen, stiff or painful joints	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Diarrhea
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Back pain	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Frequent indigestion
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Muscle aches	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Vomiting
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Numbness or tingling in hands or feet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Ring of the ears
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Skin diseases or rashes				
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Redness of eyes with tearing				
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Dimming of vision, like the lights were going out				

7. Did you see anyone wounded, killed or dead during this deployment?

*(mark all that apply)*

- No
- Yes - coalition
- Yes - enemy
- Yes - civilian

8. Were you engaged in direct combat where you discharged your weapon?

- No
- Yes (  land  sea  air )

9. During this deployment, did you ever feel that you were in great danger of being killed?

- No
- Yes

10. Are you currently interested in receiving help for a stress, emotional, alcohol or family problem?

- No
- Yes

11. Over the LAST 2 WEEKS, how often have you been bothered by any of the following problems?

- | None                  | Some                  | A Lot                 |  |
|-----------------------|-----------------------|-----------------------|--|
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Little interest or pleasure in doing things                                |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Feeling down, depressed, or hopeless                                       |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Thoughts that you would be better off dead or hurting yourself in some way |

Appendix D

PDHA (DD2769) Page 3

12. Have you ever had any experience that was so frightening, horrible, or upsetting that, IN THE PAST MONTH, you ....

- | <u>No</u>             | <u>Yes</u>            |   |
|-----------------------|-----------------------|---|
| <input type="radio"/> | <input type="radio"/> | Have had any nightmares about it or thought about it when you did not want to?                      |
| <input type="radio"/> | <input type="radio"/> | Tried hard not to think about it or went out of your way to avoid situations that remind you of it? |
| <input type="radio"/> | <input type="radio"/> | Were constantly on guard, watchful, or easily startled?   |
| <input type="radio"/> | <input type="radio"/> | Felt numb or detached from others, activities, or your surroundings?                                |

15. On how many days did you wear your MOPP over garments?

--	--

No. of days

16. How many times did you put on your gas mask because of alerts and NOT because of exercises?

--	--

No. of times

13. Are you having thoughts or concerns that ...

- | <u>No</u>             | <u>Yes</u>            | <u>Unsure</u>         |  |
|-----------------------|-----------------------|-----------------------|--|
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | You may have serious conflicts with your spouse, family members, or close friends? |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | You might hurt or lose control with someone?                                       |

17. Were you in or did you enter or closely inspect any destroyed military vehicles?

- No     Yes

18. Do you think you were exposed to any chemical, biological, or radiological warfare agents during this deployment?

- No     Don't know  
 Yes, explain with date and location

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14. While you were deployed, were you exposed to:  
 (mark all that apply)

- | <u>No</u>             | <u>Sometimes</u>      | <u>Often</u>          |  |
|-----------------------|-----------------------|-----------------------|--|
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | DEET insect repellent applied to skin        |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Pesticide-treated uniforms                   |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Environmental pesticides (like area fogging) |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Flea or tick collars                         |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Pesticide strips                             |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Smoke from oil fire                          |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Smoke from burning trash or feces            |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Vehicle or truck exhaust fumes               |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Tent heater smoke                            |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | JPB or other fuels                           |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Fog oils (smoke screen)                      |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Solvents                                     |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Paints                                       |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Ionizing radiation                           |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Radar/microwaves                             |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Lasers                                       |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Loud noises                                  |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Excessive vibration                          |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Industrial pollution                         |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Sand/dust                                    |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Depleted Uranium (if yes, explain) _____     |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | Other exposures _____                        |

Appendix E

PDHA (DD2769) Page 4

**Health Care Provider Only**

SERVICE MEMBER'S SOCIAL SECURITY #    -   -

**Post-Deployment Health Care Provider Review, Interview, and Assessment**

**Interview**

1. Would you say your health in general is:  Excellent  Very Good  Good  Fair  Poor

2. Do you have any medical or dental problems that developed during this deployment?  Yes  No

3. Are you currently on a profile or light duty?  Yes  No

4. During this deployment have you sought, or do you now intend to seek, counseling or care for your mental health?  Yes  No

5. Do you have concerns about possible exposures or events during this deployment that you feel may affect your health?  Yes  No  
Please list concerns: \_\_\_\_\_

6. Do you currently have any questions or concerns about your health?  Yes  No  
Please list concerns: \_\_\_\_\_

**Health Assessment**

After my interview/exam of the service member and review of this form, there is a need for further evaluation as indicated below. (More than one may be noted for patients with multiple problems. Further documentation of the problem evaluation to be placed in the service member's medical record.)

<p><b>REFERRAL INDICATED FOR:</b></p> <p><input type="radio"/> None</p> <p><input type="radio"/> Cardiac</p> <p><input type="radio"/> Combat/Operational Stress Reaction</p> <p><input type="radio"/> Dental</p> <p><input type="radio"/> Dermatologic</p> <p><input type="radio"/> ENT</p> <p><input type="radio"/> Eye</p> <p><input type="radio"/> Family Problems</p> <p><input type="radio"/> Fatigue, Malaise, Multisystem complaint</p> <p><input type="radio"/> Audiology</p> <p>Comments: _____</p>	<p><b>EXPOSURE CONCERNS (During deployment):</b></p> <p><input type="radio"/> GI</p> <p><input type="radio"/> GU</p> <p><input type="radio"/> GYN</p> <p><input type="radio"/> Mental Health</p> <p><input type="radio"/> Neurologic</p> <p><input type="radio"/> Orthopedic</p> <p><input type="radio"/> Pregnancy</p> <p><input type="radio"/> Pulmonary</p> <p><input type="radio"/> Other _____</p> <p><input type="radio"/> Environmental</p> <p><input type="radio"/> Occupational</p> <p><input type="radio"/> Combat or mission related</p> <p><input type="radio"/> None</p>
--	---

I certify that this review process has been completed.  
Provider's signature and stamp: This visit is coded by V70.5 \_\_ 6

Date (dd/mm/yyyy)   /   /

**End of Health Review**



Appendix F

Mediation Summary Tables

*Summary for adjusted binomial regression model with mediation evaluation of PTSD*

	<u>Age</u>	<u>Gender</u>	<u>Race</u>	<u>Branch</u>	<u>Comp.</u>	<u>Status</u>	<u>Pay</u>	<u>Days</u>	<u>Killed</u>	<u>Weap.</u>	<u>MOPP</u>	<u>Mask</u>	<u>Veh</u>	<u>Exp</u>	<u>CBR</u>
No Mediation	42 - 49	M<F		Army	AD			1-1080			0 - 10				
Mediation	18-41 50-57		Asian Black Hisp AI/AN Other	AF Marine	NG	Mar., Single	Jr. E Sgt SNC JrWo SrWo JrCG SrCG		Y>N	Y>N	11-30	0 - 30	Y>N	0 - 33	Y>N

*Summary for adjusted binomial regression model with mediation evaluation of emotional concerns*

	<u>Age</u>	<u>Gender</u>	<u>Race</u>	<u>Branch</u>	<u>Comp.</u>	<u>Status</u>	<u>Pay</u>	<u>Days</u>	<u>Killed</u>	<u>Weapon</u>	<u>MOPP</u>	<u>Mask</u>	<u>Veh</u>	<u>Exp</u>	<u>CBR</u>
No Mediation	42-57					Mar		1-1080		Y>N		0- 15			
Mediation	18-41	M<F	Asian AI/AN Black Hisp Other	Army AF Marine	AD NG	Single	Jr. E Sgt SNC JrWo SrWo JrCG SrCG		Y>N		0 - 30	16 - 30	Y>N	0-33	Y>N

*Summary for adjusted binomial regression model with mediation evaluation of physical symptoms*

	<u>Age</u>	<u>Gender</u>	<u>Race</u>	<u>Branch</u>	<u>Comp.</u>	<u>Status</u>	<u>Pay</u>	<u>Days</u>	<u>Killed</u>	<u>Weapon</u>	<u>MOPP</u>	<u>Mask</u>	<u>Veh</u>	<u>Exp</u>	<u>CBR</u>
No Mediation	46-57			Marine AF			JrWo SrWo JrCG SrCG	1-1080		Y<N		11-15			
Mediation	18-45	M<F	AI/AN Black Hisp Asian Other	Army	AD NG	Mar. Single	Jr. E Sgt SNC		Y>N		0 -30	0-10 16-30	Y>N	0 - 33	Y>N

*Summary for adjusted binomial regression model with mediation evaluation of depressive symptoms*

	<u>Age</u>	<u>Gender</u>	<u>Race</u>	<u>Branch</u>	<u>Comp.</u>	<u>Status</u>	<u>Pay</u>	<u>Days</u>	<u>Killed</u>	<u>Weapon</u>	<u>MOPP</u>	<u>Mask</u>	<u>Veh</u>	<u>Exp</u>	<u>CBR</u>
No	18-49			Marine	AD	Mar.		961-1080		Y<N	0-5	0-10			
Mediation	54-57			Army		Single									
Mediation	50-53	M<F	Asian AI/AN Black Hisp Other	AF	NG		Jr. E Sgt SNC JrWo SrWo JrCG SrCG	1-960	Y>N		6-30	11-30	Y>N	0-33	Y>N

*Summary for adjusted binomial regression model with mediation evaluation of health assessment*

	<u>Age</u>	<u>Gender</u>	<u>Race</u>	<u>Branch</u>	<u>Comp.</u>	<u>Status</u>	<u>Pay</u>	<u>Days</u>	<u>Killed</u>	<u>Weapon</u>	<u>MOPP</u>	<u>Mask</u>	<u>Veh</u>	<u>Exp</u>	<u>CBR</u>
No	54-57			Marine		Mar.			Y<N	Y>N	0-30				
Mediation	18-53	M<F	Black Hisp Asian AI/AN Other	Army AF	NG AD	Single	Jr. E Sgt SNC JrWo SrWo JrCG SrCG	1-1080				0-30	Y>N	0-33	Y>N

Appendix G

Final Approval Email AMSA

**Collins, Sean**

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**From:** Collins, Sean T LtCol ANG 104 FW/MDG/CC [sean.collins@mabarn.ang.af.mil] **Sent:** Thu 7/26/2007 5:45 PM  
**To:** Collins, Sean  
**Cc:** Bova, Carol  
**Subject:** FW: Statement re using DD Form 2796 data in PhD research. (UNCLA SSIFIED)  
**Attachments:**

Dr. Bova,  
Please see summary below that I received from Dr. Moore, the Air Force Director for the Army Medical Surveillance Activity (AMSA).

If you have any further questions -- please let me know.

Sean

Sean T. Collins, Lt Col, MA ANG

Commander/MDG

104th FW

Barnes ANGB

-----Original Message-----

**From:** Moore, Sean I Lt Col USACHPPM-Wash DC [mailto:Sean.I.Moore@us.army.mil]  
**Sent:** Thursday, July 26, 2007 5:25 PM  
**To:** Collins, Sean  
**Cc:** Collins, Sean T LtCol ANG 104 FW/MDG/CC  
**Subject:** Statement re using DD Form 2796 data in PhD research. (UNCLASSIFIED)

**Classification:** UNCLASSIFIED  
**Caveats:** NONE

For the doctoral committee chair:

LtCol Sean T. Collins has been working with this office to coordinate a study using Post-deployment Form (DD2796) data and limited demographic information (ie. marital status, education level, race) maintained by AMSA/DMSS. The information provided to LtCol Collins based on the DD2796 Forms will be de-identified (No names, No Social Security Number, no date of birth). LtCol Collins will provide this office confirmation of the IRB approval, along with a final written request of study protocol (required fields), prior to access to the requested information.

-Lt Col Moore

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