

ASSESSMENT OF HYPERTENSION AND MILITARY DEPLOYMENTS

by

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The views expressed in this dissertation are those of the author and do not reflect the official policy or position of the Department of the Air Force, Department of the Navy, Department of the Army, Department of Defense, Department of Veterans Affairs, or the US Government.

DEDICATION

I dedicate this dissertation to the loving memory of my father who has shown me what hard work and determination can achieve, and what true sacrifice for family and service to country is.

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ABSTRACT

Introduction: High-stress situations, such as military deployments, may be a risk factor for hypertension. The relationship between the stress triggered by combat deployment and hypertension is unknown. Acute stress from combat conditions can cause a temporary rise in blood pressure, which decreases within hours or days.¹ Cross-sectional studies have shown no association between hypertension and deployment to the 1991 Gulf War or to Vietnam.²⁻⁵ Self-reported hypertension often is used as an outcome in large population studies. Fair to substantial agreement has been observed between self-reported hypertension and various sources of administrative data, medical records, and blood pressure measurements.⁶⁻⁹ The goal of this dissertation was to determine whether recent deployment to Iraq and Afghanistan was associated with new-onset hypertension.

Methods: Baseline Millennium Cohort Study questionnaires (July 2001 to June 2003) were completed by 77,047 individuals.¹⁰ Follow-up questionnaires (June 2004 to February 2006) were completed by 55,021 responders. The relationship between new-onset hypertension and history of a recent military deployment was assessed through multivariable logistic regression (N=37,075). Baseline data were analyzed cross-sectionally to assess factors associated with prevalent hypertension (N=70,100). Kappa statistics were used to compare self-reported hypertension with provider diagnosed hypertension and prescription antihypertensive medication dispensed (N=41,129).

Results: The 3-year incidence of hypertension was 6.9%. After adjusting for demographic and lifestyle characteristics, deployers without combat exposure were less

likely to develop new-onset hypertension compared to nondeployers (odds ratio [OR]=0.74; 95% confidence interval [CI]: 0.64, 0.85). There was no association between deployment with combat exposure and hypertension compared to nondeployers (OR=0.94; 95% CI: 0.82, 1.07). Among deployers reporting combat exposures, the risk for incident hypertension was 1.31 (95% CI: 1.07, 1.61) compared to deployers not reporting combat exposures. The prevalence of self-reported hypertension at baseline among Cohort members was 10.4%. There was moderate agreement between self-reported hypertension and provider-diagnosed hypertension, as well as antihypertensive medications dispensed.

Conclusion: Military service members are adversely affected by hypertension.

Although deployers had lower incidence of hypertension compared to nondeployers, individuals reporting combat exposures were more likely to report new-onset hypertension. Self-reported hypertension had moderate reliability compared with provider-diagnosed hypertension and dispensed antihypertensive medication.

EXPLANATION OF DISSERTATION FORMAT

The dissertation is presented in five chapters, with three manuscripts included as appendices. The first chapter covers the specific aims of the overall dissertation research. The second chapter provides the background and review of the epidemiology of hypertension, health studies conducted in military populations, and potential impact of high-stressed situations, such as military deployments. This section also includes preliminary description of the underlying Millennium Cohort of United States military personnel. A summary of the methods for the dissertation research and three associated manuscripts is presented in chapter three. The fourth chapter consists of the results for each of the manuscripts, with the three manuscripts presented in Appendices A-C. The last chapter discusses implications of the study findings, including the strengths and limitations of the study design and analytic approach. This last chapter also includes future directions to include longitudinal studies and the evaluation of self-reported functional health and well-being.

The dissertation includes the three aforementioned manuscripts. The candidate, with input and revisions from the coauthors and dissertation committee, developed the research hypotheses, created coding procedures for the identification of antihypertensive medications, pooled relevant military databases, conducted all statistical analyses, and wrote the manuscripts. Appendix A presents the first manuscript, which describes the prevalence of hypertension in active duty members of the Millennium Cohort and evaluates the comparability between various administrative database definitions of

hypertension with self-reported hypertension at baseline. Appendix B describes the prevalence of hypertension in active duty and Reserve/National Guard members of the Millennium Cohort and assesses factors associated with self-reported hypertension at baseline. Appendix C explores the potential relationship between new-onset hypertension and recent military deployment.

CHAPTER 1: SPECIFIC AIMS

Approximately 33% of adults in the United States (US) are affected by hypertension,¹¹ with an estimated direct and indirect cost of \$66.4 billion.¹² Approximately 10.2% to 13.6% of US military members are affected by hypertension,^{2, 10} while approximately 12.3% to 55.6% of US veterans are affected.^{3, 13-15} Military members are exposed to unique conditions such as deployments, which may increase the risk for hypertension. The overall goal of this research was to determine whether recent military deployment was associated with the development of new-onset hypertension.

In order to address this goal, there was a need to study the reliability of self-reported hypertension. This aim was addressed through analyses of self-report with electronically recorded inpatient and outpatient *International Classification of Diseases*, Ninth Revision, Clinical Modification (ICD-9-CM) codes, and electronically recorded prescriptions from the military and civilian health care systems. This comparability study was based on data from active duty members who completed the baseline questionnaire. The second aim of this dissertation was to assess the prevalence of hypertension in Millennium Cohort Study participants and evaluate potential factors associated with self-reported hypertension. The prevalence study was based on active duty and Reserve/National Guard members who completed the baseline questionnaire. The final study aim was to assess incident hypertension and to determine the risk factors for hypertension in relation to deployment history. This incidence study was based on data from active duty and Reserve/National Guard members who completed both the baseline and follow-up Millennium Cohort questionnaires.

The specific aims are as follows:

Manuscript #1:

Aim 1: Determine the prevalence of hypertension among active duty cohort members using self-report and electronic medical records.

Aim 2: Determine the reliability of self-reported hypertension compared to hypertension defined by combinations of electronic ICD-9-CM codes and electronic prescription data.

Aim 3: Identify the characteristics of individuals with discordant self-reported hypertension and hypertension identified through electronic medical records.

Manuscript #2:

Aim 1: Determine the prevalence of self-reported hypertension among baseline Cohort members.

Aim 2: Determine the prevalence odds ratios of self-reported hypertension for demographic characteristics and potential covariates of hypertension.

Aim 3: Assess patterns of usage in antihypertensive medication dispensed among active duty cohort members.

Manuscript #3:

Aim 1: Calculate the cumulative incidence of new-onset hypertension by deployment status.

Aim 2: Estimate the magnitude of the association between incident self-reported hypertension and deployment history, while controlling for known hypertension risk factors in multivariable logistic regression models.

Aim 3: Evaluate other potential risk factors for incident hypertension among this military population.

CHAPTER 2: BACKGROUND AND SIGNIFICANCE

An estimated one out of every three adults in the United States (US) has hypertension.^{11, 16} Hypertension contributes to cardiovascular diseases, which lead all other conditions as the main cause of morbidity and mortality.^{17, 18} Hypertension is the leading cause of global burden of disease prevalence. Globally, approximately two-thirds of stroke and one-half of ischemic heart disease are attributable to hypertension. These proportions are highest in the more developed parts of the world. Approximately 7.1 million deaths worldwide are estimated to be due to high blood pressure.¹⁹ Hypertension affects almost 65 million Americans and accounts for about 30 million outpatient visits annually.²⁰

Deployments are often characterized as military service within austere locations, in which separation from family, strenuous work, potential exposure to unknown chemical or biological agents, and witnessing of extreme violence and death may be present.¹⁰ Certain individuals who deploy receive imminent danger pay, hardship duty pay, or combat zone tax exclusion benefits.²¹ Due to the profoundly stressful conditions present during deployments, it is plausible that deployment may be a contributing factor to hypertension, however, the temporal relationship between the stress triggered by combat deployment and hypertension is unknown. Prior epidemiological cross-sectional studies have noted no association between hypertension and deployment among Gulf War or Vietnam veterans.²⁻⁵ Acute stress from combat conditions can cause a temporary rise in blood pressure, but this is usually temporary and decreases within hours or days.¹ The Millennium Cohort Study was initiated in 2001 to longitudinally assess military-

related exposures and their impact on military and veteran health.¹⁰ This study provided the opportunity to evaluate the prevalence of hypertension in an unselected military population and to identify risk factors for the development of the condition, including the impact of potentially stressful conditions such as deployment with and without combat exposures.

Types of Hypertension

Blood pressure is defined as the force of blood against the artery walls. It is represented by systolic pressure, the pressure when the heart contracts, and diastolic pressure, the arterial pressure when the heart is refilled between two consecutive contractions. Hypertension for adults is clinically characterized as a systolic blood pressure of 140 mmHg or higher or a diastolic blood pressure of 90 mmHg or higher.¹⁸ Classification of hypertension is clinically based on an average of two or more seated blood pressure measurements during two or more office visits.¹⁸ Normal blood pressure is defined as a systolic blood pressure less than 120 mmHg and a diastolic blood pressure less than 80 mmHg. In August 2004, the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure introduced a new classification that includes prehypertension. The purpose was to identify individuals in need of lifestyle modification to reduce blood pressure.¹⁸

There are three different types of hypertension: essential, secondary, and pregnancy-related. Essential hypertension occurs when there is no specific treatable cause. Secondary hypertension occurs when there is another underlying condition, such

as kidney disease.²² When the underlying condition is treated, blood pressure usually is corrected as well. Pregnancy-related hypertension may occur in some women when they become pregnant. Gestational hypertension can be life threatening to the mother and fetus. Pregnancy-related hypertension, such as preeclampsia, is characterized by high blood pressure and protein in the mother's urine. Preeclampsia affects at least 5-8% of all pregnancies and is, along with other hypertensive disorders of pregnancy, the leading global cause of maternal and infant illness and death with an estimated 76,000 deaths each year.¹⁰ In a study of healthy, normotensive nulliparous women, 24.9% of 4,320 developed hypertensive conditions, 16.6% developed mild pregnancy-associated hypertension, 5% developed mild preeclampsia, 0.7% developed severe pregnancy-associated hypertension, while 2.5% developed severe preeclampsia.²³

Treatment Strategies

The ultimate public health goal of antihypertensive therapy is to reduce cardiovascular and renal morbidity and mortality.¹⁸ Hypertension can be treated with both lifestyle modifications and pharmacologic treatment. Lifestyle factors include weight control, exercise, maintaining a healthy diet, limiting alcohol consumption, and quitting smoking.^{18, 24} There are several types of medications used to treat high blood pressure. They include diuretics, aldosterone receptor blockers, beta blockers, combined alpha and beta blockers, angiotensin-converting enzyme inhibitors, angiotensin II antagonists, calcium channel blockers, alpha blockers, and vasodilators.¹⁸ Drugs such as

lisinopril, hydrochlorothiazide, nifedipine, and furosemide are commonly prescribed on US military installations.²⁵

Reliability and Validity of Self-Reported Hypertension

Reliability and validity are important in order to reduce misclassification and to assure that the study effects are unbiased. Reliability reflects the repeatability of a measure. This repeatability or consistency of the measurement, however, does not necessarily equate to accuracy or validity. Validity reflects the truth or accuracy of a measure. Furthermore, validity requires the identification of a "gold standard" and compares the accuracy of other measures in terms of that standard. In the absence of a true "gold standard," reliability is depended upon for the purpose of determining the reproducibility of the measures. Epidemiological studies use reliability to determine comparability between measures of similar factors.

The Kappa statistic quantifies the amount of agreement between two measures in excess of what is expected due to chance. Kappa is defined as the probability of what is observed minus the probability of what is expected, divided by one minus the probability of expected. The probability of what is observed is considered the observed percent agreement, while the probability of what is expected is considered the chance-expected agreement. Kappa is strongly affected by prevalence; when low, kappa approaches zero.²⁶ A Kappa score greater than 0.80 was considered 'greater than substantial agreement.' A Kappa score of 0.61-0.80 was considered 'substantial', a score of 0.41-60 was considered 'moderate', 0.21-0.40 was considered 'fair' and less than 0.20 was

considered 'slight or poor agreement'.²⁷ Sensitivity and specificity are often used to assess validity. Sensitivity is considered the true positive, while specificity is considered the true negative.²⁸

Several studies have reported fair to substantial agreement between self-reported hypertension and measured blood pressure or other methods for defining hypertension, such as administrative data and medical records.⁶⁻⁹ Reliability estimates, such as kappa coefficients, ranged from 0.29 to 0.70 for these measures. When self-reported hypertension was validated with other measures of hypertension, sensitivity ranged from 23% to 95%, while specificity ranged from 86% to 99%.^{6-8, 28, 29} In one study, when hypertension diagnosis from administrative data was compared to medical records, the kappa coefficient was 0.45, with sensitivity and specificity at 70.8% and 74.9%.³⁰ Comparing at least one hypertension-related ICD-9 code and at least one hypertension prescription claim with medical records increased the kappa coefficient to 0.65 with sensitivity and specificity at 76.2% and 93.3%.³⁰

Although direct blood pressure measurements were not readily obtainable in the Millennium Cohort Study, high correlation between self-reported hypertension and documented hypertension in medical records has been demonstrated in another US military population.²⁸ The agreement between self-reported hypertension and documented hypertension in the medical records of active duty, retired, and military family members was 94.2%.²⁸ The sensitivity of self-report correctly identifying high blood pressure histories was 95.4%, while the specificity of self-report correctly identifying normal blood pressure histories was 92.4%.²⁸ Medical records were used to

obtain the most recent systolic and diastolic blood pressure readings, documentation of prescribed antihypertensive medications, and evidence of a medical diagnosis of hypertension.²⁸

Prevalence of Hypertension

The prevalence of hypertension, defined as blood pressure \geq 140/90 mmHg or taking antihypertensive medication was estimated at 29.3% in the United States (US) from 2003-2004.¹¹ Hypertension prevalence also increased with age in the US population.¹¹ Among US adults, the prevalence of hypertension was reported at 7.3% among adults 18-39 years of age, 32.6% among those 40-59 years of age, and 66.5% among those 60 years of age and older.¹¹ Recent national statistics from 2003-2004 reported higher prevalence for non-Hispanic Blacks than non-Hispanic Whites (34.4% versus 30.3%).¹¹ Over 65 million adults in the US are affected by hypertension,¹⁶ while over 1 billion adults worldwide are affected.³¹

Hypertension prevalence previously has been reported to be 10.2% for Millennium Cohort members from the US military¹⁰ and 13.6% in other US military populations.¹⁰ Among US military veterans, the estimates for the prevalence of hypertension have ranged from 12.3% to 55.6%.^{3, 13-15} This greater difference in range was partially attributed to the varying ages within the veteran sample, with higher prevalence generally observed in older populations.

Risk Factors for Hypertension

The Framingham Heart Study has made significant contributions to the understanding of cardiovascular disease and hypertension.³²⁻³⁵ Several risk factors for hypertension include obesity, little or no exercise, high dietary salt intake, excessive alcohol consumption, being African American, and familial history of hypertension.^{20, 37-42} Stress reduction⁴³⁻⁴⁶ as well as smoking cessation,^{47,48} often established as a risk factor for cardiovascular diseases, have shown mixed results in their role of preventing progression of hypertension.

Stress and Hypertension

High-stress situations, such as military deployments, present unique exposures to military service members. Acute stress from exposure to combat conditions can cause a rise in blood pressure, but this is usually temporary and decreases within hours or days.¹ The effects of long-term stress from deployment are unknown, although cross-sectional studies have showed no association between hypertension and deployment to the 1991 Gulf War or to Vietnam.²⁻⁵ Due to the profoundly stressful conditions present during deployments, it is plausible that deployment may be a contributing factor to hypertension; however, the temporal relationship between the stress triggered by combat deployment and hypertension is unknown. There is much public and veteran concern over long-term health consequences related to the current combat deployments in Iraq and Afghanistan.^{49, 50}

In a study by Markovitz et al,⁵¹ job strain was found to be associated with incident hypertension in an 8-year cohort study of 3,200 initially normotensive individuals. Job strain was characterized as high strain, low strain, passive, and active, based on the Job Content Questionnaire by Karasek et al, which looked at the demands of work and the employees' level of latitude or control.^{51, 52} Another study by Ducher et al⁵² reported no global relationship between job strain and blood pressure levels, but found a statistically significant association between job strain and blood pressure in a subgroup of newly diagnosed hypertensive subjects exposed to high job strain (N=926). An earlier study of 1,003 male public servants reported no association between blood pressure reactions to mental stress and future hypertension, after correcting for initial screening blood pressures, age and initial screening pressures.⁴³

The underlying mechanism of stress-induced hypertension is unknown.⁵³ One postulated mechanism is that stress-induced hypertension is caused by the inhibition of prostaglandin synthesis (physiological function involved in the regulation of blood pressure) due to the release of corticoids.⁵⁴ Others believe that emotional stress, responsible for the increase in blood pressure or for aggravating existing hypertension, is caused by a sudden rise of dopamine.⁵⁵ During the “fight or flight” defense reaction to emotional stress, the sudden rise in dopamine may support the need for increased muscle and coronary blood flow.⁵⁵ Others suggest that alterations in the electrolytes may be involved in stress-induced hypertension, specifically an increase in sodium and calcium, with decrease in magnesium.⁵³ More studies are needed to describe the mechanism of stress on hypertension.

Obesity

Obese individuals are at increased risk for developing hypertension, cardiovascular disease, and stroke.^{32, 56} According to Grotto et al,⁵⁷ body mass index was the strongest predictor of prehypertension, defined as systolic blood pressure of 120 to 139 mmHg and diastolic blood pressure levels of 80 to 89 mmHg. Among US military retirees, the prevalence of hypertension has been shown to be approximately two times higher in the overweight population (OR=1.93 to 2.73; 95% CI: 1.59, 3.23) compared to normal weight persons and up to three to six times higher among the obese (OR=2.55 to 6.07; 95% CI: 2.03, 7.97).⁵⁸

Physical Activity

Physical activity, through aerobic endurance training, was shown to decrease blood pressure in a meta-analysis involving 72 trials and 105 study groups (N=3,936).⁴¹ The effect of blood pressure was higher in individuals with hypertension than normotensive individuals; thus exercise was likely to contribute to the prevention of hypertension.⁴¹ Frequent exercise was found to be associated with decreased risk of coronary heart disease and stroke in participants of the Physicians' Health Study (N=18,662).⁵⁶

Alcohol Consumption

High levels of alcohol consumption of two or more drinks per day was concluded to be associated with increased risk of hypertension (N=2,609).⁴⁰ Individuals who drank

mostly outside mealtimes had significant increase in the risk of hypertension compared to lifetime abstainers or those who drank during mealtimes.⁴⁰ Daily consumption of alcohol was found to be associated with lower risk of coronary heart disease but not stroke.⁵⁶ Ethanol has been shown to raise high-density lipoprotein levels, protecting individuals against heart diseases, while preliminary in vitro studies have shown that beverages containing high levels of polyphenols, such as red wine and dark beer, have inhibited low-density lipoproteins.⁵⁹ In a study by Fernandez et al,⁶⁰ alcohol consumption was higher in military personnel ages 18 to 25 compared to civilians of the same age group. Service members had 27.3% prevalence of heavy drinking in the previous 30 days, while civilians had 15.3% prevalence.⁶⁰

Smoking

There are varied results on the role of smoking on hypertension. According to the 2000 Behavior Risk Factor Surveillance System, state-specific adult smoking prevalence ranged from 12.9% to 30.5%.⁶¹ Based on the 2002 Department of Defense Survey of Health-Related Behaviors among Military Personnel, 33.8% of military members report smoking, with the highest use in the Marine Corps (38.7%) and the lowest in the Air Force (27.0%).⁶² Cigarette smoking was considered a risk factor for cardiovascular disease in patients with hypertension.⁶³ In a prospective study of 4,736 men and women aged 45 to 64 years by Ohira et al,⁶⁴ current smoking, age, systolic blood pressure, and diabetes mellitus were risk factors for all ischemic stroke subtypes, while hypertension was the most powerful predictor for all ischemic stroke subtypes. An

ischemic stroke occurs when the brain is deprived of oxygen and essential nutrients resulting from the occlusion of an artery to the brain or neck.⁶⁵ Smoking is traditionally not considered a risk factor for hypertension. However, in a study by Niskanen et al,⁶⁶ smoking was associated with the development of hypertension in men after 11 years of follow-up (N=854). Also, smoking has been shown to increase arterial stiffness, and normotensive individuals with lower arterial elasticity are more likely to develop hypertension.⁶⁶

Combat Deployment as a Measure of Stress

Combat deployments present unique stressors. These include high operational tempo, deployments to areas of extreme and sub-optimal living conditions, military-unique occupational exposures, as well as psychological stress from traumatic and deadly situations.¹⁰ Due to the profoundly stressful conditions present during deployments, it is plausible that deployment may be a contributing factor to hypertension. However, the temporal relationship between the stress triggered by combat deployment and hypertension is unknown.

Deployment to the Gulf War in 1991 was associated with various medical conditions, including chronic fatigue syndrome, fibromyalgia, dermatologic conditions (particularly atopic dermatitis and verruca vulgaris—or common wart), and dyspepsia (frequent heartburn and recurrent abdominal pain).² Other symptoms described by Gulf War veterans included fatigue, joint pain, dermatitis, headaches, memory loss, blurred vision, and diarrhea.⁶⁷ In a study by Gray et al (N=11,868),⁴ Gulf War US Navy Seabees

had a higher prevalence for chronic fatigue syndrome, posttraumatic stress disorder, multiple chemical sensitivity, and irritable bowel syndrome. In contrast, other studies found no association between exposure to combat and subsequent risk of disease. In a study by Smith et al (N=431,762)⁵ of regular active-duty and Reserve, Army and Air Force personnel deployed to Khamisiyah, Iraq, during the Gulf War, there was no increased risk for hospitalization or diagnosis of any chronic diseases, such as diseases of the circulatory system to include hypertension and acute myocardial infarction, nearly ten years later. Even though hypertension was not associated with Gulf War deployment, or observed among veterans who served in Vietnam in cross-sectional studies,^{2,3} further prospective studies are needed to directly look at deployers in order to account for the “healthy warrior effect” since deployers are generally healthier than nondeployers.

Millennium Cohort Study

Similar to the Framingham Heart Study, the Millennium Cohort Study has the potential to test theories of exposure-disease associations.⁴ It is the largest ongoing prospective cohort study of US military personnel.¹⁰ The cohort aims to longitudinally assess military-related exposures and their impact on military and veteran health. The primary objective of the Millennium Cohort Study is to determine if risk factors related to military service are associated with adverse health outcomes.⁴

These are the first analyses within the Millennium Cohort Study to look at the development of hypertension and the potential association between hypertension and military deployments. These analyses build upon the results of other findings from the

Millennium Cohort Study. Further details of the Millennium Cohort Study are found in the Methods Section.

CHAPTER 3: METHODS

Human Subjects Approval

Ethics approval was obtained from the Institutional Review Board of the University of Arizona (Tucson, AZ). The researcher completed all requirements for the Basic Collaborative Institutional Training Initiative Course in The Protection of Human Research Subjects. A Project Review Form was submitted to the University of Arizona Institutional Review Board, which included the verification of human subjects training; project abstract; population; recruitment and consent procedures; methodology and data collection procedures; confidentiality of personal identifying information; and benefits, costs, compensations, and risks. A site authorization letter was obtained from the Principal Investigator of the Millennium Cohort Study, Director of the Department of Defense Center for Deployment Health Research. The University of Arizona, Human Subjects Protection Program granted exempt status for this study (see Human Subjects Approval Form in Appendix D). Secondary analyses were conducted on existing data collected. Self-reported questionnaires posed minimal risk to subjects, to include any potential vulnerable populations such as individuals less than 18 years of age. No recruitment of subjects was required for this study. Informed consent was obtained during the original data collection; no additional consent was required. Study data were stored on existing Naval Health Research Center information system networks meeting current Department of Defense data security requirements.

Sample Size and Power Calculation

The sample size available for the analysis of combat deployment and development of hypertension consisted of 55,021 active duty participants who completed the Millennium Cohort Panel 1-Wave 2 questionnaire. The number of individuals deployed between baseline (Panel 1-Wave 1) and follow-up (Panel 1-Wave 2) was estimated at 30%. Using this estimate, the number of individuals who deployed between baseline and follow-up was 16,650 and those who did not deploy were 38,370. The number of respondents with new-onset self-reported hypertension in Panel 1-Wave 2, who did not report hypertension at Panel 1-Wave 1, was 3,105. Estimation of new-onset hypertension was based on preliminary frequencies obtained from initial analysis of self-reported data from the Millennium Cohort questionnaires alone.

When the incidence of hypertension among those who were not deployed was estimated at 5% over the 3-year time period, the relative risk was estimated at 1.2. Using these frequencies, the estimated power for a two-sample comparison of proportions in Stata, version 9.0, College Station, TX, at alpha of 0.05, was 100%, indicating that there was enough power to detect a difference. Therefore, there are enough subjects in this study to have adequate power to conduct stratified analyses. For instance, among the estimated sample size of 16,650 individuals who deployed, if approximately 50% were expected to be exposed to combat-related conditions, with a potential relative risk of 1.2 and an alpha of 0.05, the power was estimated at 98.48%. Table 1 provides a range of power estimation calculation based on the Open Epi, Version 2—Open Source Epidemiologic Statistics for Public Health, under the ‘Power’ and ‘Cohort’ tabs.⁶⁸

TABLE 1. Power Calculation

Potential Exposure	Potential Relative Risk	Two-Sided Confidence Interval	Power
30%	1.2	95%	100%
30%	1.2	99%	100%
30%	1.1	95%	94%
30%	1.1	99%	83%
20%	1.2	95%	100%
20%	1.2	99%	99.98%
20%	1.1	95%	87%
20%	1.1	99%	70%
15%	1.2	95%	99.98%
15%	1.2	99%	99.83%
15%	1.1	95%	79%
15%	1.1	99%	58%

Overview of the Millennium Cohort Study

In response to health concerns of military service members about deployment and other occupational exposures, the Millennium Cohort Study was initiated in 2001.¹⁰ The goal of the Millennium Cohort Study is to prospectively measure the impact of exposure from military service, to include deployments. The Millennium Cohort is positioned to temporally assess potential causal pathways in relation to deployments.¹⁰ The Cohort is projected to span 22 years and currently consists of three panels. The Cohort was designed to be linked with other various data sources, such as military and civilian inpatient and outpatient care, pharmacy, immunization, deployment, environmental exposure, and medical history.¹⁰ Only Panel 1 was considered for this current study. Enrollment for Panel 1-Wave 1 spanned from July 2001 to July 2003, and resulted in 77,047 consenting participants.¹⁰ Follow-up of baseline enrollees was conducted

approximately three years later (Panel 1-Wave 2) and questionnaires were received from 55,021 respondents. This large population-based sample of the US military, predominantly comprised of healthy individuals, presents unique characteristics. These include exposure to high operational tempo, deployments to areas of extreme and sub-optimal living conditions, military-unique occupational exposures, as well as psychological stress from traumatic and deadly situations.¹⁰

In a study by Smith B et al,²¹ self-reported history of deployment and electronic-reported deployment data were compared. Self-reported deployment data were obtained through the Millennium Cohort questionnaire (Panel 1-Wave 2) and the electronic-reported deployment data were obtained from the Defense Manpower Data Center (DMDC). Agreement of deployment history between the electronic and self-reported data was found to be greater than substantial at 92% (kappa 0.81).²¹ The current analyses used the same definition of deployment as described by Smith B et al based on the electronic-reported data from DMDC. Additionally, deployment was further categorized into deployment with combat exposure and deployment without combat exposure, based on Smith T et al.⁴⁹

Systematic validation and quality control processes were established for paper and electronic questionnaire submission.¹⁰ For every 3,000 paper questionnaires scanned, 50 were randomly selected and compared with corresponding electronic records.¹⁰ Mockup questionnaires were submitted both initially and throughout enrollment to check for correct data coding and transmission.¹⁰ Additionally, 1% of respondents were asked to

complete a similar but shorter survey instrument to assess the reliability of selected questions.⁴

Randomly sampled subjects were recruited through postcard mailings in July 2001. This mailing consisted of an introductory postcard, questionnaire, and reminder postcard mailings. Due to the terrorist attacks of September 11th, enrollment was extended with the final invitations mailed in December 2002. In addition, e-mail invitations were initiated with Secure Socket Layer technology, web site security licenses, and verification of participants' user identifications and passwords, for added data security.¹⁰ Semiannual e-mails and postcards were sent each Memorial Day and Veterans Day to promote continued participation and to update contact information.

Study Population

Enrollment for the Millennium Cohort Study baseline self-administered questionnaire spanned from July 2001 to June 2003 and resulted in 77,047 consenting participants.¹⁰ A representative sample of US active duty, Reserve, and National Guard service members from the Army, Air Force, Navy, Coast Guard, and Marines were randomly selected from military installations across the United States and overseas countries. Individuals who had previously deployed to Southwest Asia, Bosnia, or Kosovo between 1998 and 2000, Reserve and National Guard personnel, and female service members were oversampled to ensure adequate power in stratified analyses.¹⁰

Follow-up questionnaires for members of the Millennium Cohort Study were sought from June 2004 to February 2006 and resulted in 55,021 respondents. Response

to the follow-up questionnaire was not captured for 22,027 individuals resulting in a response rate of 71.4%. Among the 22,027 individuals not captured at follow-up, 510 individuals withdrew from the study, while 157 individuals were deceased. Less than 1% of the study population was deceased in the interval and was therefore not eligible.

Variable Description

Definition of Self-Reported Hypertension

Self-reported prevalent hypertension was captured by the following question at baseline: “Has your doctor or other health professional EVER told you that you have any of the following conditions?...Hypertension (high blood pressure).” A response of “No” or “Yes” was elicited. A blank field was available for "If YES, what year did the problem begin?" The follow-up questionnaire asked whether "In the last 3 years, has your doctor or health care professional told you that you had any of the following conditions?...Hypertension (high blood pressure)." A blank field was also available for "If YES, in what year were you first diagnosed?"

New-onset hypertension was identified by self-report of hypertension on the follow-up questionnaire after reporting no hypertension at baseline. Normotensive individuals were defined as subjects who self-reported "No" to hypertension at both baseline and follow-up questionnaires (Figure 1).

Hypertension Defined through Electronic Medical Records

Electronically recorded *International Classification of Diseases*, Ninth Revision, Clinical Modification (ICD-9-CM) diagnoses, based on work done by Smith B et al (Appendix 1),⁶⁹ were used to assess hypertension prevalence in active duty cohort members from outpatient and inpatient medical records in military and civilian facilities. However, ICD-9-CM codes 642.3 (transient hypertension of pregnancy) and 642.4 (mild or unspecified pre-eclampsia) were excluded since pregnancy-related hypertension was excluded from self-reported data. Outpatient data were obtained from the Standard Ambulatory Data Record, which began collecting and compiling outpatient diagnoses from military healthcare facilities starting in October 1998. Inpatient data were obtained from the Standard Inpatient Data Record, which began collecting and compiling hospitalization diagnoses from military healthcare facilities as of October 1988. Diagnoses obtained for medical care rendered outside of military healthcare facilities, and billed to the Department of Defense for care, were obtained from the Health Care Services Record beginning from October 1993. Table 1 displays the dates of data availability. All electronic medical records were scanned through the date of the survey submission from the aforementioned availability dates. Various definitions of diagnosed hypertension were explored using the above sources. Outpatient military, inpatient military, and both outpatient and inpatient medical care rendered outside military healthcare facilities were looked at separately for at least one ICD-9-CM code. At least two ICD-9-CM codes were then evaluated for each of the above. Finally, combinations of outpatient and inpatient codes were assessed.

Hypertension Defined through Antihypertensive Medications

Antihypertensive medications dispensed to self-reported hypertensive active duty members were queried for 16 broad American Hospital Formulary Service therapeutic classes to include cardiovascular-related classes, based on the Physician's Desk Reference, 57th edition from the Seventh Report of the Joint National Committee (Appendix 1).¹⁸ Mandatory reported pharmaceutical data (October 2000 to September 2003) and voluntarily reported archived data (October 1999 to September 2001) were obtained from the Pharmacy Data Transaction Service (PDTS) within the Military Health System Data Repository and the Department of Defense (DoD) Pharmacoeconomic Center. Table 1 displays the dates of data availability. Data were captured from all military medical treatment facilities worldwide, civilian retail pharmacy networks, and TRICARE Mail Order Pharmacy. From the therapeutic classes queried, potential antihypertensive medications were further classified individually through product names. Product names were then recoded into generic names, limited to long-term use denoted by prescription antihypertensive medications dispensed for 30 days or more. Table 2 lists the generic antihypertensive medications used for these analyses. The data obtained from PDTS and the DoD Pharmacoeconomic Center were then merged with the Millennium Cohort data and scanned through the date of survey submission from the aforementioned availability dates.

Definition of Deployment

Electronically reported deployment data were obtained from the Defense Manpower Data Center. The electronic deployment data captured individuals who received imminent danger pay, hardship duty pay, and combat zone tax exclusion. Recent deployments in support of the wars in Iraq and Afghanistan, which occurred after the baseline questionnaire and before the follow-up questionnaire, were classified into three categories: nondeployed, deployed with reported combat exposures, and deployed without reported combat exposures. The definition of deployment was consistent with what was previously defined by the Millennium Cohort Study team according to works done by Smith B et al.²¹ Recent deployment to Iraq and Afghanistan was considered the exposure variable. Therefore, individuals with deployments to Iraq and Afghanistan prior to the baseline questionnaire were excluded. Combat exposure was defined as subjects who self-reported on the follow-up questionnaire as being personally exposed to witnessing a person's death due to war, disaster, or tragic event; witnessing instances of physical abuse (torture, beating, rape); dead and/or decomposing bodies; maimed soldiers or civilians; or prisoners of war or refugees in the past three years. The definition of self-reported combat exposure was consistent with works done by Smith T et al.⁴⁹

Other Variables

Self-reported physical and behavioral data were available from the baseline and follow-up questionnaires. Variables included self-reported height and weight, alcohol consumption, smoking status, physical activity, strength training, and demographics

(Table 3). Body mass index (BMI) was calculated from self-reported height and weight at baseline using the following formula: kilograms divided by meters squared. BMI was then categorized as: normal/underweight, overweight, or obese, as defined according to the National Heart, Lung, and Blood Institute.⁷⁰ Normal/underweight individuals were characterized by a BMI of less than 25 kg/m², overweight individuals by a BMI of 25 kg/m² to less than 30 kg/m², and obese individuals by a BMI of 30 kg/m² or more.

Heavy and moderate alcohol consumption was assessed through the following question: "IN THE PAST YEAR, on the days that you drank alcoholic beverages, on average, how many drinks did you have?" Three categories were then defined according to the Dietary Guidelines for Americans, Department of Health and Human Services and Department of Agriculture.⁷¹ Heavy drinking consisted of average alcohol consumption of greater than one drink a day for women and two drinks a day for men. Moderate drinking consisted of an average of one drink a day for women and two drinks a day for men. No to low drinking were those who reported an average of less than one drink a day for women and less than two drinks a day for men. Low to no drinking also included individuals who self-reported not consuming at least 12 drinks of any type of alcoholic beverage (including beer and wine) in their entire life or at least 12 drinks of any type of alcoholic beverage in the past year, due to the forced skip patterns within the questionnaire.

Self-reported use of cigarettes (never, past, current) was captured through three questions at baseline. Never smokers were characterized by those who answered "No" to "IN YOUR LIFETIME, have you smoked at least 100 cigarettes (5 packs)?" Past

smokers were classified by those who answered “Yes” to the above in addition to “Yes, and succeeded” to the following question: “Have you ever tried to quit smoking?”

Current smokers were considered individuals who did not try to quit smoking or were unsuccessful, and answered “Yes” to “IN THE PAST YEAR, have you used any of the following tobacco products?...Cigarettes.”

Physical activity and strength training questions were only included in the follow-up questionnaire. The variables were classified based on recommendations from the American College of Sports Medicine and the American Heart Association, in which moderate physical activity consisted of 30 minutes 5 days a week, vigorous physical activity consisted of 20 minutes 3 days a week, and strength training consisted of 8-10 exercises on 2 or more nonconsecutive days each week.⁷² However, because light and moderate exercise could not be distinguished, participants who self-reported at least 150 minutes per week of moderate or light exercise, and/or at least 60 minutes of vigorous exercise were considered physically active. Conducting 8-10 strength training exercises was estimated at 30 minutes, therefore, individuals who self-reported at least 60 minutes per week of strength training or work that strengthened their muscles were considered to be engaged in active strength training.

The demographic data were obtained from the Defense Manpower Data Center (DMDC) and included sex (male female), birth year (pre 1960, 1960-1969, 1970-1979, 1980 and forward), education (less than high school diploma, high school diploma, some college, college graduate, advanced degree), marital status (married, single, other), race/ethnicity (white non-Hispanic, black non-Hispanic, Asian/Pacific Islander, Native

American, Hispanic, other), military pay grade (enlisted, officer), service branch (Army, Air Force, Navy/Coast Guard, Marines), and service component (Reserve/National Guard, active duty). In addition, occupations within the military were available for ten separate categories. Self-reported education, marital status, and occupational category from the Millennium Cohort baseline questionnaire were used to supplement missing DMDC data.

Manuscript #1: Analysis Strategy

Aim 1: Determine the prevalence of hypertension among active duty cohort members using self-report and electronic medical records.

Aim 2: Determine the reliability of self-reported hypertension compared to hypertension defined by combinations of electronic ICD-9-CM codes and electronic prescription data.

Aim 3: Identify the characteristics of individuals with discordant self-reported hypertension and hypertension identified through electronic medical records.

In Manuscript #1, subjects from the original baseline cohort were limited to active duty military service men and women with known self-reported hypertension status and complete demographic data (Figure 2). Reserve and National Guard personnel were excluded since active duty, retirees, and their family members are the main beneficiaries of the military health care system. Furthermore, women who self-reported no menstrual period because of pregnancy or recent birth and those who self-reported giving birth in

the last three years were excluded to rule out pregnancy-related hypertension. The self-reported hypertension subset consisted of a total of 41,129 subjects.

Hypertension was based on the three different sources: self-report from the Millennium Cohort baseline questionnaire, electronically-recorded ICD-9-CM codes, and electronically recorded prescriptions from the DoD pharmaceutical databases.

Provider-diagnosed International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes, based on work done by Smith B et al,⁶⁹ were obtained from outpatient and inpatient records in military and civilian facilities, to include the Standard Ambulatory Data Record, Standard Inpatient Data Record, and the Health Care Services Record. However, the ICD-9-CM codes 642.3 (transient hypertension of pregnancy) and 642.4 (mild or unspecified pre-eclampsia) were excluded.

Pharmaceutical data were obtained from the Pharmacy Data Transaction Service (PDTS) Defense Manpower Data Center and the DoD Pharmacoeconomic Center. Antihypertensive medications were identified based on therapeutic classes from the Physician's Desk Reference, 57th edition from the Seventh Report of the Joint National Committee (appendix 1).¹⁸ In order to include a broader range of potential prescription antihypertensive medications, however, cardiovascular drugs, cardiac drugs, cardiotonic agents, and miscellaneous cardiac drugs also were included for a total of 16 American Hospital Formulary Service therapeutic classes. This ensured that potential antihypertensive medications would not be missed. Potential antihypertensive

medications were further classified through product names, recoded into generic names, and limited to prescriptions dispensed for at least 30 days.

Manuscript #2: Analysis Strategy

Aim 1: Determine the prevalence of self-reported hypertension with baseline Cohort members.

Aim 2: Determine the prevalence odds ratios of self-reported hypertension for demographic characteristics and potential covariates of hypertension.

Aim 3: Assess patterns of usage in antihypertensive medication dispensed among active duty cohort members.

In Manuscript #2, the aim was to describe the prevalence of self-reported hypertension at baseline and to determine characteristics associated with the self-report of hypertension in this military population. Subjects from the baseline cohort were limited to individuals with known self-reported hypertension status and complete demographic data (Figure 3). Sub-analyses were conducted on active duty service members with known self-reported hypertension status to assess antihypertensive medication use within Cohort members. Women who self-reported no menstrual period because of pregnancy or recent birth and those who self-reported giving birth in the last 3 years were excluded to rule out pregnancy-related hypertension. Additionally, individuals with incomplete demographic and covariate data were excluded.

Hypertension was defined as a binary variable (hypertensive, normotensive) based on self-reported data from the baseline Millennium Cohort questionnaire. Electronic prescription antihypertensive medication dispensed also were used to classify hypertension in a subset of active duty cohort members.

Manuscript #3: Analysis Strategy

Aim 1: Calculate the cumulative incidence of new-onset hypertension by deployment status.

Aim 2: Estimate the magnitude of the association between incident self-reported hypertension and deployment history, while controlling for known hypertension risk factors in multivariable logistic regression models.

Aim 3: Evaluate other potential risk factors for incident hypertension among this military population.

In Manuscript #3, subjects were limited to individuals who completed baseline and follow-up Millennium Cohort Study questionnaires (Panel 1-Wave 1 and Panel 1-Wave 2) with known hypertension status, and complete demographic and covariate data (Figure 4). Individuals with hypertension at baseline were excluded. Women with no menstrual period because of pregnancy or recent birth and women who gave birth in the last three years were excluded. Previously deployed individuals prior to baseline and those deployed while completing either questionnaire were excluded since deployment was the exposure variable.

Responders and non-responders to the follow-up questionnaire were assessed. Non-responders were further evaluated ($n=22,027$). Information on these non-responders was captured for the number of individuals who withdrew from the study and the number of those who were deceased prior to the enrollment of Panel 1-Wave 2 follow-up.

Self-reported hypertension and covariate data were obtained from the Millennium Cohort Study, baseline Panel 1-Wave 1, and follow-up Panel 1-Wave 2 questionnaires. Hypertension incidence was defined as individuals without hypertension at baseline, but later reported new-onset hypertension at follow-up. Alcohol consumption and smoking status were both derived from the baseline questionnaire. Obesity status was calculated from body mass index (BMI) scores, derived from height and weight from the baseline questionnaires. Physical activity and strength training variables were derived from the follow-up questionnaire since these activities were not included in the baseline questionnaire.

Military deployment and demographic data were obtained from the Defense Manpower Data Center (DMDC) for service members deployed to countries such as Iraq and Afghanistan after September 11, 2001. The electronic deployment data captured individuals who received imminent danger pay, hardship duty pay, and combat zone tax exclusion. The deployment variable was further categorized into deployment with combat exposure and deployment without combat exposure. Deployment was assessed as three separate categories (nondeployed, deployed with self-reported combat exposure, and deployed without self-reported combat exposure).

Statistical Analyses

In Manuscript #1, the prevalence of hypertension was calculated among the three different sources of self-report, provider diagnosis, and antihypertensive medications dispensed. Baseline characteristics were determined for self-reported hypertension, electronically recorded diagnosis, and prescription antihypertensive medication. The Pearson's chi-square test was used to assess unadjusted associations among categorical data. Reliability between diagnosis methods was evaluated using kappa statistics and corresponding 95% confidence intervals were calculated. Multiple variations of outpatient and inpatient ICD-9-CM codes were assessed to identify provider-diagnosed hypertension and to determine the highest agreement with self-reported hypertension.

In Manuscript #2, prevalence was determined for self-reported hypertension. Descriptive analyses were conducted on baseline Cohort members and consisted of calculated proportions for characteristics of interest. Pearson's chi-square was used to evaluate differences between hypertensive and normotensive individuals by various demographic and behavioral characteristics. Multiple logistic regression was conducted to estimate the odds ratio between prevalent hypertension given demographics and behavioral characteristics, such as BMI, alcohol consumption, and smoking status. Multicollinearity was assessed for variables with a conservative variance inflation level of greater than four to determine the existence of high degree of correlation among two or more explanatory variables.⁷³ Marginal analysis was conducted to determine which variable to include in the model. Univariate analyses were run for all variables. Variables were broadly assessed at the 0.20-level of significance and were initially

included in the model. Confounding was assessed by calculating the absolute difference of the crude odds ratio minus the adjusted odds ratio divided by the adjusted odds ratio, and evaluating whether that result was greater than 10%. Potential confounders and variables considered confounders based on the literature were also kept in the model. The most parsimonious model was then determined. This model included all other variables except for education. Education was then given a second chance in the model. We then modeled with demographics characteristics only and then modeled with demographic and military characteristics only. The results did not change from the different methods of modeling, therefore, the full model with lifestyle behaviors was used to characterize the variables of interest. A sub-analysis of active duty members was then conducted to assess antihypertensive medications dispensed. Pearson's chi-square tests were used to determine whether differences existed among hypertensive and normotensive individuals.

In Manuscript #3, the relationship between new-onset hypertension and recent military deployment was assessed. Cumulative incidence was calculated to estimate the 3-year risk of new-onset hypertension. Pearson's chi square was used to evaluate the difference in characteristics between responders and non-responders to the follow-up questionnaire. We conducted multivariable logistic regression with the outcome variable, being new-onset hypertension, with the explanatory variable, as recent deployment. Odds ratios and 95% confidence intervals were obtained from the regression model. Odds ratios were used to estimate the effect measure of relative risk. Covariates evaluated were sex, birth year, education, marital status, race/ethnicity, active duty status, military pay grade, service branch, occupation, obesity status, alcohol consumption,

physical activity, strength training, and smoking status. Stress was excluded in our model since it was an intermediate variable resulting from deployment. The most parsimonious model included all variables except for education, occupation, service branch, and smoking status. The variables excluded then were given a second chance in the model independently. Multicollinearity and confounding were assessed, and modeling was conducted similarly as in Manuscript #2. The results did not change from the different methods of modeling, therefore, the full model with lifestyle behaviors were used to characterize the variables of interest.

CHAPTER 4: RESULTS

Manuscript #1: Hypertension Prevalence and Reliability Assessment

A total of 41,129 active duty members were evaluated for the prevalence of self-reported hypertension, provider-diagnosed hypertension, and antihypertensive medications dispensed. Detailed results are presented in Appendix 1. The prevalence of provider-diagnosed hypertension was 5.0%, of antihypertensive medications dispensed was 7.0%, of self-reported hypertension was 10.0%, and the prevalence of any of the three sources was 13.3%. There was moderate agreement between self-reported and electronically recorded diagnosed hypertension ($\kappa=0.50$; 95% CI: 0.49, 0.52), and self-reported hypertension and hypertension defined as at least one antihypertensive medication dispensed in the pharmacy system ($\kappa=0.49$; 95% CI: 0.47, 0.50). When self-report was compared to the combined provider diagnoses plus antihypertensive medication dispensed, there was moderate agreement ($\kappa=0.48$; 95% CI: 0.46, 0.50).

Manuscript #2: Factors Associated with Self-Reported Hypertension

A total of 70,100 active duty, Reserve, and National Guard members were assessed for factors associated with prevalent hypertension. Detailed results are presented in Appendix 2. The overall prevalence of self-reported hypertension at the baseline Millennium Cohort questionnaire for participants in this study was 10.4%, with 2.7% for those born after 1980 and 19.1% in the older group born prior to 1960. Adjusted models showed hypertension prevalence was lower for females, younger individuals, Hispanics, and participants from the Air Force service. Obese individuals were over three times more likely to report hypertension (OR=3.65; 95% CI: 3.36, 3.97)

compared to normal/underweight individuals. Hypertensive subjects were 1.77 (95% CI: 1.65, 1.89) times more likely to be non-Hispanic Black than non-Hispanic White. Self-reported hypertensive active duty members who were dispensed antihypertensive medications were more likely to be older and non-Hispanic Black compared to those not on treatment.

Manuscript #3: Hypertension and Deployment Relationship

A total of 37,075 active duty, Reserve, and National Guard participants were evaluated to determine the relationship between incident hypertension and recent military deployment to Iraq and Afghanistan. Detailed results are presented in Appendix 3. Newly reported hypertension was found in 5.6% of those participants who were deployed and 7.3% among the nondeployed. Within the three years between baseline and follow-up survey, over 24.5% of the 37,075 Cohort members who responded to both surveys with no pregnancy-related hypertension and complete demographics had been deployed, with 12.3% who self-reported combat exposure during that deployment. After adjusting for potential confounding, deployers with no reported combat exposures were 0.74 (95% CI: 0.65, 0.86) times as likely to develop incident hypertension than nondeployers. There was no association between deployers with reported combat exposures and nondeployers; however, when compared to deployers without reported combat exposure, deployers with reported combat exposure were 1.31 (95% CI: 1.07, 1.61) times more likely to develop incident hypertension.

CHAPTER 5: DISCUSSION AND CONCLUSIONS

The overall goal of this study was to determine whether recent military deployment was associated with the development of new-onset hypertension. Secondly, we sought to determine the prevalence of hypertension using three different sources of information, to include self-report from Millennium Cohort questionnaires, electronically recorded inpatient and outpatient *International Classification of Diseases*, Ninth Revision, Clinical Modification (ICD-9-CM) codes, and electronically recorded prescriptions from the military and civilian health care systems. An additional aim was to assess the reliability of self-reported hypertension compared to provider-diagnosed hypertension, and prescription antihypertensive medications dispensed as an indicator of hypertension.

In this large cohort of US military service members, the prevalence of hypertension was lower than found in the general US population. The prevalence of self-reported hypertension among active duty and Reserve/National Guard Cohort members was 10.4%. Prevalence was higher substantially in the older age group born prior to 1960 compared to the younger age group born in 1980 and forward (19.1% versus 2.6%).

Overall, the prevalence of hypertension was highest in self-reported data followed by prescription antihypertensive medication dispensed and provider-diagnosed hypertension. When different methods of capturing ICD-9-CM codes were compared with self-reported hypertension, kappa statistics ranged from 0.44 to 0.50 (95% CI ranging from 0.42 to 0.52). When self-report was compared to at least one antihypertensive medication dispensed, there was moderate agreement (kappa=0.49; 95%

CI: 0.47, 0.50). Provider diagnosis compared to at least one antihypertensive medication resulted in a higher kappa statistic of 0.60 (95% CI: 0.58, 0.61). When the combined ICD-9-CM codes and antihypertensive medications dispensed were compared the self-report, the agreement was moderate (kappa=0.48; 95% CI 0.46, 0.50).

Recent military deployment with no reported combat exposures was protective of new-onset hypertension. Deployers with no reported combat exposures were 0.74 (95% CI: 0.65, 0.86) times as likely to develop new-onset hypertension than nondeployers, after adjusting for sex, birth year, education, marital status, race/ethnicity, active duty status, military pay grade, service branch, occupation, obesity status, alcohol consumption, physical activity, strength training, and smoking status. When deployers with reported combat exposure were compared to nondeployers, there was no association.

While deployment in general appeared to be protective for new-onset hypertension, it is possible that the comparison among the deployers may be more appropriate to determine the effect of higher stress deployments. Deployers are often healthier than nondeployers since satisfactory state of health is a requirement for pre-deployment clearance. Service members are deployed to locations where medical care may be minimal and evacuation to more advanced medical facilities would impact the mission and drain limited resources. In order to account for this “healthy deployer effect,” deployers with combat exposure were compared to deployers without combat exposure. Deployers with reported combat exposure were found to be at higher risk of developing hypertension, when compared to deployers with no reported combat exposure. Individuals who are deployed are more likely to be healthier than those who

are not deployable or not deployed. Furthermore, service members who are more likely to be exposed to combat are presumably healthier than those who may not be exposed to combat. Figure 5 shows the postulated causal relationships between health status, deployment, combat exposure, and new-onset hypertension. For these reasons, the estimated odds ratios among deployers with combat exposure was likely to be biased towards the null, providing greater confidence that risk for hypertension incidence among this population truly existed.

The nature of this prospective cohort study design allows for calculation of cumulative incidence and estimated risk of new onset hypertension. Selection bias may have occurred since individuals who died and those who potentially developed hypertension but dropped out were not included in the study. The cumulative incidence of hypertension was calculated within the 3-year period. However, the implications of not censoring after this 3-year period would have resulted in increased cases of hypertensive individuals in the future since hypertension has been shown to increase with age. Because the outcome of self-reported hypertension was binary, multivariable logistic regression was used to determine whether there was a relationship between the binary dependent variable and multiple independent variables. The odds ratios were calculated from the logistic regression equations. In this case, odds ratios were used to estimate relative risk, under the assumptions that the cases of hypertension reasonably reflect all cases, selection of cases and controls are not based on the exposure of recent deployment history, and that the outcome of hypertension was considered rare.

Strengths

The main strength of this study lies in the prospective design, which allows for calculation of cumulative incidence and estimated risk of new-onset hypertension. Cohort studies are less prone to recall bias. An additional strength of this study was the large sample size, which allows for robust analysis of hypertension and deployment and adequate power to detect a difference. Further, the ability to electronically link to outpatient and inpatient medical outcomes as well as pharmaceutical data allow for a unique investigation of the three sources of hypertension assessment. The population was representative of all branches of service in the military and generalizable to the US military population.

Limitations

Misclassification of hypertension status was potentially present in all three sources of assessment. Recall bias or lack of understanding of the disease may be present in self-reported data resulting in over or under reporting of the disease. Misclassification also can occur in provider-diagnosed hypertension in Manuscript #1. ICD-9-CM codes are limited by their date of capture. Antihypertensive medications dispensed may not necessarily capture individuals who are hypertensive or those actually on active treatment in Manuscripts #1 and #2. Many antihypertensive medications also are prescribed for other conditions such as migraine headaches, anxiety, bipolar disorders, alcohol withdrawal, aggressive behavior, and conditions affecting the heart and kidneys. Although the prevalence of heart conditions and kidney failure are fairly low in the

healthy military population, antihypertensive medication can be used to treat cardiac arrhythmias, angina pectoris, congestive heart failure, and renal dysfunction. Therefore receipt of antihypertensive medication may lead to a normotensive person falsely classified as hypertensive. Limitations in pharmacy data also may be a factor since mandatory reporting was not implemented until 2000.

Because new-onset hypertension was captured as a binary variable (hypertensive, non-hypertensive) in Manuscript #3, misclassification error may have occurred where hypertension preceded deployment. However, in a sub-analysis of 1,707 hypertensive individuals with self-reported year of onset after the baseline survey date, 42 were identified as hypertensive prior to deployment and were excluded.

Misclassification of pregnant women may have occurred in the attempt to exclude pregnancy-related hypertension. Because exclusion was limited by the information from the questions asked within the Millennium Cohort Study baseline and follow-up questionnaires, only women with no period due to pregnancy or women who recently gave birth within the last three years were captured. Pregnant women who may have had spotting menstrual cycles were not excluded. Additionally, hypertension may have been diagnosed after childbirth unrelated to the pregnancy. However, this population was relatively small in each of the three manuscripts and unlikely to change the results.

Differential loss to follow-up is a concern in longitudinal studies and can result in biased cumulative incidence estimates. Individuals lost to follow-up may have different characteristics of exposure and disease, compared to the rest of the population. The response rate of 71.4% was achieved, and there was minimal or no difference in relation

to hypertension status, sex, race/ethnicity, service branch, active duty status, or occupation. Selection bias could have occurred from individuals who were unable to submit the questionnaires while deployed to austere locations, or who did not have adequate time for health examinations and diagnosis of hypertension upon return. For this reason, individuals who completed their questionnaire while deployed were excluded in Manuscript #3. Furthermore, allowing for a diagnosis time of three months between post deployment until self-report of hypertension did not change the results.

Future Directions

This study addressed the affect of recent military deployment on incidence hypertension. Future studies addressing long-term consequences of deployment are possible as more longitudinal data are available. Other future analyses include identifying individuals who died as a result of hypertension-related diseases and assessing whether individuals who did not respond to the follow-up questionnaire were the result of being deployed, in order to further address potential selection bias. Another analysis includes assessing the initiation or resumption of smoking as a result of stress from combat. Future analyses controlling for the overall general health of deployers and nondeployers are projected. Additionally, evaluation of self-reported functional health and well-being among hypertensive individuals is warranted.

Conclusions

Military service members are adversely affected by chronic diseases, such as hypertension, as are all populations. Preventing hypertension is essential to promoting a fit and ready force. Deployment, in general, was protective of new-onset hypertension. A lower incidence of hypertension was found among military deployers, and was likely due to a selection process that resulted in a higher level of overall health in this group. However, accounting for this “healthy warrior effect” showed that deployers with reported combat exposures were at higher risk of developing hypertension than deployers without reported combat exposure. The reduction of obesity and alcohol consumption, as well as the promotion of physical activity and strength training may be valuable in decreasing the prevalence of hypertension in military service members. Due to the ill health effects of smoking and increased cardiovascular risk, smoking cessation should still be recommended due to its long-term association with cardiovascular disease. Self-reported hypertension has shown to have moderate agreement with provider-diagnosed ICD-9-CM codes and dispensed antihypertensive medication, and is an indication of reasonable reliability if only one source were available to researchers.

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APPENDIX A: MANUSCRIPT #1**Prevalence of Hypertension in a Large Military Cohort: Comparison of Self-Report,
Electronic Medical and Prescription Records**

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ABSTRACT

Objective: We sought to determine the prevalence of hypertension and the reliability of self-report from a large, population-based cohort, compared to electronic medical diagnosis and record of prescriptions dispensed to active duty United States (US) military personnel.

Research Design: Self-reported hypertension from baseline Millennium Cohort data were utilized in addition to hypertensive outpatient and inpatient diagnoses, and antihypertensive medications dispensed from US Department of Defense pharmacy records to determine the prevalence of hypertension among US service members. Percent agreement and kappa statistics were calculated to evaluate overall agreement between self-report and other sources of hypertension assessment.

Results: The prevalence of hypertension was 5.0% from provider diagnosis, 7.0% based on antihypertensive medication dispensed, 10.0% from self-report, and 13.3% using any of the three sources. There was moderate agreement between self-reported and electronically recorded diagnosed hypertension (kappa=0.50; 95% confidence interval [CI]: 0.49, 0.52), and self-report and at least one antihypertensive medication dispensed in the pharmacy system (kappa=0.49; 95% CI: 0.47, 0.50). When self-report was compared to the combined provider diagnoses plus antihypertensive medication dispensed, there was moderate agreement (kappa=0.48; 95% CI: 0.46, 0.50).

Conclusions: Information gained from electronic medical records can complement self-report when identifying hypertensive patients in the absence of blood pressure measurements. Moderate agreement was observed between self-report and diagnosis,

antihypertensive medication dispensed, and combined diagnosis plus antihypertensive medication dispensed.

INTRODUCTION

Hypertension affects approximately 33% of adults in the United States (US) and is associated with substantial clinical and economic burden of illness.^{1,2} Prevalence increases with age in the general US population.¹ Due to a younger and relatively healthier population base, the prevalence of hypertension in the US military was less when compared to the general US population. Previous reports suggest the prevalence of self-reported hypertension among US service members to be 10.2% (9.9% among active duty and 10.6% among Reserve/National Guard).³ Prevalence of hypertension has been reported slightly higher at 12.3% to 55.6% among retired military populations.⁴⁻⁷

Self-reported health outcomes are often used to assess disease state in large population-based studies. Accurately identifying hypertensive individuals within real-world settings is crucial when studying patterns of care, and becomes especially important when screening large patient populations. Challenges exist in the methods used to identify hypertensive patients. When blood pressure measurements are unavailable, evaluating several sources of administrative data may be valuable in the accurate identification of hypertensive individuals. Sources of data include self-administered questionnaires, electronic medical records, and prescription medication databases. Several studies have used kappa statistics to determine reliability by assessing the agreement of self-reported hypertension compared to various sources that capture hypertension, including administrative data, medical records, or blood pressure measurements.⁸⁻¹¹ Studies also have determined the validity of self-reported

hypertension in which administrative data, medical records, or blood pressure measurements were deemed the "gold standard."^{8-10, 12, 13}

The purpose of this study was to determine the prevalence of hypertension in a large population-based military cohort as assessed by self-report and electronic medication records. Further, this study compares hypertension indication agreement between self-reported, electronically recorded hypertension diagnosis, and electronically recorded medications, to better assess hypertensive patients within this Cohort. Unique aspects of this research include its large sample size, prospective design, and focus on a mainly younger population who at baseline were actively serving in the US military.

METHODS

Study Population

Baseline enrollment in the Millennium Cohort Study spanned from July 2001 to June 2003 and resulted in 77,047 consenting participants.³ Individuals who had previously deployed to Southwest Asia, Bosnia, or Kosovo between 1998 and 2000, Reserve and National Guard personnel, and female service members were oversampled to ensure adequate power in stratified analyses.³ A representative sample of US active duty, Reserve, and National Guard service members from the Army, Air Force, Navy, Coast Guard, and Marines were randomly selected from personnel on service rosters as of October 2000.

In the current analysis, individuals were limited to active duty men and women with known self-reported hypertension status (present or absent) and complete

demographic data at baseline. Reserve and National Guard personnel were excluded due to differential access to military healthcare. Furthermore, women who positively reported "No periods because pregnant or recently gave birth" or "Have you given birth within the last three years" were excluded to rule out pregnancy-related hypertension. As a result, a total of 41,129 Millennium Cohort members were eligible for this study.

Definition of Hypertension

Self-reported hypertension was captured by the Millennium Cohort baseline questionnaire. Participants were asked: "Has your doctor or other health professional EVER told you that you have any of the following conditions?" The condition, "Hypertension (high blood pressure)," was captured through a response of "No" or "Yes."

Electronically recorded *International Classification of Diseases*, Ninth Revision, Clinical Modification (ICD-9-CM) diagnoses, based on work done by Smith B et al (Appendix 1),¹⁴ were used to assess hypertension prevalence in active duty cohort members from outpatient and inpatient medical records in military and civilian facilities. However, ICD-9-CM codes 642.3 (transient hypertension of pregnancy) and 642.4 (mild or unspecified pre-eclampsia) were excluded since pregnancy-related hypertension was excluded from self-reported data. Outpatient data were obtained from the Standard Ambulatory Data Record, which began collecting and compiling outpatient diagnoses from military healthcare facilities starting in October 1998. Inpatient data were obtained from the Standard Inpatient Data Record, which began collecting and compiling

hospitalization diagnoses from military healthcare facilities as of October 1988.

Diagnoses obtained for medical care rendered outside of military healthcare facilities, and billed to the Department of Defense (DoD) for care, were obtained from the Health Care Services Record beginning from October 1993. All electronic medical records were scanned through the date of the survey submission from the aforementioned availability dates. Various definitions of diagnosed hypertension were explored using the above sources. Outpatient military, inpatient military, and both outpatient and inpatient medical care rendered outside military healthcare facilities were looked at separately for at least one ICD-9-CM code. At least two ICD-9-CM codes were then looked at for each of the above. Finally, combinations of outpatient and inpatient codes were assessed.

Antihypertensive medications were based on therapeutic classes from the Physician's Desk Reference, 57th edition from the Seventh Report of the Joint National Committee (Appendix 2).¹⁵ In order to capture a broader range of potential prescription antihypertensive medications, cardiovascular drugs, cardiac drugs, cardiotonic agents, and miscellaneous cardiac drugs also were included for a total of 16 American Hospital Formulary Service therapeutic classes. Potential antihypertensive medications were further classified through product names, recoded into generic names, and limited to more long-term prescriptions dispensed for at least 30 days or more.

Pharmaceutical data were obtained from the Pharmacy Data Transaction Service (PDTS) within the Military Health System Data Repository (MDR). PDTS is a DoD centralized electronic pharmaceutical dispensing database that captures mandatory-reported data from all military medical treatment facilities worldwide, civilian retail

pharmacy networks, and TRICARE Mail Order Pharmacy. Because PDTS was initiated in 2000, voluntarily reported archived data were obtained from the DoD Pharmaco-economic Center and the National Mail Order Pharmacy data were queried from the MDR database, which both spanned from October 1999 to September 2001.

Other Variables

Demographic and service data were acquired from the Defense Manpower Data Center and supplemented with baseline Millennium Cohort questionnaire data as necessary. The variables included in the analysis were sex, birth year, education, marital status, race/ethnicity, military pay grade (enlisted or officer), service branch (Army, Air Force, Navy/Coast Guard, Marines), and occupation.

Statistical Analysis

Baseline characteristics were determined for self-reported hypertension, electronically recorded diagnosis, and prescription antihypertensive medication. The Pearson's chi-square test was used to assess unadjusted associations among categorical data. Kappa statistics and corresponding 95% confidence intervals were calculated to evaluate the overall agreement between self-reported hypertension, electronically recorded diagnosis, and pharmacy medications dispensed. A kappa score greater than 0.80 was considered "greater than substantial agreement," 0.61-0.80 is considered "substantial," 0.41-0.60 was considered "moderate," 0.21-0.40 was considered "fair," and less than 0.20 was considered "slight or poor agreement."¹⁶ Statistical analyses were

performed using SAS software, version 9.1.3 (SAS Institute, Inc., Cary, NC).¹⁷. Kappa statistics were further calculated for various combinations of diagnosis indication and antihypertensive medications to determine which combination better agreed to self-reported hypertension.

RESULTS

Baseline characteristics are reported in Table 1 for 41,129 active duty Millennium Cohort participants with complete data. Those self-reporting hypertension were more likely to be older and married compared to self-reported normotensive individuals. Cohort members identified as hypertensive by electronic record of diagnosis were more likely to be older, better educated, married, Black non-Hispanic, and serving in the Air Force when compared with those without record of diagnosis. Participants who were dispensed at least one antihypertensive medication were more likely to be older, better educated, and married when compared to those with no antihypertensive medication dispensed. Individuals identified as hypertensive by electronic diagnosis plus at least one antihypertensive medication dispensed were more likely to be older, better educated, married, and Black non-Hispanic when compared with those with no record of diagnosis and no antihypertensive medication dispensed.

The prevalence of self-reported hypertension among active duty Millennium Cohort members with no pregnancy-related hypertension was found to be 10.0%. The prevalence of provider-diagnosed hypertension, noted as two or more outpatient and/or one or more inpatient codes, was 5.0%, while the prevalence of at least one

antihypertensive prescription medication dispensed was observed to be 7.0%. When provider diagnosis was combined with at least one antihypertensive medication for a more stringent criteria, the prevalence dropped to 3.7%. The prevalence of hypertension as evidenced by positive indication to any of the sources used for this study was 13.3%. A Venn diagram illustrates the amount of overlap from the three definitions of hypertension (Figure 1). A total of 1,858 had both self-report of hypertension and antihypertensive medication dispensed, 1,654 had both self-report and diagnosis, while 1,529 had both diagnosis and antihypertensive medication dispensed. More specifically, the number of individuals who had all three sources of hypertension was 1,437.

Agreement between the various definitions or classification systems are shown in Table 2. Kappa statistics ranged from 0.44 to 0.50 (95% CI: 0.43, 0.52) when self-reported hypertension was compared to combinations of outpatient and inpatient provider diagnoses. Comparison of self-report to inpatient diagnoses or data from civilian medical facilities resulted in lower kappa scores. There was moderate agreement between self-reported hypertension and at least one electronically recorded diagnosis (kappa=0.49; 95% CI: 0.48, 0.51). Defining hypertension using two or more outpatient and/or one or more inpatient codes showed similar agreement (kappa=0.50; 95% CI: 0.49, 0.52) and was used to represent provider-diagnosed hypertension in other analyses, since this combination showed a higher kappa coefficient and increased the likelihood that the codes represent an intent of a diagnosis instead of a visit to rule-out hypertension. Although inpatient diagnoses had little impact on kappa statistics, the option was included. Moderate agreement was observed between self-reported hypertension and at

least one antihypertensive medication dispensed in the pharmacy system ($\kappa=0.49$; 95% CI: 0.47, 0.50). Comparing self-report to at least two antihypertensive medication did not change results. When evaluating the concordance of ICD-9-CM codes and antihypertensive medications, the agreement between at least two outpatient and/or one inpatient diagnoses and at least one antihypertensive medication was higher, although moderate ($\kappa=0.60$; 95% CI: 0.58, 0.61). When self-reported hypertension was compared to at least two or more outpatient and/or one or more inpatient codes combined with at least one antihypertensive medication dispensed, the agreement was moderate ($\kappa=0.48$; 95% CI: 0.46, 0.50). Table 3 shows the concordance and discordance between self-reported hypertension and the various methods of classifying hypertension through provider diagnosis, at least one antihypertensive medication dispensed, and the combination of diagnosis and antihypertensive medication. Of the 4,120 individuals who self-reported ever being told they had hypertension, 1,858 (45.1%) were dispensed antihypertensive medication. Of the 2,055 provider-coded hypertensive patients, 1,529 (74.4%) were dispensed antihypertensive medication.

DISCUSSION

Overall, the prevalence of hypertension was highest in self-reported data followed by prescription antihypertensive medication dispensed, and provider-diagnosed hypertension from electronic medical records. National data have shown that men have a higher prevalence of hypertension than women (38% versus 29%) while Blacks have a higher prevalence of hypertension than Whites (38% versus 29%).¹⁸ In the current study

based on self-reported data, men also were more likely to have hypertension than women (10.7% versus 7.1%), while non-Hispanic Blacks were more likely to have hypertension than non-Hispanic Whites (14.9% versus 9.3%). Although men have higher prevalence of hypertension, women have been shown to be more aware of their hypertension status (76% versus 63%) and are more frequently being treated with antihypertensive medication (61% versus 44%).¹⁹ In this study, women were slightly more likely to be dispensed antihypertensive medication than men (8.6% versus 6.6%). This may be due to more physician contact with women compared to men.

Misclassification of hypertension status is potentially present in all three sources of assessment. Recall bias may be present in self-reported data resulting in over or under reporting. Patients erroneously reporting hypertension while still undergoing the diagnostic or 'rule out' phase, may stem from inadequate patient-clinician communication.¹⁴

Misclassification also can occur in provider-diagnosed hypertension. ICD-9-CM codes are limited by their date of capture. Individuals may self-report hypertension that was diagnosed prior to the electronic capturing of the ICD-9-CM codes. Furthermore, the incentive to improve coding is not as high in military health care facilities compared to the civilian sector, where codes are linked to direct reimbursement of charges.²⁰

Antihypertensive medications dispensed may not necessarily capture individuals who are hypertensive or those actually on active treatment. Many antihypertensive medications also are prescribed for other conditions such as migraine headaches, anxiety, bipolar disorders, alcohol withdrawal, aggressive behavior, and conditions affecting the

heart and kidneys. Although the prevalence of heart conditions and kidney failure are fairly low in the healthy military population, antihypertensive medication can be used to treat cardiac arrhythmias, angina pectoris, congestive heart failure, and renal dysfunction. Therefore receipt of antihypertensive medication may lead to a normotensive person falsely classified as hypertensive.

The prevalence of antihypertensive medication use has been found to be higher among older individuals, but it also is true that the prevalence of hypertension increases with age.²¹ Long-term adherence and control is a problem in the management of hypertensive patients,²² yet older age has been associated with increased adherence.^{23, 24} Therefore, one might expect the agreement between self-reported hypertension and receipt of an antihypertensive prescription to be stronger in older persons. Thus younger age may contribute to low sensitivity for detection of hypertension by receipt of a prescription of an antihypertensive medication. Another potential factor contributing to low sensitivity might be remission of hypertension as might be seen with lifestyle intervention leading to no recent requirement for antihypertensive medication.

Classifying hypertension using a serial strategy as defined by a diagnosis of hypertension (at least 2 outpatient and/or at least 1 inpatient codes) plus at least one antihypertensive medication ensured higher specificity and therefore a greater likelihood that hypertension was truly present in persons meeting these criteria. Compared to this standard, the positive predictive value of self-reported hypertension would diminish, but would be offset by a higher negative predictive value. Thus, the more stringent serial strategy would result in better ability of self-report of hypertension to rule out disease (if

negative) than to rule in disease (if positive). Choice of criteria for assessing hypertension would depend on the goals of the analysis, and whether greater information and benefit were derived from an inclusive (rule in) versus an exclusive (rule out) strategy. There were 92 (0.2%) individuals who self-reported not having hypertension, but had medical record of hypertension as denoted above. Among those who self-reported having hypertension, 2,683 (65%) individuals did not have an electronic diagnosis of hypertension. Of those, 421 had no electronic diagnosis but were dispensed antihypertensive medication, 217 had no evidence of being prescribed antihypertensive medication, and 2,045 had neither.

Several studies have reported fair to substantial agreement between self-reported hypertension and various sources of hypertension such as administrative data, medical records, or blood pressure measurements.⁸⁻¹¹ Kappa coefficients ranged from 0.29 to 0.70 (95% CI range: 0.05, 0.76). When self-reported hypertension was validated with the various sources of hypertension in other studies, sensitivity ranged from 23% to 95%, while specificity ranged from 86% to 99%.^{8-10, 12, 13} In another study, when at least one hypertension-related diagnosis was compared to medical records, the kappa coefficient was 0.45, with sensitivity and specificity at 70.8% and 74.9%.²⁵ A study of military personnel found the agreement between self-reported hypertension and documented hypertension in the medical records of active duty, retired, and military family members to be 94.2% (N=536).¹² The sensitivity of correctly identifying high blood pressure histories was 95.4%, while the specificity of correctly identifying normal blood pressure histories was 92.4%.¹² One would expect the observed agreement to be much higher than

in the current study since a more thorough process was used, in which medical records were reviewed to obtain the most recent systolic and diastolic blood pressure readings, documentation of prescribed antihypertensive medications, and evidence of a medical diagnosis of hypertension.¹² Comparing at least one hypertension-related diagnosis and at least one hypertension prescription claim with medical records increased the kappa coefficient to 0.65 with sensitivity and specificity at 76.2% and 93.3%.²⁵ The predominately moderate agreement found in this study is consistent with previous studies. In this study, when different methods of capturing diagnoses and antihypertensive prescription medications were compared with self-reported hypertension, kappa statistics varied slightly. However, less agreement was found when self-reported hypertension was compared to inpatient diagnoses and data from civilian facilities only. This decline in agreement is possibly due to the well recognized dependence of kappa on the prevalence of the condition of interest.²⁶ Since few individuals would have had the opportunity to be hospitalized in DoD or non DoD settings, the occurrence of hypertension diagnosed in these facilities is low and therefore responsible for the decline in kappa. When various methods of capturing diagnoses were compared to at least one antihypertensive medication dispensed, slightly increased kappa statistics were found.

The providers' discretion to recommend lifestyle modification instead of antihypertensive treatment also may explain the discordance between self-reported hypertension and dispensed antihypertensive medications. According to the Veterans Health Administration/DoD Clinical Practice Guidelines, clinicians should recommend

lifestyle modifications to all patients.²⁷ They also may consider aggressive lifestyle modifications without drug therapy for a short period of time up to six months in selective patients with lower blood pressure measurements, no cardiovascular risk factors, and high motivation for exercise and diet restriction.²⁷ Antihypertensive medication is recommended for all others and for those who cannot control their blood pressure with short-term aggressive lifestyle modifications. Initial reliance on lifestyle modification as treatment may explain some of the discrepancy between self-report of the condition and confirmation of pharmacologic treatment received for the same condition.

There are several limitations to these analyses. Complete electronically recorded diagnostic and prescription medication data were not available for Reserve and National Guard personnel (N=33,157). Misclassification of pregnant women for exclusion may have occurred. Pregnancy-related hypertension may not have been captured accurately through self-report in active duty women who reported having no period due to pregnancy or recently giving birth. The relatively small number of those excluded (n=2,486) is unlikely to affect the results.

The sample of responders to the Millennium Cohort Study questionnaire may not be generalizable to the entire military population since those who are severely ill may not respond. However, investigation of potential biases in the Millennium Cohort has found a well-representative military cohort who report reliable data and whose participation appears to be not influenced by poor health prior to enrollment.^{3, 28-36}

Despite limitations, the main strengths of this study include a large sample size, allowing for a robust analysis of hypertension. Further, the ability to electronically link

to outpatient and inpatient medical outcomes as well as pharmaceutical data allow for a unique investigation of the three sources of hypertension assessment. Because access to healthcare is free to all active duty members and blood pressure measurement is routinely performed for all medical visits, one would expect a low probability of undiagnosed hypertension in this population.

Conclusion

The prevalence of self-reported hypertension in this large population-based military cohort was 10.0% with a prevalence of 13.3% as indicated by any source. Including electronic medical diagnoses and medications dispensed may provide a more accurate ascertainment of hypertension in a population when clinical data are not available. Moderate agreement of self-reported hypertension with provider-diagnosed hypertension and antihypertensive medications dispensed is an indication of reasonable reliability if only one source were available to researchers. Understanding the strengths and limitations of administrative databases are critical when using these data sets to classify patients in large population-based studies.

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TABLE 1. Baseline Characteristics of Self-Reported Hypertension (HTN), ICD-9-CM[†] Codes and Antihypertensive Medication Dispensed among Active Duty Cohort Members (Part 1)

Characteristics* (N=41,129)	Self-Report				Diagnosis [†]			
	HTN (N=4,120)		Non-HTN (N=37,009)		HTN (N=2,055)		Non-HTN (N=39,074)	
	n	%	n	%	n	%	n	%
Sex								
Male	3,541	(85.9)	29,400	(79.4)	1,720	(83.7)	31,221	(79.9)
Female	579	(14.1)	7,609	(20.6)	335	(16.3)	7,853	(20.1)
Birth year								
Pre 1960	1,029	(25.0)	4,153	(11.2)	681	(33.1)	4,501	(11.5)
1960-1969	1,978	(48.0)	14,517	(39.2)	1,072	(52.2)	15,423	(39.5)
1970-1979	1,033	(25.1)	16,012	(43.3)	288	(14.0)	16,757	(42.9)
1980 and forward	80	(1.9)	2,327	(6.3)	14	(0.7)	2,393	(6.1)
Education								
<High school diploma	101	(2.4)	896	(2.4)	37	(1.8)	960	(2.5)
High school diploma	1,791	(43.5)	17,166	(46.4)	684	(33.3)	18,273	(46.8)
Some college	1,215	(29.5)	9,340	(25.3)	758	(36.9)	9,797	(25.1)
College graduate	537	(13.0)	5,860	(15.8)	281	(13.7)	6,116	(15.6)
Advanced degree	476	(11.6)	3,747	(10.1)	295	(14.3)	3,928	(10.0)
Marital Status								
Married	3,089	(75.0)	23,427	(63.3)	1,628	(79.2)	24,888	(63.7)
Single	807	(19.6)	11,789	(31.9)	296	(14.4)	12,300	(31.5)
Other	224	(5.4)	1,793	(4.8)	131	(6.4)	1,886	(4.8)
Race								
White, non-Hispanic	2,464	(59.8)	24,115	(65.2)	1,129	(55.0)	25,450	(65.1)
Black, non-Hispanic	867	(21.1)	4,965	(13.4)	561	(27.3)	5,271	(13.5)
Asian/Pacific Islander	499	(12.1)	4,535	(12.3)	249	(12.1)	4,785	(12.3)
American Indian	37	(0.9)	298	(0.8)	12	(0.6)	323	(0.8)
Hispanic	206	(5.0)	2,486	(6.7)	87	(4.2)	2,605	(6.7)
Other	47	(1.1)	610	(1.6)	17	(0.8)	640	(1.6)
Military Pay Grade								
Enlisted	3,236	(78.5)	27,961	(75.6)	1,588	(77.3)	29,609	(75.8)
Officer	884	(21.5)	9,048	(24.4)	467	(22.7)	9,465	(24.2)
Service Branch								
Army	1,567	(38.0)	14,512	(39.2)	662	(32.2)	15,417	(39.4)
Air Force	1,218	(29.6)	10,953	(29.6)	840	(40.9)	11,331	(29.0)
Navy/Coast Guard	1,110	(26.9)	8,796	(23.8)	499	(24.3)	9,407	(24.1)
Marines	225	(5.5)	2,748	(7.4)	54	(2.6)	2,919	(7.5)
Occupational Category								
Combat specialist	767	(18.6)	8,517	(23.0)	304	(14.8)	8,980	(23.0)
Electronic repair	461	(11.2)	3,949	(10.7)	220	(10.7)	4,190	(10.7)
Communications/Intel	323	(7.8)	3,133	(8.5)	150	(7.3)	3,305	(8.5)
Health care specialist	369	(9.0)	3,347	(9.0)	218	(10.6)	3,498	(9.0)
Other technical	120	(2.9)	972	(2.6)	64	(3.1)	1,028	(2.6)
Functional support	815	(19.8)	6,395	(17.3)	475	(23.1)	6,735	(17.2)
Electrical/mechanic	731	(17.7)	5,968	(16.1)	365	(17.8)	6,334	(16.2)
Craft workers	121	(2.9)	924	(2.5)	63	(3.1)	982	(2.5)
Service support	358	(8.7)	2,800	(7.6)	167	(8.1)	2,991	(7.7)
Students/others	56	(1.4)	1,004	(2.7)	29	(1.4)	1,031	(2.6)

* Complete self-reported hypertension and demographic data from baseline Millennium Cohort questionnaire July 2001 to June 2003

[†] At least 2 *International Classification of Diseases*, Ninth Revision, Clinical Modification (ICD-9-CM)

outpatient codes and/or at least 1 ICD-9-CM inpatient code in military or civilian facilities equal or prior to the questionnaire date

‡ Antihypertensive medication dispensed for at least 30 days or more equal or prior to questionnaire date

TABLE 1. Baseline Characteristics of Self-Reported Hypertension (HTN), ICD-9-CM[†] Codes and Antihypertensive Medication Dispensed among Active Duty Cohort Members (Part 2)

Characteristics* (N=41,129)	Antihypertensive [‡]				Diagnosis Plus Antihypertensive ^{†‡}			
	HTN (N=2,885)		Non-HTN (N=38,244)		HTN (N=1,529)		Non-HTN (N=39,600)	
	N	%	n	%	n	%	n	%
Sex								
Male	2,181	(75.6)	30,760	(80.4)	1,273	(83.3)	31,668	(80.0)
Female	704	(24.4)	7,484	(19.6)	256	(16.7)	7,932	(20.0)
Birth year								
Pre 1960	937	(32.5)	4,245	(11.1)	558	(36.5)	4,624	(11.7)
1960-1969	1,407	(48.8)	15,088	(39.5)	793	(51.9)	15,702	(39.6)
1970-1979	515	(17.8)	16,530	(43.2)	170	(11.1)	16,875	(42.6)
1980 and forward	26	(0.9)	2,381	(6.2)	8	(0.5)	2,399	(6.1)
Education								
<High school diploma	60	(2.1)	937	(2.4)	28	(1.8)	969	(2.4)
High school diploma	1,043	(36.1)	17,914	(46.8)	511	(33.4)	18,446	(46.6)
Some college	928	(32.2)	9,627	(25.2)	549	(35.9)	10,006	(25.3)
College graduate	402	(13.9)	5,995	(15.7)	212	(13.9)	6,185	(15.6)
Advanced degree	452	(15.7)	3,771	(9.9)	229	(15.0)	3,994	(10.1)
Marital Status								
Married	2,217	(76.8)	24,299	(63.5)	1,230	(80.4)	25,286	(63.8)
Single	458	(15.9)	12,138	(31.8)	206	(13.5)	12,390	(31.3)
Other	210	(7.3)	1,807	(4.7)	93	(6.1)	1,924	(4.9)
Race								
White, non-Hispanic	1,689	(58.6)	24,890	(65.1)	832	(54.4)	25,747	(65.0)
Black, non-Hispanic	663	(23.0)	5,169	(13.5)	423	(27.7)	5,409	(13.7)
Asian/Pacific Islander	367	(12.7)	4,667	(12.2)	201	(13.1)	4,833	(12.2)
American Indian	21	(0.7)	314	(0.8)	8	(0.5)	327	(0.8)
Hispanic	113	(3.9)	2,579	(6.8)	55	(3.6)	2,637	(6.7)
Other	32	(1.1)	625	(1.6)	10	(0.7)	647	(1.6)
Military Pay Grade								
Enlisted	2,146	(74.4)	29,051	(76.0)	1,169	(76.5)	30,028	(75.8)
Officer	739	(25.6)	9,193	(24.0)	360	(23.5)	9,572	(24.2)
Service Branch								
Army	957	(33.2)	15,122	(39.5)	485	(31.7)	15,594	(39.4)
Air Force	1,039	(36.0)	11,132	(29.1)	597	(39.1)	11,574	(29.2)
Navy/Coast Guard	779	(27.0)	9,127	(23.9)	401	(26.2)	9,505	(24.0)
Marines	110	(3.8)	2,863	(7.5)	46	(3.0)	2,927	(7.4)
Occupational Category								
Combat specialist	435	(15.1)	8,849	(23.1)	221	(14.5)	9,063	(22.9)
Electronic repair	290	(10.0)	4,120	(10.8)	157	(10.3)	4,253	(10.7)
Communications/Intel	205	(7.1)	3,250	(8.5)	109	(7.1)	3,346	(8.5)
Health care specialist	438	(15.2)	3,278	(8.6)	172	(11.3)	3,544	(9.0)
Other technical	83	(2.9)	1,009	(2.6)	44	(2.9)	1,048	(2.6)
Functional support	614	(21.3)	6,596	(17.2)	352	(23.0)	6,858	(17.3)
Electrical/mechanic	480	(16.6)	6,219	(16.3)	286	(18.7)	6,413	(16.2)
Craft workers	76	(2.6)	969	(2.5)	46	(3.0)	999	(2.5)
Service support	219	(7.6)	2,939	(7.7)	120	(7.8)	3,038	(7.7)
Students/others	45	(1.6)	1,015	(2.7)	22	(1.4)	1,038	(2.6)

* Complete self-reported hypertension and demographic data from baseline Millennium Cohort questionnaire July 2001 to June 2003

- † At least 2 *International Classification of Diseases*, Ninth Revision, Clinical Modification (ICD-9-CM) outpatient codes and/or at least 1 ICD-9-CM inpatient code in military or civilian facilities equal or prior to the questionnaire date
- ‡ Antihypertensive medication dispensed for at least 30 days or more equal or prior to questionnaire date

TABLE 2. Agreement (Kappa Statistics) Between Various Methods of Classifying Hypertension (HTN)

Comparisons (N=41,129)	HTN Present	HTN Absent	Kappa (95% CII)
Agreement of self-reported HTN* and diagnosis† with			
At least 1 outpatient or inpatient code	1,856	36,047	0.49 (0.48, 0.51)
At least 1 outpatient and 1 inpatient code	1,622	36,084	0.44 (0.43, 0.46)
At least 1 outpatient code in military facility	1,798	36,086	0.48 (0.47, 0.50)
At least 1 inpatient code in military facility	212	36,965	0.09 (0.08, 0.10)
At least 1 code in civilian facility	60	36,998	0.03 (0.02, 0.03)
At least 2 outpatient and/or inpatient codes	1,644	36,620	0.50 (0.49, 0.52)
At least 2 outpatient and 2 inpatient codes	1,540	36,645	0.48 (0.46, 0.49)
At least 2 outpatient and/or 1 inpatient codes	1,654	36,608	0.50 (0.49, 0.52)
At least 2 outpatient and 1 inpatient codes	1,653	36,608	0.50 (0.49, 0.52)
At least 2 outpatient codes in military facility	1,586	36,644	0.49 (0.47, 0.51)
At least 2 inpatient codes in military facility	74	37,004	0.03 (0.02, 0.04)
At least 2 codes in civilian facility	16	37,007	0.01 (0.00, 0.01)
Agreement of self-reported HTN* and antihypertensive medication‡ with			
At least 1 antihypertensive medication	1,858	35,982	0.49 (0.47, 0.50)
At least 2 antihypertensive medications	1,673	36,401	0.49 (0.47, 0.50)
Agreement of diagnosis† (at least 2 outpatient and/or 1 inpatient codes) and antihypertensive medication† with			
At least 1 antihypertensive medication	1,529	37,718	0.60 (0.58, 0.61)
Agreement of self-reported HTN* and diagnosis† (at least 2 outpatient and/or 1 inpatient codes) plus			
At least 1 antihypertensive medication	1,437	36,917	0.48 (0.46, 0.50)

* Complete self-reported hypertension and demographic data from baseline Millennium Cohort questionnaire July 2001 to June 2003

† Diagnosis equal or prior to the questionnaire date in military and civilian facilities, unless otherwise noted

‡ Potential antihypertensive medication dispensed for at least 30 days equal or prior to questionnaire date

Note: **Bold** indicates method of classification used in subsequent analyses

TABLE 3. Kappa Statistics 2x2 Tables and 95% Confidence Intervals (CI)

Provider Diagnosis*

		Yes	No	
Self-Reported Hypertension	Yes	1,654	2,466	4,120
	No	401	36,608	37,009
		2,152	38,977	41,129

Kappa = 0.50
(95% CI: 0.49, 0.52)

Antihypertensive Medication†

		Yes	No	
Self-Reported Hypertension	Yes	1,858	2,262	4,120
	No	1,027	35,982	37,009
		2,885	38,244	41,129

Kappa = 0.49
(95% CI: 0.47, 0.50)

Provider Diagnosis* Plus Antihypertensive Medication‡

		Yes	No	
Self-Reported Hypertension	Yes	1,437	2,683	4,120
	No	92	36,917	37,009
		1,529	39,600	41,129

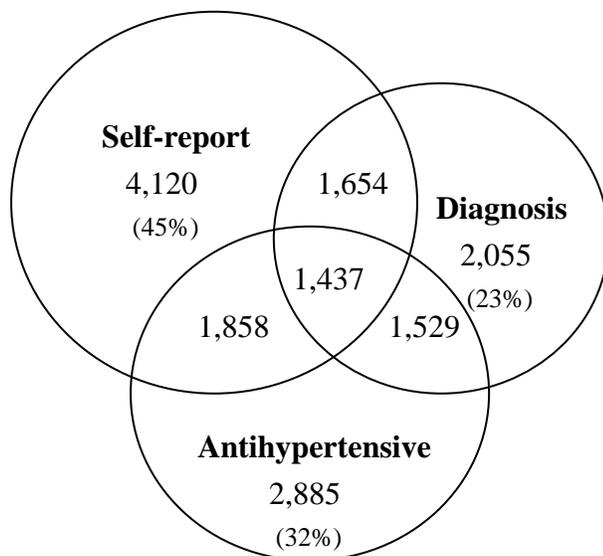
Kappa = 0.48
(95% CI: 0.46, 0.50)

* 2 outpatient and/or at least 1 inpatient codes

† At least 1 antihypertensive medication dispensed

‡ 2 outpatient and/or at least 1 inpatient codes plus at least 1 antihypertensive medication

FIGURE 1. Venn Diagram of Hypertension Sources



Self-report = Complete self-reported hypertension and demographic data from baseline Millennium Cohort questionnaire July 2001 to June 2003

Diagnosis = At least 2 outpatient codes and/or at least 1 inpatient code in military and civilian facilities equal or prior to questionnaire date

Antihypertensive = Antihypertensive medication dispensed for at least 30 days or more equal or prior to questionnaire date

APPENDIX 1. *International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM Diagnoses Used to Characterize Hypertension)*

ICD-9-CM Code*	Description
401	Essential hypertension
401.0	Malignant
401.1	Benign
401.9	Unspecified
402.xx	Hypertensive heart disease
403.xx	Hypertensive renal disease
404.xx	Hypertensive heart and renal disease
405.xx	Secondary hypertension
437.2	Hypertensive encephalopathy
997.91†	Hypertension

* Based on work done by Smith B et al; excluded ICD-9-CM code 642.3 (transient hypertension of pregnancy) and 642.4, (mild or unspecified pre-eclampsia)

† Captures ICD-9-CM code 997.9 prior to October 1995 due to change in naming convention

APPENDIX 2. American Hospital Formulary Service Therapeutic Classes for
 Identification of Potential Antihypertensive Medications

Therapeutic Class Code	Therapeutic Class
240000	Cardiovascular Drugs*
240400	Cardiac Drugs
240408	Cardiotonic Agents
240440	Miscellaneous Cardiac Drugs*
240800	Hypotensive Agents
241200	Vasodilating
241292	Miscellaneous Vasodilating Agents
242000	Alpha-Adrenergic Blocking Agents
242400	Beta-Adrenergic Blocking Agents
242800	Calcium-Channel Blocking Agents
242892	Miscellaneous Calcium-Channel Blocking Agents
243200	Renin-Angiotensin System Inhibitors*
243204	Angiotensin-Converting Enzyme Inhibitors
243208	Angiotensin II Receptor Antagonists
402800	Diuretics
402810	Potassium Sparing Diuretics

* No data fields

APPENDIX B: MANUSCRIPT #2**Factors Associated with Self-Reported Hypertension in US Military****Service Members**

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Abstract

Objective: Hypertension affects over a quarter of the US population and can lead to debilitating cardiovascular disease, stroke, and kidney failure. The objective of this study was to determine the prevalence of hypertension within a large, representative cohort of US military members and to describe patterns of prescription antihypertensive medication use.

Methods: Baseline self-reported questionnaire data from participants in the Millennium Study Cohort were used, along with prescription dispensing data available for active duty participants. Prevalence of self-reported hypertension was estimated. Multivariable logistic regression was used to assess the association between hypertension and demographic and self-reported behavioral characteristics, such as obesity status, alcohol consumption, and smoking.

Results: The overall prevalence of self-reported hypertension was 10.4%, with 2.7% for those born after 1980 and 19.1% for those born prior to 1960. Obese individuals were over three times more likely to report hypertension (odds ratio [OR]=3.65; 95% confidence interval [CI]: 3.36, 3.97) compared to normal/underweight individuals. Hypertensive subjects were 1.77 (95% CI: 1.65, 1.89) times more likely to be non-Hispanic black than non-Hispanic white. Self-reported hypertensive active duty members who were dispensed antihypertensive medication were more likely to be older and non-Hispanic black compared to those not dispensed treatment.

Conclusion: Hypertension prevalence within the military increased with age, similar to national statistics. After adjustment, prevalent hypertension was associated with

modifiable behavioral characteristics of being overweight, obese, a heavy drinker, and a smoker. Individuals at higher risk for hypertension were dispensed antihypertensive medication.

INTRODUCTION

Over 65 million United States (US) adults are affected by hypertension,¹ with an estimated direct and indirect cost of \$66.4 billion.² The prevalence of hypertension, defined as blood pressure \geq 140/90 mmHg or taking antihypertensive medication in the US from 2003-2004 was estimated at 29.3%,³ while in developed countries worldwide, close to 1 billion people are impacted.⁴ Annually, high blood pressure contributes to approximately 277,000 US deaths² and 7.1 million deaths worldwide.⁵ Hypertension and its control are important within the military because a strong and healthy force are essential to national defense. Hypertension prevalence has been reported between 10.2% for Millennium Cohort member from the US military⁶ and 13.6% in other US military populations.⁷ Among US military veterans, the estimates for the prevalence of hypertension have ranged from 12.3% to 55.6%.⁸⁻¹¹

Healthy lifestyle modifications are critical in the prevention and reduction of cardiovascular disease and also are recommended for prevention and control of hypertension.¹² Behavioral modifications include weight loss, exercise, salt and alcohol reduction, stress reduction, and cessation of smoking.¹³ Stress reduction,¹⁴⁻¹⁷ as well as smoking cessation,^{18,19} although a more established risk factor for cardiovascular diseases, have shown mixed results in their role of preventing progression of hypertension.

Pharmacological treatment is also an effective strategy in the reduction of hypertension. However, among US adults, over 40% of those with hypertension are not on antihypertensive treatment.¹² Among active duty military members, veterans, and

their family members, a higher proportion (91.2%) of hypertensive individuals, as identified through blood pressure measurements, were on antihypertensive medications, as assessed through interviews.²⁰ Previous reports from the Millennium Cohort Study have shown that 74.4% of active duty Cohort members diagnosed with hypertension were dispensed antihypertensive medication, while a lower proportion (45.1%) of active duty members who self-reported hypertension were on treatment.²¹ Differentiating the characteristics of hypertensive individuals who are on treatment may be beneficial to increasing treatment of uncontrolled high blood pressure.

The purpose of this study was to determine the baseline prevalence of self-reported hypertension within a representative cohort of US military members from all branches of service and to describe the characteristics of those members with hypertension. Patterns of antihypertensive medication dispensed to military members also will be described.

METHODS

Study Population

The population includes 77,047 Millennium Cohort participants who consented and completed a self-administered questionnaire between July 2001 to June 2003.⁶ The initial probability-based recruitment sample for the Cohort represented approximately 11.3% of the 2.2 million active duty, Reserve, and National Guard service members as of October 1, 2000⁶ from all branches of service. Service members who previously deployed to Southwest Asia, Bosnia, or Kosovo between 1998 and 2000, Reserve and

National Guard personnel, and females were oversampled to ensure adequate power in stratified analyses.⁶ The survey instrument consisted of 67 items with multiple components.²² Mail and on-line questionnaire submission options were made available to all participants.²²

For the current analysis active duty and Reserve/National Guard participants with complete baseline hypertension and covariate data were included. Pregnancy-related hypertension was excluded, captured through a positive response to either of the following questions at baseline: “No periods because pregnant or recently gave birth” or “Have you given birth within the last 3 years.” The total population in the current analysis consisted of 70,100 subjects. A sub-analysis describing specific antihypertensive medication use among self-reported hypertensive active duty members with complete baseline hypertension data, demographics, and no pregnancy-related hypertension included 4,120 individuals.

Definition of Hypertension

Self-reported hypertension was captured by the following question at baseline: “Has your doctor or other health professional EVER told you that you have any of the following conditions?...Hypertension (high blood pressure).” A response of “No” or “Yes” was elicited.

Behavioral Characteristics

Self-reported behavioral data included self-reported height and weight, alcohol consumption, and smoking status. Body mass index (BMI) was calculated from self-reported weight divided by height squared (kg/m^2). BMI was then categorized as: normal/underweight, overweight, or obese, as defined according to the National Heart, Lung, and Blood Institute.²³ Normal/underweight individuals were characterized by a BMI of less than $25 \text{ kg}/\text{m}^2$, overweight individuals by a BMI of $25 \text{ kg}/\text{m}^2$ to less than $30 \text{ kg}/\text{m}^2$, and obese individuals by a BMI of $30 \text{ kg}/\text{m}^2$ or more. Heavy and moderate alcohol consumption was assessed through the following question: "IN THE PAST YEAR, on the days that you drank alcoholic beverages, on average, how many drinks did you have?" Three categories were then defined according to the Dietary Guidelines for Americans, Department of Health and Human Services and Department of Agriculture.²⁴ Heavy drinking consisted of average alcohol consumption of greater than one drink a day for women and two drinks a day for men. Moderate drinking consisted of an average of one drink a day for women and two drinks a day for men. No to low drinking consisted of an average of less than one drink a day for women and less than two drinks a day for men. Low to no drinking also included individuals who self-reported not consuming at least 12 drinks of any type of alcoholic beverage in their entire life or at least 12 drinks of any type of alcoholic beverage in the past year.

Self-reported use of cigarettes (never, past, current) was captured through three questions at baseline. Never smokers were characterized by those who answered "No" to "IN YOUR LIFETIME, have you smoked at least 100 cigarettes (5 packs)?" Past

smokers were classified by those who answered “Yes” to the above in addition to “Yes, and succeeded” to the following question: “Have you ever tried to quit smoking?”

Current smokers were considered individuals who did not try to quit smoking or were unsuccessful, and answered “Yes” to “IN THE PAST YEAR, have you used any of the following tobacco products?...Cigarettes.”

Demographic Characteristics

Demographic data included sex, birth year, education, marital status, race/ethnicity, military pay grade (enlisted, officer), service branch (Army, Air Force, Navy/Coast Guard, Marines), service component (Reserve/National Guard, active duty), and occupation (combat specialists, healthcare specialists, other occupations).

Demographic data were obtained from the Defense Manpower Data Center (DMDC).

Self-reported education, marital status, and occupational category were used to supplement missing DMDC data.

Use of Antihypertensive Medications

Antihypertensive medications dispensed to self-reported hypertensive active duty members were queried for 16 broad American Hospital Formulary Service therapeutic classes to include cardiovascular-related classes, based on the Physician’s Desk Reference, 57th edition from the Seventh Report of the Joint National Committee (Appendix 1).¹² Mandatory reported pharmaceutical data (October 2000 to September 2003) and voluntarily reported archived data (October 1999 to September 2001) were

obtained from the Pharmacy Data Transaction Service within the Military Health System Data Repository and the Department of Defense Pharmacoeconomic Center. Data were captured from all military medical treatment facilities worldwide, civilian retail pharmacy networks, and TRICARE Mail Order Pharmacy. Potential antihypertensive medications were further classified through product names, recoded into generic names, limited to long-term use denoted by prescription antihypertensive medications dispensed for 30 days or more, and scanned through the date of survey submission from the aforementioned availability dates.

Statistical Analysis

Descriptive analyses were conducted on baseline Cohort members and consisted of calculated proportions for characteristics of interest. Pearson's chi-square was used to evaluate differences between hypertensive and normotensive individuals by various demographic and behavioral characteristics. Multiple logistic regression was conducted to estimate the odds ratio between prevalent hypertension given demographics and behavioral characteristics, such as BMI, alcohol consumption, and smoking status. Correlation and multicollinearity were assessed for variables with a variance inflation level of greater than four, indicating high correlation. Descriptive analyses were conducted on the subgroup of active duty members who self-reported hypertension to compare baseline characteristics between those who used antihypertensive medication and those who did not. Statistical analyses were performed using SAS software, version 9.1.3 (SAS Institute, Inc., Cary, NC).^{7,25}

RESULTS

Baseline characteristics of this population are reported in Table 1. The prevalence of self-reported hypertension among Cohort members was 10.4%. Prevalence substantially was higher in the older age group born prior to 1960 compared to the younger age group born in 1980 and forward (19.1% versus 2.7%), and also was higher among obese individuals compared to normal or underweight individuals (21.5% versus 5.3%). Individuals with self-reported hypertension were more likely to be older, married, and overweight or obese. There were no demographic or behavior variables that demonstrated multicollinearity. The prevalence odds ratios were adjusted for demographic and behavioral characteristics, such as BMI, alcohol consumption, and smoking status. Unadjusted and adjusted odds ratios are presented in Table 2. After adjustment, being female, younger, single, Hispanic, and officer, and serving in the Air Force were associated with lower odds of reporting hypertension. Individuals with hypertension were 1.77 (95% CI: 1.65, 1.89) times more likely to be non-Hispanic black, and 1.14 (95% CI: 1.03, 1.27) times slightly more likely to be Asian/Pacific Islander, compared to non-Hispanic white individuals respectively. Persons in the combat specialist occupation were protective of prevalent hypertension (OR=0.80; 95% CI: 0.75, 0.86) when compared to other occupations. Obese individuals were 3.65 (95% CI: 3.36, 3.97) times more likely to report hypertension compared to normal/underweight individuals. Being past or current smokers was associated with prevalent hypertension.

A total of 27,767 antihypertensive medications were dispensed to the 4,120 active duty Cohort members who self-reported hypertension prior to the survey submission date,

including multiple refills. When multiple refills were factored out, 4,832 antihypertensive medications were dispensed, of which 3,593 (74.4%) were dispensed to self-reported hypertensive active duty members. Those who were dispensed antihypertensive medications were more likely to be older and non-Hispanic black compared to those participants not on treatment (Table 3). The top ten antihypertensive medications dispensed, which accounted for 82.4% of the total dispensed, were lisinopril, hydrochlorothiazide, atenolol, amlodipine, triamterene, nifedipine, benazepril, fosinopril, verapamil, and propranolol. Diuretics, angiotensin-converting enzyme (ACE) inhibitors, and beta-adrenergic blocking agents leading the top therapeutic classes dispensed.

A total of 926 active duty members were dispensed only one type of antihypertensive medication, while 932 were dispensed multiple types of antihypertensive medications. Of those on multiple combinations of antihypertensive medication, 484 (51.9%) were dispensed two types, 237 (25.4%) were dispensed three types, 130 (13.9%) were dispensed four types, and 81 (8.7%) were dispensed five or more types of antihypertensive medication. The maximum number of different types of antihypertensive medications dispensed to one individual was 13. There were 105 different combinations of two types of antihypertensive medications dispensed. Of the 484 individuals who were dispensed two types of antihypertensive medications, the top combinations were lisinopril and hydrochlorothiazide (17.8%), atenolol and lisinopril (7.4%), and atenolol and hydrochlorothiazide (6.6%).

DISCUSSION

Overall, the prevalence of hypertension was lower than the national average, although older individuals and non-Hispanic Blacks were also more likely to be hypertensive. Previous epidemiologic studies also have consistently identified non-Hispanic blacks as being at increased risk for hypertension.²⁶⁻²⁸ Recent national statistics from 2003-2004 reported higher prevalence for non-Hispanic blacks than non-Hispanic whites (34.4% versus 30.3%).³ Similarly, the current study showed a higher prevalence among non-Hispanic blacks when compared to non-Hispanic whites (15.8% versus 9.6%). In most developed countries, hypertension prevalence increases with age.²⁹ Among US adults, the prevalence has been reported as 7.3% among adults 18-39 years of age, 32.6% among 40-59 year olds, and 66.5% in those 60 years of age and older.³ In the current study, prevalence also increased with age, as shown by the prevalence of 8.0% among adults 18-39 years of age, 22.4% among 40-59 year olds, and 60.0% among adults older than 60 years of age.

Obesity has been shown to be highly associated with hypertension.³⁰ Among US military retirees, the prevalence of hypertension has been shown to be approximately two times higher in overweight persons (OR=1.93 to 2.73; 95% CI: 1.59, 3.23) compared to normal weight persons and up to three to six times higher among obese (OR=2.55 to 6.07; 95% CI: 2.03, 7.97).³¹ In the current study, obesity showed the highest measure of association with hypertension. Obese individuals were over three times more likely to report hypertension (OR=3.65; 95% CI: 3.36, 3.97) compared to normal/underweight individuals.

Although heavy drinking, current smoking, being on active duty status, and being a Marine were protective in the unadjusted model, they were no longer protective after adjusting for demographic and behavioral characteristics. Age may have been a confounding factor since heavy drinkers, current smokers, and Marines were proportionally younger than low to non-drinkers, non-smokers, and Army service members. Active duty members also were younger and more likely to be born between 1970 and 1979 than prior to 1960. After adjustment, there was no association among current smokers and Marines, while the odds of hypertension increased for those on active duty status and self-reporting heavy drinking.

Overall, 74.4% of active duty participants who self-reported hypertension had been dispensed an antihypertensive medication from October 1999 to the date of survey taken. Antihypertensive treatment was more likely to be dispensed to older and non-Hispanic blacks, who also had a higher self-reported prevalence of hypertension. Active duty non-Hispanic blacks self-reported more hypertension than active duty non-Hispanic whites (14.9% versus 9.3%). Lisinopril, an ACE-inhibitor, was more likely to be prescribed in males participants, while hydrochlorothiazide, a diuretic, was the leading antihypertensive medication dispensed to female participants. ACE-inhibitors are effective in patients with other comorbidities such as diabetes, renal insufficiency, and or proteinuria.³² Diuretics are well tolerated^{33, 34} and are considered a first-line medication for uncomplicated hypertension.¹²

Monotherapy of antihypertensive medication most often is ineffective in controlling hypertension, despite more than 75 different antihypertensive agents available

to treat hypertension.³² Nationally, it has been reported that more than two-thirds of hypertensive individuals require more than one antihypertensive medication.¹² Fixed-dose combinations, or polytherapy, may reduce side effects and promote adherence.³⁵ Additionally, those considered high risk, such as blacks and individuals with diabetic neuropathy or renal insufficiency may require polytherapy.³⁵ In the current study, half of hypertensive individuals received polytherapy hypertensive medication, with 932 out of 1,858 dispensed more than one antihypertensive medication. The number of comorbidities reported did not have an effect on the number of types of antihypertensive medications dispensed.

Several limitations exist. Misclassification of hypertension may occur in self-report and antihypertensive medications dispensed. Patients who self-report hypertension may over- or under-report the condition as a result of recall bias or lack of understanding of the disease. Furthermore, patients who were still undergoing the diagnostic phase may report hypertension when they are not due to poor patient-clinician communication.⁴⁴ Although direct blood pressure measurements were not available in this study, high correlation between self-reported hypertension and documented hypertension in medical records has been demonstrated in another US military population. The agreement between self-reported hypertension and documented hypertension in the medical records of active duty, retired, and military family members was 94.2%.³⁶ The sensitivity of correctly identifying high blood pressure histories was 95.4%, while the specificity of correctly identifying normal blood pressure histories was 92.4%.³⁶ Medical records were used to obtain the most recent systolic and diastolic blood pressure readings,

documentation of prescribed antihypertensive medications, and evidence of a medical diagnosis of hypertension.³⁶

Misclassification of pregnant women may have occurred in the attempt to exclude pregnancy-related hypertension. Exclusion was limited by the available question capturing women with no period due to pregnancy or recent childbirth. Pregnant women with spotting menstrual cycles were not excluded. Additionally, hypertension may have been diagnosed after childbirth unrelated to the pregnancy.

Antihypertensive medications may have been prescribed for other conditions other than hypertension, such as migraines, anxiety, bipolar disorders, alcohol withdrawal, aggressive behavior, abnormal heart rhythms, angina pectoris, and kidney dysfunction. However, the probability was diminished since antihypertensive medications were evaluated within the subgroup of individuals who self-reported hypertension. Furthermore, generalizability to the entire Cohort or military population may be limited, especially in the restricted sub-analysis of active duty members. However, previous studies have evaluated the reliability and selection bias in relation to poor health, and have shown favorable results.^{6, 37-43}

Despite these limitations, the strengths of this study include the large sample size allowing a thorough look at prevalence, although care should be taken to not draw causal connections. Additionally, the population was representative of all branches of service in the military. Future studies evaluating risk factors for incidence hypertension are needed.

CONCLUSION

Hypertension and complications related to hypertension may adversely affect the readiness of the military force. Due to a younger and healthier population, the prevalence of hypertension within the military population remained consistently lower than national statistics at 10.4%. After adjusting for demographic and behavioral characteristics, prevalent hypertension was associated with modifiable behavioral characteristics of overweight, obesity, heavy drinking, and smoking. Prescription antihypertensive medications dispensed were shown to target individuals at higher risk for hypertension, such as older adults and non-Hispanic Blacks. Hypertensive individuals should adopt lifestyle modifications, especially weight loss and alcohol reduction, and be evaluated for antihypertensive medication for the reduction of high blood pressure.

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TABLE 1. Baseline Characteristics of Self-Reported Hypertension (HTN) in Cohort Members

Characteristics* (N=70,100)	No HTN Self-Reported (N=62,840)		Self-Reported HTN (N=7,260)	
	n	%	n	%
Sex				
Male	48,134	(76.6)	6,112	(84.2)
Female	14,706	(23.4)	1,148	(15.8)
Birth year				
Pre 1960	12,858	(20.5)	3,044	(41.9)
1960-1969	24,121	(38.4)	2,816	(38.8)
1970-1979	22,071	(35.1)	1,296	(17.9)
1980 and forward	3,790	(6.0)	104	(1.4)
Education				
<High school diploma	3,811	(6.1)	419	(5.8)
High school diploma	26,746	(42.6)	2,823	(38.9)
Some college	15,803	(25.1)	2,181	(30.0)
College graduate	10,703	(17.0)	1,084	(14.9)
Advanced degree	5,777	(9.2)	753	(10.4)
Marital status				
Married	38,851	(61.8)	5,403	(74.4)
Single	19,718	(31.4)	1,289	(17.8)
Other	4,271	(6.8)	568	(7.8)
Race/ethnicity				
White, non-Hispanic	44,620	(71.0)	4,752	(65.5)
Black, non-Hispanic	7,676	(12.2)	1,441	(19.8)
Asian/Pacific Islander	5,061	(8.1)	557	(7.7)
Native American	524	(0.8)	68	(0.9)
Hispanic	4,071	(6.5)	367	(5.1)
Other	888	(1.4)	75	(1.0)
Service component				
Reserve/National Guard	27,032	(43.0)	3,277	(45.1)
Active duty	35,808	(57.0)	3,983	(54.9)
Military pay grade				
Enlisted	47,930	(76.3)	5,680	(78.2)
Officer	14,910	(23.7)	1,580	(21.8)
Service branch				
Army	29,529	(47.0)	3,433	(47.3)
Air Force	18,354	(18.4)	2,132	(29.4)
Navy/Coast Guard	11,550	(5.4)	1,435	(19.7)
Marines	3,407	(29.2)	260	(3.6)
Occupational category				
Other occupations	43,247	(68.8)	5,296	(72.9)
Combat specialist	13,384	(21.3)	1,248	(17.2)
Health care specialist	6,209	(9.9)	716	(9.9)
Body mass index				
Normal/underweight	24,026	(38.2)	1,335	(18.4)
Overweight	32,677	(52.0)	4,242	(58.4)
Obese	6,137	(9.8)	1,683	(23.2)

Alcohol consumption				
No to low drinking	16,164	(25.7)	2,062	(28.4)
Moderate drinking	19,274	(30.7)	2,318	(31.9)
Heavy drinking	27,402	(43.6)	2,880	(39.7)
Smoking status				
Nonsmoker	36,497	(58.1)	3,899	(53.7)
Past smoker	14,708	(23.4)	2,087	(28.7)
Current smoker	11,635	(18.5)	1,274	(17.6)

* Complete self-reported hypertension and covariate data from baseline Millennium Cohort questionnaire July 2001 to June 2003, excluding pregnancy-related hypertension

TABLE 2. Prevalence of Hypertension and Unadjusted and Adjusted Odds of Self-Reported Hypertension (HTN) in Cohort Members for Various Characteristics

Characteristics* (N=70,100)	Prevalence %	Unadjusted Odds Ratio (95% CI)	Adjusted Odds† Ratio (95% CI)
Sex			
Male	11.3	1.00 reference	1.00 reference
Female	7.2	0.62 (0.58, 0.66)	0.75 (0.69, 0.80)
Birth year			
Pre 1960	19.1	1.00 reference	1.00 reference
1960-1969	10.5	0.49 (0.47, 0.52)	0.43 (0.40, 0.46)
1970-1979	5.5	0.25 (0.23, 0.27)	0.24 (0.22, 0.26)
1980 and forward	2.7	0.12 (0.10, 0.14)	0.15 (0.12, 0.18)
Education			
<High school diploma	9.9	1.00 reference	1.00 reference
High school diploma	9.5	0.96 (0.86, 1.07)	0.91 (0.81, 1.02)
Some college	12.1	1.26 (1.12, 1.40)	1.04 (0.92, 1.18)
College graduate	9.2	0.92 (0.82, 1.04)	0.89 (0.77, 1.01)
Advanced degree	11.5	1.19 (1.05, 1.35)	0.91 (0.78, 1.07)
Marital status			
Married	12.2	1.00 reference	1.00 reference
Single	6.1	0.47 (0.44, 0.50)	0.89 (0.83, 0.96)
Other	11.7	0.96 (0.87, 1.05)	1.00 (0.91, 1.10)
Race/ethnicity			
White, non-Hispanic	9.6	1.00 reference	1.00 reference
Black, non-Hispanic	15.8	1.76 (1.65, 1.88)	1.77 (1.65, 1.89)
Asian/Pacific Islander	9.9	1.04 (0.94, 1.13)	1.14 (1.03, 1.27)
Native American	11.5	1.22 (0.95, 1.57)	1.24 (0.95, 1.61)
Hispanic	8.3	0.85 (0.76, 0.95)	0.88 (0.78, 0.98)
Other	7.8	0.79 (0.63, 1.01)	0.87 (0.68, 1.11)
Service component			
Reserve/National Guard	10.8	1.00 reference	1.00 reference
Active duty	10.0	0.92 (0.87, 0.96)	1.30 (1.23, 1.38)
Military pay grade			
Enlisted	10.6	1.00 reference	1.00 Reference
Officer	9.6	0.89 (0.84, 0.95)	0.81 (0.74, 0.89)
Service branch			
Army	10.4	1.00 reference	1.00 reference
Air Force	10.4	1.00 (0.94, 1.06)	0.87 (0.81, 0.94)
Navy/Coast Guard	11.1	1.07 (1.00, 1.14)	1.00 (0.93, 1.08)
Marines	7.1	0.66 (0.58, 0.75)	0.88 (0.77, 1.01)
Occupational category			
Other occupations	10.9	1.00 reference	1.00 reference
Combat specialist	8.5	0.76 (0.71, 0.81)	0.80 (0.75, 0.86)
Health care specialist	10.3	0.94 (0.87, 1.02)	1.03 (0.94, 1.12)
Body mass index			
Normal/underweight	5.3	1.00 reference	1.00 reference
Overweight	11.5	2.34 (2.19, 2.49)	1.87 (1.74, 2.00)
Obese	21.5	4.94 (4.57, 5.33)	3.65 (3.36, 3.97)

Alcohol consumption					
Low to no drinking	11.3	1.00	reference	1.00	reference
Moderate drinking	10.7	0.94	(0.89, 1.00)	0.96	(0.90, 1.03)
Heavy drinking	9.5	0.82	(0.78, 0.88)	1.08	(1.02, 1.16)
Smoking status					
Nonsmoker	9.7	1.00	reference	1.00	reference
Past smoker	12.4	1.33	(1.26, 1.41)	1.15	(1.08, 1.22)
Current smoker	9.9	1.03	(0.96, 1.10)	1.12	(1.04, 1.20)

* Complete self-reported hypertension and covariate data from baseline Millennium Cohort questionnaire July 2001 to June 2003, excluding pregnancy-related hypertension

† Adjusted for all other variables in the table

TABLE 3. Baseline Characteristics of Prescription Antihypertensive Medication Use among 4,120 Active Duty Members who Self-Reported Hypertension

Characteristics* (N=4,120)	No Antihypertensive Med (N=2,262)		Antihypertensive Med Use (N=1,858)	
	n	%	n	%
Sex				
Male	2,004	(88.6)	1,537	(82.7)
Female	258	(11.4)	321	(17.3)
Birth year				
Pre 1960	368	(16.3)	661	(35.6)
1960-1969	1,035	(45.7)	943	(50.7)
1970-1979	792	(35.0)	241	(13.0)
1980 and forward	67	(3.0)	13	(0.7)
Education				
<High school diploma	62	(2.7)	39	(2.1)
High school diploma	1,100	(48.6)	691	(37.2)
Some college	610	(27.0)	605	(32.6)
College graduate	291	(12.9)	246	(13.2)
Advanced degree	199	(8.8)	277	(14.9)
Marital status				
Married	1,605	(71.0)	1,484	(79.9)
Single	550	(24.3)	257	(13.8)
Other	107	(4.7)	117	(6.3)
Race/ethnicity				
White, non-Hispanic	1,436	(63.5)	1,028	(55.3)
Black, non-Hispanic	377	(16.7)	490	(26.4)
Asian/Pacific Islander	255	(11.3)	244	(13.1)
Native American	25	(1.1)	12	(0.6)
Hispanic	136	(6.0)	70	(3.8)
Other	33	(1.4)	14	(0.8)
Military pay grade				
Enlisted	1,823	(80.6)	1,413	(76.1)
Officer	439	(19.4)	445	(23.0)
Service branch				
Army	954	(42.2)	613	(33.0)
Air Force	587	(25.9)	631	(33.9)
Navy/Coast Guard	566	(25.0)	544	(29.3)
Marines	155	(6.9)	70	(3.8)
Occupational category				
Combat specialist	479	(21.2)	288	(15.5)
Electronic repair	257	(11.4)	204	(11.0)
Communication/Intel	188	(8.3)	134	(7.2)
Health care specialist	146	(6.5)	223	(12.0)
Other technical	68	(3.0)	52	(2.8)
Functional support	418	(18.5)	397	(21.4)
Electrical/mechanic	390	(17.2)	341	(18.3)
Craft workers	69	(3.0)	52	(2.8)
Service support	218	(9.6)	140	(7.5)

Student/others	29 (1.3)	27 (1.5)
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* Complete self-reported hypertension and demographic data, excluding pregnancy-related hypertension

APPENDIX 1. American Hospital Formulary Service Therapeutic Classes for Identification of Potential Antihypertensive Medications

Therapeutic Class Code	Therapeutic Class
240000	Cardiovascular Drugs*
240400	Cardiac Drugs
240408	Cardiotonic Agents
240440	Miscellaneous Cardiac Drugs*
240800	Hypotensive Agents
241200	Vasodilating
241292	Miscellaneous Vasodilating Agents
242000	Alpha-Adrenergic Blocking Agents
242400	Beta-Adrenergic Blocking Agents
242800	Calcium-Channel Blocking Agents
242892	Miscellaneous Calcium-Channel Blocking Agents
243200	Renin-Angiotensin System Inhibitors*
243204	Angiotensin-Converting Enzyme Inhibitors
243208	Angiotensin II Receptor Antagonists
402800	Diuretics
402810	Potassium Sparing Diuretics

* No data fields

APPENDIX C: MANUSCRIPT #3**The Relationship Between New-Onset Hypertension and Military Deployment in a Large Population-Based Cohort: The Millennium Cohort**

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Abstract

Introduction: High-stress situations, such as military deployments, are a potential risk factor for hypertension. Furthermore, the relationship between stress triggered by combat deployment and hypertension is unknown.

Methods: The Millennium Cohort baseline questionnaire was conducted from July 2001 to June 2003 and was completed by 77,047 active duty and Reserve/National Guard members. The follow-up questionnaire was completed by 55,021 responders approximately three years later from June 2004 to February 2006. Multivariable logistic regression was used to estimate the 3-year risk of new-onset hypertension in a large military cohort, some of whom had deployed in support of the wars in Iraq and Afghanistan. The population included 37,075 service members with no pregnancy-related hypertension with complete data. The final models were adjusted for demographic characteristics, military data, and lifestyle behaviors.

Results: Newly reported hypertension was found in 5.6% of the deployed and 7.3% of the nondeployed. After adjusting for potential confounding, deployers with no reported combat exposures were less likely to develop incident hypertension than nondeployers (odds ratio [OR]=0.74; 95% confidence interval [CI]: 0.65, 0.86). There was no association between hypertension and deployers with reported combat exposures compared to nondeployers. However, among deployers, those reporting combat exposures were 1.31 times more likely to develop incident hypertension compared to deployers not reporting combat exposures (95% CI: 1.07, 1.61).

Conclusion: While deployers, in general, had lower incidence of newly-reported hypertension when compared to nondeployed, deployers reporting combat exposures were more likely to report new-onset hypertension than deployers who did not report combat exposures.

INTRODUCTION

An estimated one out of every three adults in the United States has hypertension.¹ Hypertension contributes to cardiovascular diseases, which lead all other conditions as the main cause of morbidity and mortality.^{3,4} Several risk factors for hypertension include obesity, little or no exercise, high dietary salt intake, excessive alcohol consumption, being African American, and familial history of hypertension.⁵⁻¹¹ There has been much concern among the public and within veteran organizations over long-term health consequences related to the current combat deployments in Iraq and Afghanistan.^{12,13} High-stress situations, such as military deployments, present unique exposures to military service members. Acute stress from exposure to combat conditions can cause a rise in blood pressure, but this is usually temporary and decreases within hours or days.¹⁴ The effects of long-term stress from deployment is unknown, although cross-sectional studies have showed no association between hypertension and deployment to the 1991 Gulf War or to Vietnam.¹⁵⁻¹⁸ Due to the profoundly stressful conditions present during deployments, it is plausible that deployment may be a contributing factor to hypertension, however, the temporal relationship between the stress triggered by combat deployment and hypertension is unknown. In response to concerns about the health effects of military service and associated exposures, the Millennium Cohort study was initiated in 2001 to longitudinally address these issues.¹⁹ This population, predominantly comprised of healthy individuals, presents unique characteristics, including high operational tempo, deployments to areas of extreme and sub-optimal living conditions, military-unique occupational exposures, as well as

psychological stress from traumatic and deadly situations.¹⁹ This was the first study to prospectively investigate the relationship between military deployments and hypertension in a large population-based cohort, many of whose members were deployed with reported combat exposures. The purpose of this study was to determine whether recent military deployment was related to the development of new-onset hypertension.

METHODS

Study Population

The Millennium Cohort Study was initiated in response to the need identified from the 1991 Gulf War to collect long-term health information on military service members to identify the health consequences of military deployments other than immediate battle casualties. The study population comprised of military service members and veterans from military installations across the United States and worldwide, who served in the US Army, Air Force, Navy, Coast Guard, and Marine Corps. The Millennium Cohort Study baseline questionnaire spanned from July 2001 to June 2003, and consisted of 77,047 consenting enrollees.¹⁹ Oversampling of individuals who had previously deployed to countries of high threat, Reserve and National Guard personnel, and female service members ensured adequate power in stratified analyses.¹⁹ A follow-up questionnaire was sent to all baseline participants approximately three years later between June 2004 to February 2006, and resulted in 55,021 responders (Figure 1). In the current analysis, participants were limited to service members who completed both baseline and follow-up Millennium Cohort questionnaires (response rate 71.4%).

Individuals who self-reported ever having hypertension at baseline (n=5,753), and those with unknown hypertension status at either baseline or follow-up (n=2,326) were excluded. Individuals who had previously deployed in support of the wars in Iraq and Afghanistan prior to baseline submission (n=2,215), those who completed either questionnaire while deployed (n=3,238), and those without complete demographic or covariate data also were excluded. Women who self-reported having no menstrual period because of pregnancy or recent birth or who reported giving birth in the previous three years (n=3,811) were excluded to rule out pregnancy-related hypertension. The final study population for this analysis consisted of a total of 37,075 participants.

Hypertensions Data

New-onset hypertension was defined by self-report of hypertension on the follow-up questionnaire among persons reporting no hypertension at baseline. Normotensive individuals were defined as those who self-reported "No" to hypertension at both baseline and follow-up. The Millennium Cohort Study baseline questionnaire asked "Has your doctor or other health professional EVER told you that you have any of the following conditions?...Hypertension (high blood pressure)." A blank field was available for "If YES, what year did the problem begin?" The follow-up questionnaire asked "In the LAST 3 YEARS, has your doctor or health care professional told you that you had any of the following conditions?...Hypertension (high blood pressure)." A blank field also was available for "If YES, in what year were you first diagnosed?"

Deployment Data

Electronically reported deployment data and demographic data were obtained from the Defense Manpower Data Center. Recent deployments in support of the wars in Iraq and Afghanistan, which occurred after the baseline questionnaire and before the follow-up questionnaire were classified into three categories: nondeployed, deployed with reported combat exposures, and deployed without reported combat exposures. Combat exposure was defined as individuals who self-reported on the follow-up questionnaire as being personally exposed to witnessing a person's death due to war, disaster, or tragic event; witnessing instances of physical abuse; dead and/or decomposing bodies; maimed soldiers or civilians; or prisoners of war or refugees in the past three years.

Behavioral Characteristics

Obesity status was defined according to the National Heart, Lung, and Blood Institute²⁰ as a body mass index (BMI) greater than or equal to 30 kg/m². BMI scores were calculated from self-reported height and weight from the baseline questionnaire.

Alcohol consumption was separated into three categories according to the Dietary Guidelines for Americans, Department of Health and Human Services and Department of Agriculture.²¹ Number of drinks reported was assessed by the following question: "IN THE PAST YEAR, on those days that you drank alcohol beverages, on average, how many drinks did you have?" One drink was defined as one 12-ounce beer, one 4-ounce glass of wine, or one 1.5 ounce shot of liquor. Heavy drinking was classified as average

alcohol consumption at baseline greater than one drink a day for women and greater than two drinks a day for men. Moderate drinking was defined as consumption of an average of one drink a day for women and two drinks a day for men at baseline. No to low drinking was defined as an average of less than one drink a day for women and two drinks a day for men. Due to the inherent skip patterns within the baseline questionnaire, no to low drinking also was supplemented with individuals who self-reported not having at least 12 drinks of any type of alcoholic beverage (including beer and wine) in their entire life and those who self-reported not having at least 12 drinks of any type of alcoholic beverage in the past year.

Physical activity and strength training were captured only at follow-up. The variables were classified based on the American College of Sports Medicine and the American Heart Association, in which moderate physical activity consisted of 30 minutes 5 days a week, vigorous physical activity consisted of 20 minutes 3 days a week, and strength training consisted of 8-10 exercises on 2 or more nonconsecutive days each week.²² However, because light and moderate exercise could not be distinguished, participants who self-reported at least 150 minutes per week of moderate or light exercise, and/or at least 60 minutes of vigorous exercise were considered physically active. Conducting 8-10 strength training exercises was estimated at 30 minutes, therefore, individuals who self-reported at least 60 minutes per week of strength training or work that strengthened their muscles were considered to be engaged in active strength training.

Self-reported use of cigarettes (never, past, current) was captured through three questions at baseline. Never smokers were characterized by those who answered “No” to “IN YOUR LIFETIME, have you smoked at least 100 cigarettes (5 packs)?” Past smokers were classified by those who answered “Yes” to the above in addition to “Yes, and succeeded” to the following question: “Have you ever tried to quit smoking?” Current smokers were considered individuals who did not try to quit smoking or were unsuccessful, and answered “Yes” to “IN THE PAST YEAR, have you used any of the following tobacco products?...Cigarettes.”

Statistical Analysis

Cumulative incidence of new-onset hypertension due to recent deployment was calculated for the entire study population and by demographics and covariate data, along with the 95th percent confidence interval. Multivariable logistic regression was used to determine the relationship between new-onset hypertension and recent deployment. New-onset hypertension was the binary outcome variable, while deployment in support of the wars in Iraq and Afghanistan was the explanatory variable. Univariate analysis was conducted and covariates included in the model were sex, birth year, education, marital status, race/ethnicity, service component (active duty, Reserve/National Guard), military pay grade (enlisted, officer), service branch (Army, Air Force, Navy/Coast Guard, Marines), occupation (other occupations, combat specialists, health care specialists), obesity status, alcohol consumption, physical activity, strength training, and smoking status. Potential confounders were evaluated for each variable and retained in

the adjusted model, in addition to variables considered confounders in the literature. Correlation among all variables was evaluated, and multicollinearity was deemed likely if the variance inflation factor was greater than four, indicating high correlation. Deployers with and without reported combat exposure were first compared with nondeployers. A sub-analysis of deployers with reported combat exposure was later conducted compared with deployers without combat exposure. Statistical analyses were performed using SAS software, version 9.1.3 (SAS Institute, Inc., Cary, NC).²³

RESULTS

Among the 77,047 participants who completed the baseline Panel 1 questionnaire, response to the follow-up questionnaire was not captured in 22,027 individuals for the following reasons: withdrew from the study ($n=510$) and deceased ($n=157$), giving a response rate of 71.4%. Among the non-deceased with complete demographics, responders ($n=54,657$) were more likely to be older, more educated, married, and officers than non-responders ($n=21,698$) (Table 1).

Table 2 shows baseline characteristics by deployment status. Within approximately three years between baseline and follow-up survey, over 24.5% of the 37,075 Cohort members who responded to both surveys with no pregnancy-related hypertension and complete demographics had been deployed, with 12.3% who self-reported combat exposure during that deployment. Deployers were more likely to be male (26.9% versus 16.6% in women) and younger (34.6% for those born 1980 and forward versus 16.5% for those born prior to 1960). Deployers with reported combat

exposures were more likely to be male, younger, from the Army branch of service, engaged in active strength training, and nonsmokers, while deployers without combat exposure were more likely to have some college education and be from the Air Force branch.

A total of 2,564 respondents reported new-onset hypertension within the three years between baseline and follow-up survey, for a cumulative incidence of 6.9%. The incidence among individuals who were not deployed during the follow-up period was 7.3% versus 5.3% among deployers without combat experience and 6.0% for those with combat experience. Table 3 shows the relationships between military deployments and self-reported incident hypertension. Adjusted for demographic characteristics and several lifestyle factors, deployers without combat exposure were 0.74 (95% CI: 0.65, 0.86) times as likely to develop new-onset hypertension than nondeployers. However, individuals who deployed with combat exposure did not show an increase in risk of new-onset hypertension compared to individuals who did not deployed (OR=0.94; 95% CI: 0.82, 1.07).

Table 3 also shows the relationship for the other demographic and behavioral characteristics and incident hypertension, adjusted for the other variables. Being female, younger, single, and an officer were protective of new-onset hypertension. Non-Hispanic blacks were 1.85 (95% CI: 1.64, 2.09) times as likely to develop hypertension than non-Hispanic whites, while military members on active duty status were 1.23 (95% CI: 1.12, 1.35) times as likely to develop hypertension than Reserve/National Guard members. Obese individuals were 2.19 (95% CI: 1.97, 2.43) times more likely to report incident

hypertension than non-obese individuals. Those who consumed on average heavy amounts of alcohol each day were slightly more likely to develop hypertension compared to those considered low to non-drinkers (OR=1.15; 95% CI: 1.03, 1.28). Individuals who actively strength trained were 19% less likely to develop hypertension than those who did not actively strength train (OR=0.81; 95% CI: 0.74, 0.88), while being physically active was slightly protective of new-onset hypertension (OR=0.90; 95% CI: 0.83, 0.99). Smoking was not associated with new-onset hypertension.

Among deployers reporting combat exposures, the risk for incident hypertension was 1.31 (95% CI: 1.07, 1.61) when compared to deployers not reporting combat exposures (Table 4), after adjusting for demographic and behavioral characteristics. Being younger and an officer were protective of incident hypertension among deployers reporting combat exposure, compared to those not reporting combat exposure. Non-Hispanic blacks and obese individuals had approximately a two-fold increase in risk, while Hispanics had slightly higher risk, when compared to non-Hispanic whites or non-obese individuals respectively. Actively engaging in strength training also was protective of hypertension in this population. Being a current smoker was slightly protective of new-onset hypertension (OR=0.74; 95% CI: 0.56, 0.99).

DISCUSSION

New-onset hypertension was reported in 6.9% of this large population-based cohort over three years of whom 24.5% were deployed in support of the wars in Iraq and Afghanistan. New-onset hypertension was reported among 7.3% of those who were

nondeployed, 5.3% of those who deployed and reported no combat exposures, and 6.0% of deployed of those members who deployed and reported combat exposures. While deployment in general appeared to be protective for new-onset hypertension, it is possible that this comparison may be biased by the healthy worker, or in this case, the “healthy warrior effect.” The comparison among the deployers may be more appropriate to determine the effect of higher stress deployments. Deployers are often healthier than nondeployers since satisfactory state of health is a requirement for pre-deployment clearance. Service members are deployed to locations where medical care may be minimal and evacuation to more advanced medical facilities would impact the mission and drain limited resources.

In order to account for this “healthy deployer effect,” deployers with combat exposure were compared to deployers without combat exposure. Deployers with reported combat exposure were found to be at higher risk of developing hypertension, when compared to deployers with no reported combat exposure. Individuals who are deployed are more likely to be healthier than those who are not deployable or not deployed. Furthermore, service members who are more likely to be exposed to combat are presumably healthier than those who may not be exposed to combat. For these reasons, the estimated odds ratios among deployers with combat exposure was likely to be biased towards the null, providing greater confidence that risk for hypertension incidence among this population truly existed.

Obese persons are at increased risk for developing hypertension, cardiovascular disease, and stroke.^{24, 25} Additionally, being overweight and obese contributes to \$1.1

billion in treatment of associated comorbidities in the Department of Defense.²⁶ In the current study assessing deployers and nondeployers, obese individuals had a two-fold higher risk of developing new-onset hypertension compared to those who were not obese after adjusting for other covariates. Similar trends showing increased BMI as a risk factor for hypertension have been identified in other prospective cohort studies.^{6, 27}

Physical activity is especially important in promoting cardiovascular benefits along with reduction in high blood pressure.^{10, 25} In the current study assessing deployers and nondeployers, physical activity was slightly protective of new-onset hypertension after adjusting for other covariates (OR=0.90; 95% CI: 0.83, 0.99). Physical fitness is considered an occupational requirement and an active measure of performance in the military setting. Over 60% of Cohort members self-reported engaging in active physical activity (62.9% of men and 58.3% of women). In contrast, based on the Behavioral Risk Factor Surveillance System in 2005, only 49.7% of men and 46.7% of women in the US population 18 years of age and older participated in regular physical activity, as defined by 30 minutes a day five days a week of moderate-intensity exercise and/or 20 minutes a day three times a week of vigorous-intensity exercise.²⁸ Physical activity and strength training were not captured at baseline. Strength training has been reported as a complement to aerobic exercise in the prevention, treatment, and control of hypertension.²⁹ Strength training also has been shown to help facilitate weight control³⁰ and be potentially beneficial in the management of hypertension.³¹ In the current study, individuals who actively strength trained were at decreased risk of developing new-onset hypertension.

Higher levels of alcohol consumption of two or more drinks per day has been shown to be associated with hypertension when compared to lifetime abstainers (OR=2.31; 95% CI: 1.47, 3.62).⁹ Daily consumption of alcohol has been associated with lower risk of coronary heart disease but not stroke.²⁵ In the current study assessing deployers and nondeployers, there was no relationship between alcohol consumption and hypertension incidence after adjusting for other covariates. Further exploration in the levels of alcohol consumption is needed to determine the actual affect of alcohol on hypertension.

There are varied results on the role of smoking on hypertension. Although cigarette smoking temporarily increases blood pressure even after 30 minutes^{32, 33} and is a risk factor for cardiovascular disease and stroke,^{25, 34-36} several studies have reported no association between smoking and hypertension.^{11, 37, 38} Some studies have reported an association,^{33, 39} though smoking cessation did not decrease the risk of hypertension possibly due to the weight gain that often accompanies change in this habit.³³ In the current study assessing deployers and nondeployers, there was no association between new-onset hypertension and smoking, after adjusting for covariates. When assessing deployers with combat exposures in comparison to deployers with no combat exposure, smoking was slightly protective. However, due to the ill health effects of smoking and increased cardiovascular risk, smoking cessation should still be recommended due to its long-term association with cardiovascular disease.

Limitations and Strengths

Limitations to this study include potential loss to follow-up bias, misclassification error, and generalizability. Differential loss to follow-up is a concern in longitudinal studies and can result in biased cumulative incidence estimates. The response rate of 71.4% was achieved, and there was minimal or no difference in relation to hypertension status, sex, race/ethnicity, service branch, active duty status, or occupation. Selection bias could have occurred from individuals who were unable to submit the questionnaires while deployed to austere locations. For this reason, individuals who completed their questionnaire while deployed were excluded. Selection bias may have also occurred for some who did not have adequate time to be examined and diagnosed with hypertension upon return. A sub-analysis was conducted, in which only deployments three months prior to the follow-up questionnaire were considered to allow for a diagnosis visit, and did not change the results.

Because new-onset hypertension was captured as a binary variable (hypertensive, non-hypertensive), misclassification error may have occurred where hypertension preceded deployment. However, in a sub-analysis of 1,707 hypertensive individuals with self-reported year of onset after the baseline survey date, 42 were identified as hypertensive prior to deployment and were excluded. This study was based on self-reported hypertension, which may be prone to recall bias and may not represent the true measure of hypertension in the population. However, self-reported hypertension was found to have moderate agreement with provider diagnosed and antihypertensive medications dispensed.⁴⁰ Misclassification may have occurred in the excluded pregnant

population at baseline and follow-up in the efforts to exclude pregnancy-related hypertension. However, this population was relatively small (n=3,811) and unlikely to change the results.

Despite the limitations, the strength of this study lies in the prospective design, which allows for calculation of cumulative incidence and estimated risk of new-onset hypertension. Cohort studies are less prone to recall bias. Generalizability to the entire US military population is believed to be high since previous studies have shown these cohort data to be reliable and survey response to be uninfluenced by poor health status.^{13, 19, 41-46} Furthermore, the strength of the study includes a large sample size, which allows for sub-group comparisons and adequate power to detect clinically important differences.

CONCLUSION

Hypertension potentially leads to other profound conditions such as heart disease, stroke, and kidney failure. Based on this population-based cohort, an estimated 6.9% of military service members reported new hypertension within a 3-year period. A lower incidence of new-onset hypertension was found among military deployers and was likely due to a selection process that resulted in a higher level of overall health in this group. However, deployers with reported combat exposure were found to be at higher risk of developing hypertension than deployers without reported combat exposure. Preventing hypertension is essential to promoting a fit and ready force. The reduction of obesity and the promotion of strength training and physical activity may be valuable in decreasing the prevalence of hypertension in military service members. Future studies addressing long-

term consequences of deployment are recommended as more longitudinal data are available.

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TABLE 1. Baseline Characteristics between Responders and Non-Responders to Follow-Up Millennium Cohort Questionnaire

Characteristics (N=76,355)	Respondents*		Non-Responders†	
	n	%	n	%
Sex				
Male	40,113	(73.4)	15,813	(72.9)
Female	14,544	(26.6)	5,885	(27.1)
Birth year				
Pre 1960	13,379	(24.5)	3,083	(14.2)
1960-1969	22,168	(40.6)	6,767	(31.2)
1970-1979	16,843	(30.8)	9,616	(44.3)
1980 and forward	2,267	(4.1)	2,232	(10.3)
Education				
<High school diploma	2,934	(5.4)	1,739	(8.0)
High school diploma	20,917	(38.3)	11,724	(54.0)
Some college	14,510	(26.5)	4,990	(23.0)
College graduate	10,322	(18.9)	2,299	(10.6)
Advanced degree	5,974	(10.9)	946	(4.4)
Marital status				
Married	36,286	(66.4)	11,878	(54.7)
Single	14,468	(26.5)	8,504	(39.2)
Other	3,903	(7.1)	1,316	(6.1)
Race/ethnicity				
White, non-Hispanic	38,776	(70.9)	14,390	(66.3)
Black, non-Hispanic	6,661	(12.2)	3,841	(17.7)
Asian/Pacific Islander	4,838	(8.9)	1,195	(5.5)
Native American	450	(0.8)	224	(1.1)
Hispanic	3,177	(5.8)	1,721	(7.9)
Other	755	(1.4)	327	(1.5)
Service component				
Reserve/National Guard	23,942	(43.8)	8,893	(41.0)
Active duty	30,715	(56.2)	12,805	(59.0)
Military pay grade				
Enlisted	39,841	(72.9)	18,942	(87.3)
Officer	14,816	(27.1)	2,756	(12.7)
Service branch				
Army	26,083	(47.7)	10,049	(46.3)
Air Force	16,447	(30.1)	5,762	(26.6)
Navy/Coast Guard	9,882	(18.1)	4,236	(19.5)
Marines	2,245	(4.1)	1,651	(7.6)
Occupational category				
Other occupations	37,389	(68.4)	15,734	(72.5)
Combat specialist	11,160	(20.4)	4,138	(19.1)
Healthcare specialist	6,108	(11.2)	1,826	(8.4)

* Responders who completed baseline questionnaires from June 2001 to June 2003 and follow-up questionnaires from June 2004 to February 2006

† Non-responders who completed the baseline questionnaire but not the follow-up questionnaire, excluding 157 confirmed deceased prior to initiation of follow-up (June, 1, 2004)

TABLE 2. Baseline Characteristics of Millennium Cohort Study Respondents by Military Deployment between Baseline and Follow-Up Surveys*

Characteristics† (N=37,075)	Nondeployed (n=27,974)		Deployed No Combat (n=4,548)		Deployed Combat (n=4,553)	
	n	%	n	%	n	%
Demographic characteristics						
Sex						
Male	20,931	(74.8)	3,800	(83.6)	3,903	(85.7)
Female	7,043	(25.2)	748	(16.4)	650	(14.3)
Birth year						
Pre 1960	7,757	(27.7)	855	(18.8)	674	(14.8)
1960-1969	11,686	(41.8)	2,028	(44.6)	1,807	(39.7)
1970-1979	7,606	(27.2)	1,460	(32.1)	1,788	(39.3)
1980 and forward	925	(3.3)	205	(4.5)	284	(6.2)
Education						
<High school diploma	1,506	(5.4)	139	(3.0)	308	(6.7)
High school diploma	10,417	(37.2)	1,449	(31.9)	2,052	(45.1)
Some college	7,013	(25.1)	1,713	(37.7)	900	(19.8)
College graduate	5,477	(19.6)	873	(19.2)	925	(20.3)
Advanced degree	3,561	(12.7)	374	(8.2)	368	(8.1)
Marital status						
Married	18,640	(66.6)	3,049	(67.1)	2,856	(62.7)
Single	7,207	(25.8)	1,193	(26.2)	1,430	(31.4)
Other	2,127	(7.6)	306	(6.7)	267	(5.9)
Race/ethnicity						
White, non-Hispanic	20,279	(72.5)	3,432	(75.5)	3,136	(68.9)
Black, non-Hispanic	3,083	(11.0)	446	(9.8)	438	(9.6)
Asian/Pacific Islander	2,388	(8.5)	327	(7.2)	592	(13.0)
Native American	210	(0.8)	32	(0.7)	36	(0.8)
Hispanic	1,642	(5.9)	255	(5.6)	266	(5.8)
Other	372	(1.3)	56	(1.2)	85	(1.9)
Service component						
Reserve/National Guard	13,218	(47.3)	1,811	(39.8)	1,728	(38.0)
Active duty	14,756	(52.7)	2,737	(60.2)	2,825	(62.0)
Military pay grade						
Enlisted	19,922	(71.2)	3,399	(74.7)	3,250	(71.4)
Officer	8,052	(28.8)	1,149	(25.3)	1,303	(28.6)
Service branch						
Army	13,450	(48.1)	1,186	(26.1)	2,968	(65.2)
Air Force	7,654	(27.4)	2,362	(51.9)	951	(20.9)
Navy/Coast Guard	5,665	(20.2)	838	(18.4)	330	(7.2)
Marines	1,205	(4.3)	162	(3.6)	304	(6.7)
Occupational category						
Other occupations	18,891	(67.5)	3,400	(74.8)	2,753	(60.5)
Combat specialists	5,629	(20.1)	978	(21.5)	1,324	(29.1)
Healthcare specialists	3,454	(12.4)	170	(3.7)	476	(10.4)

Behavioral characteristics

Obesity status					
Non-obese	25,021	(89.4)	4,158	(91.4)	4,161 (91.4)
Obese	2,953	(10.6)	390	(8.6)	392 (8.6)
Alcohol consumption					
No to low drinking	7,692	(27.5)	1,070	(23.5)	917 (20.1)
Moderate drinking	9,474	(33.9)	1,528	(33.6)	1,505 (33.1)
Heavy drinking	10,808	(38.6)	1,950	(42.9)	2,131 (46.8)
Physical activity					
Not physically active	11,023	(39.4)	1,658	(36.5)	1,449 (31.8)
Physically active	16,951	(60.6)	2,890	(63.5)	3,104 (68.2)
Strength training					
Non-active strength training	15,435	(55.2)	2,355	(51.8)	1,865 (41.0)
Active strength training	12,539	(44.8)	2,193	(48.2)	2,688 (59.0)
Smoking status					
Nonsmoker	16,720	(59.8)	2,771	(60.9)	2,629 (57.7)
Past smoker	6,847	(24.5)	1,026	(22.6)	1,051 (23.1)
Current smoker	4,407	(15.7)	751	(16.5)	873 (19.2)

* Deployment in support of wars in Iraq and Afghanistan

† Complete self-reported data from baseline Millennium Cohort questionnaires from June 2001 to June 2003 and follow-up questionnaires from June 2004 to February 2006

TABLE 3. Relationship Between Incident Hypertension and Military Deployment

Covariates* (N = 37,075)	Cumulative Incidence %	Adjusted† Odds Ratio	95% CI‡
Self-reported hypertension	6.9		
Deployment status§			
Nondeployed	7.3	1.00	reference
Deployed no combat exposure	5.3	0.74	(0.65, 0.86)
Deployed with combat exposure	6.0	0.94	(0.82, 1.07)
Demographic characteristics			
Sex			
Male	7.5	1.00	reference
Female	5.0	0.63	(0.56, 0.71)
Birth year			
Pre 1960	10.9	1.00	reference
1960-1969	6.9	0.54	(0.49, 0.60)
1970-1979	4.0	0.31	(0.27, 0.36)
1980 and forward	2.9	0.27	(0.19, 0.39)
Education			
<High school diploma	6.5	1.00	reference
High school diploma	7.0	1.06	(0.87, 1.30)
Some college	7.7	1.05	(0.85, 1.29)
College graduate	6.0	0.96	(0.77, 1.21)
Advanced degree	6.6	0.91	(0.70, 1.18)
Marital status			
Married	7.9	1.00	reference
Single	4.4	0.85	(0.75, 0.96)
Other	7.1	0.93	(0.79, 1.09)
Race/ethnicity			
White, non-Hispanic	6.4	1.00	reference
Black, non-Hispanic	11.0	1.85	(1.64, 2.09)
Asian/Pacific Islander	6.1	1.13	(0.95, 1.34)
Native American	7.2	1.17	(0.73, 1.86)
Hispanic	6.7	1.08	(0.90, 1.30)
Other	6.8	1.16	(0.81, 1.65)
Service component			
Reserve/National Guard	7.2	1.00	reference
Active duty	6.7	1.23	(1.12, 1.35)
Military pay grade			
Enlisted	7.3	1.00	reference
Officer	5.8	0.77	(0.66, 0.90)
Service branch			
Army	7.1	1.00	reference
Air Force	7.0	0.97	(0.86, 1.08)
Navy/Coast Guard	6.8	0.92	(0.82, 1.04)
Marines	5.1	0.86	(0.68, 1.08)

Occupational category			
Other occupations	7.2	1.00	reference
Combat specialists	6.2	0.92	(0.83, 1.03)
Healthcare specialists	6.5	1.01	(0.88, 1.16)
Behavioral characteristics			
Obesity status			
Non-obese	6.0	1.00	reference
Obese	14.6	2.19	(1.97, 2.43)
Alcohol consumption			
Low to no drinking	7.4	1.00	reference
Moderate drinking	6.8	0.98	(0.88, 1.10)
Heavy drinking	6.7	1.15	(1.03, 1.28)
Physical activity			
Not physically active	8.0	1.00	reference
Physically active	6.2	0.90	(0.83, 0.99)
Strength training			
Non-active strength training	7.9	1.00	reference
Active strength training	5.8	0.81	(0.74, 0.88)
Smoking status			
Nonsmoker	6.6	1.00	reference
Past smoker	8.1	1.09	(0.99, 1.20)
Current smoker	6.4	0.94	(0.83, 1.07)

* Complete self-reported data from baseline Millennium Cohort questionnaires from June 2001 to June 2003 and follow-up questionnaires from June 2004 to February 2006

† Adjusted for all other variables in table

‡ 95th percent confidence interval

§ Deployed in support of wars in Iraq and Afghanistan

TABLE 4. Relationship Between Incident Hypertension and Deployment with Reported Combat Exposure

Covariates* (N = 9,101)	Cumulative Incidence %	Adjusted Odds Ratio	95% CI†
Self-reported hypertension	5.6		
Deployment status‡			
Deployed no combat exposure	5.3	1.00	reference
Deployed with combat exposure	6.0	1.31	(1.07, 1.61)
Demographic characteristics			
Sex			
Male	5.9	1.00	reference
Female	4.3	0.75	(0.56, 1.01)
Birth year			
Pre 1960	9.6	1.00	reference
1960-1969	6.3	0.58	(0.45, 0.73)
1970-1979	3.4	0.32	(0.24, 0.44)
1980 and forward	2.5	0.23	(0.12, 0.45)
Education			
<High school diploma	6.0	1.00	reference
High school diploma	5.7	0.86	(0.55, 1.33)
Some college	6.0	0.89	(0.55, 1.43)
College graduate	4.5	0.94	(0.56, 1.58)
Advanced degree	6.5	1.15	(0.62, 2.12)
Marital status			
Married	6.4	1.00	reference
Single	3.9	0.91	(0.70, 1.18)
Other	5.8	0.91	(0.62, 1.33)
Race/ethnicity			
White, non-Hispanic	5.1	1.00	reference
Black, non-Hispanic	10.4	1.99	(1.52, 2.60)
Asian/Pacific Islander	3.9	0.94	(0.62, 1.42)
Native American	4.4	0.84	(0.26, 2.71)
Hispanic	7.1	1.49	(1.03, 2.14)
Other	6.6	1.08	(0.52, 2.26)
Service component			
Reserve/National Guard	6.0	1.00	reference
Active duty	5.4	1.18	(0.95, 1.47)
Military pay grade			
Enlisted	6.1	1.00	reference
Officer	4.5	0.61	(0.42, 0.87)
Service branch			
Army	5.5	1.00	reference
Air Force	5.6	0.95	(0.73, 1.25)
Navy/Coast Guard	6.2	1.12	(0.83, 1.53)
Marines	5.6	1.33	(0.85, 2.06)

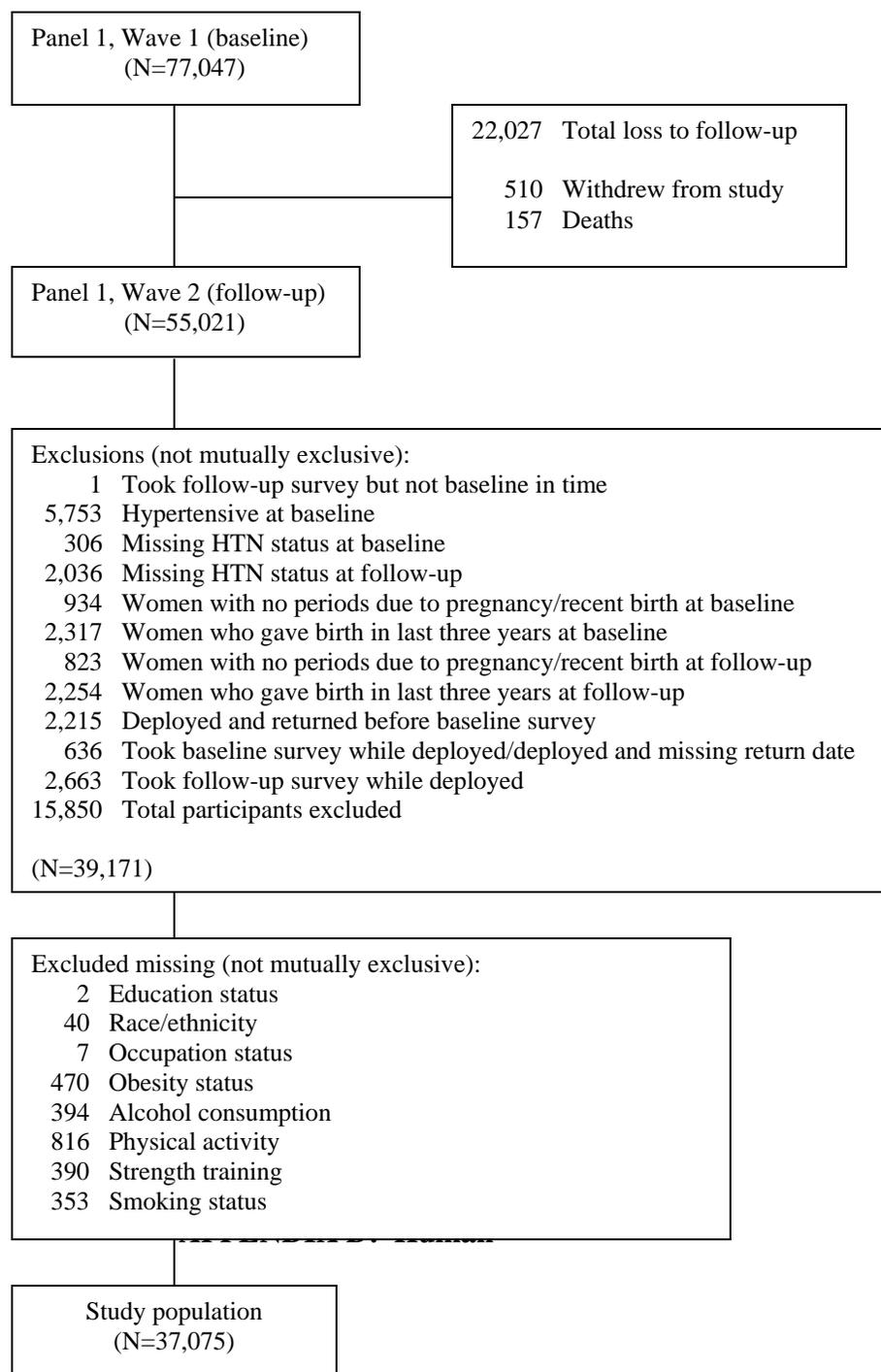
Occupational category			
Other occupations	6.0	1.00	reference
Combat specialists	4.5	0.82	(0.64, 1.05)
Healthcare specialists	6.2	1.01	(0.70, 1.45)
Behavioral characteristics			
Obesity status			
Non-obese	5.0	1.00	reference
Obese	12.3	2.17	(1.70, 2.78)
Alcohol consumption			
Low to no drinking	6.6	1.00	reference
Moderate drinking	5.8	0.98	(0.77, 1.26)
Heavy drinking	5.0	0.97	(0.76, 1.23)
Physical activity			
Not physically active	6.6	1.00	reference
Physically active	5.2	0.94	(0.76, 1.15)
Strength training			
Non-active strength training	6.5	1.00	reference
Active strength training	4.9	0.80	(0.65, 0.97)
Smoking status			
Nonsmoker	5.8	1.00	reference
Past smoker	6.3	0.97	(0.77, 1.21)
Current smoker	4.2	0.74	(0.56, 0.99)

* Complete self-reported data from baseline Millennium Cohort questionnaires from June 2001 to June 2003 and follow-up questionnaires from June 2004 to February 2006

† 95th percent confidence interval

‡ Deployed in support of wars in Iraq and Afghanistan

FIGURE 1. Flowchart of Study Population





Human Subjects
Protection Program

1235 N. Mountain Ave.
P.O. Box 245137
Tucson, AZ 85724-5137
Tel: (520) 626-6721
<http://irb.arizona.edu>

25 October 2007

Nisara Granado, MPH
Advisor: Robin Harris, Ph.D.
Mel and Enid Zuckerman
College of Public Health
1295 N. Martin
PO Box 245163

RE: ASSESSMENT OF HYPERTENSION, COMBAT DEPLOYMENT, AND SELF-REPORTED FUNCTIONING AND WELL-BEING

Dear Ms. Granado:

We received documents concerning your above cited project. Regulations published by the U.S. Department of Health and Human Services [45 CFR Part 46.101(b) (4)] exempt this type of research from review by our Institutional Review Board.

Exempt status is granted with the understanding that no further changes or additions will be made to the procedures followed (copies of which we have on file) without the review and approval of the Human Subjects Committee and your College or Departmental Review Committee. Any research related physical or psychological harm to any subject must also be reported to each committee.

Thank you for informing us of your work. If you have any questions concerning the above, please contact this office.

Sincerely,

A handwritten signature in cursive script that reads 'Rebecca Dahl'.

Rebecca Dahl, R.N., Ph.D.
Director
Human Subjects Protection Program

cc: Departmental/College Review Committee



APPENDIX E: Additional Tables and Figures

TABLE 1. Electronic Medical Records Availability

Data	Source	Availability
Outpatient military	Standard Ambulatory Data Record	October 1998 to September 2005
Inpatient military	Standard Inpatient Data Record	October 1988 to June 2007
Medical care outside military health facilities	Health Care Services Record	October 1993 to June 2006
Mandatory reported pharmaceutical	Pharmacy Data Transaction Service (PDTs)	October 2000 to September 2001
Voluntarily reported archived pharmaceutical	PDTs and the Department of Defense Pharmacoeconomic Center	October 1999 to September 2001

TABLE 2. List of Generic Antihypertensive Medications

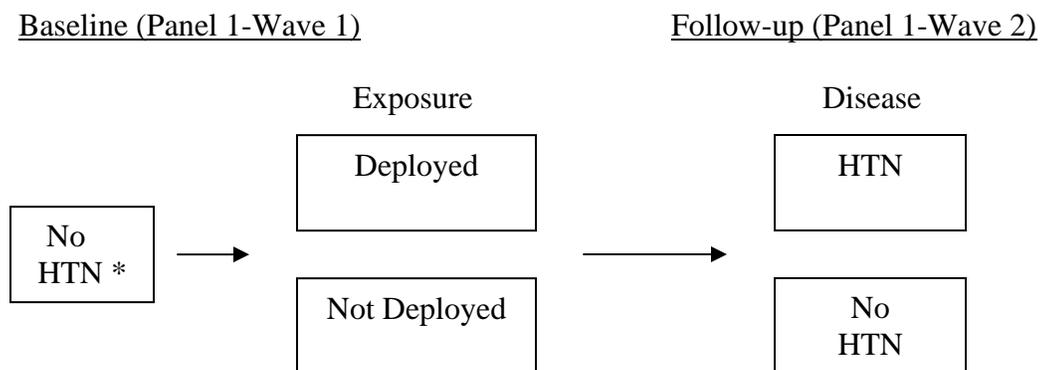
Acebutolol	Labetalol
Amiloride	Lisinopril
Amlodipine	Losartan
Atenolol	Methyldopa
Benazepril	Metolazone
Bexatolol	Metoprolol
Bisoprolol	Minoxidil
Candesartan	Nadolol
Captopril	Nifedipine
Carvedilol	Penbutolol
Clonidine	Pindolol
Diltiazem	Prazosin
Doxazosin	Propranolol
Enalapril	Quinapril
Felodipine	Ramipril
Fosinopril	Sotalol
Furosemide	Spirolactone
Guanfacine	Terazosin
Hydralazine	Triamterene
Hydrochlorothiazide	Valsartan
Indapamide	Verapamil
Irbesartan	

TABLE 3. Variables Table

Variable	Question	Categories
Obesity	Approximately how much do you weigh (in pounds)?	Yes No
	How tall are you? For example, a person who is 5'8" tall would write 5 feet 08 inches	
Alcohol consumption	IN THE PAST YEAR, on those days that you drank alcohol beverages, on average, how many drinks did you have?	Low to no drinking Moderate drinking Heavy drinking
	IN YOUR ENTIRE LIFE, have you had at least 12 drinks of any type of alcoholic beverage (including beer and wine)?	
	IN THE PAST YEAR, have you had at least 12 drinks of any type of alcoholic beverage?	
Physical activity	In a TYPICAL WEEK, how much time do you spend participating in...(Please mark both your typical "days per week" and "minutes per day" doing these activities)	Active Non-active
	b. VIGOROUS exercise or work that causes heavy sweating or large increases in breathing or heart rate? (e.g. running, active sports, marching, biking)	
	c. MODERATE or LIGHT exercise or work that causes light sweating or slight	

	<p>increases in breathing or heart rate? (e.g. walking, cleaning, slow jogging)</p> <p>Responses: Days per week, Minutes per day, None, Cannot physically do</p>	
Strength training	<p>In a TYPICAL WEEK, how much time do you spend participating in...(Please mark both your typical "days per week" and "minutes per day" doing these activities)</p> <p>a. STRENGTH TRAINING or work that strengthens your muscles? (e.g. lifting/pushing/pulling weights)</p> <p>Responses: Days per week, Minutes per day, None, Cannot physically do</p>	<p>Active</p> <p>Non-active</p>
Smoking status	<p>IN YOUR LIFETIME, have you smoked at least 100 cigarettes (5 packs)?...No, Yes</p> <p>Have you ever tried to quit smoking?...Yes, and succeeded, Yes, but not successfully, No</p> <p>IN THE PAST YEAR, have you used any of the following tobacco products?...Cigarettes</p>	<p>Nonsmoker</p> <p>Past smoker</p> <p>Current smoker</p>

FIGURE 1: Exposure-Disease Model



* HTN = hypertension
Individuals with hypertension at baseline were excluded

FIGURE 2: Flowchart of Study Population for Manuscript #1

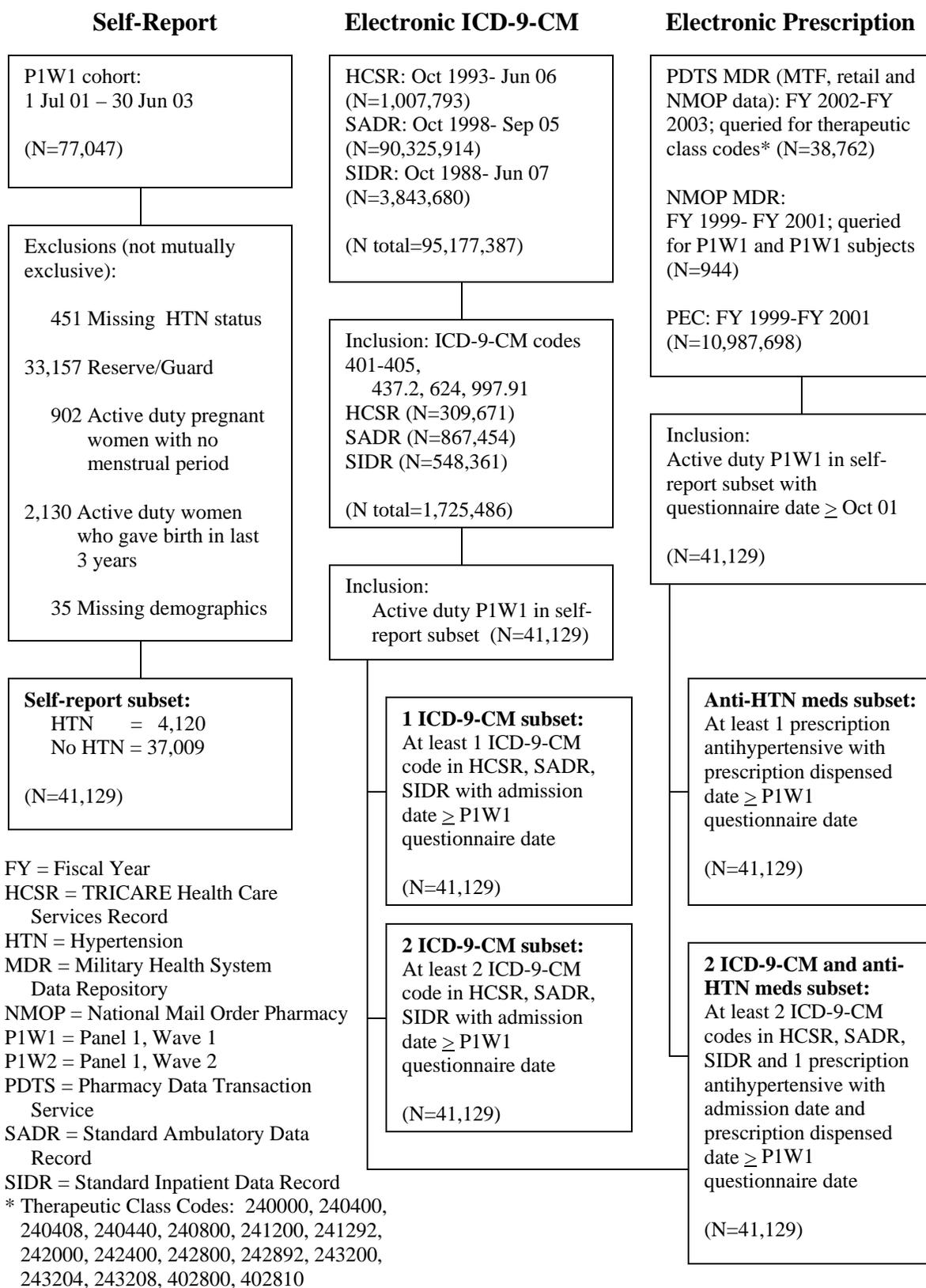
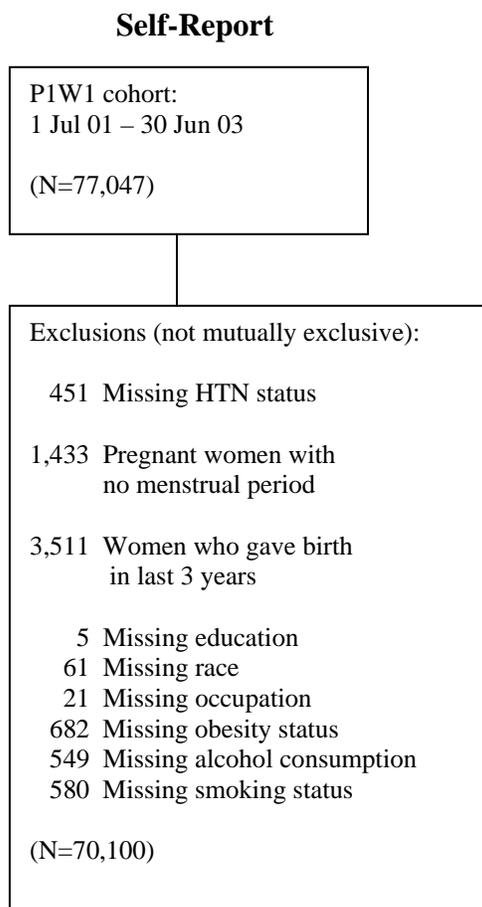


FIGURE 3: Flowchart of Study Population for Manuscript #2



Flowchart of active duty subset shown in Figure 2.

FIGURE 4: Flowchart Study Population for Manuscript #3

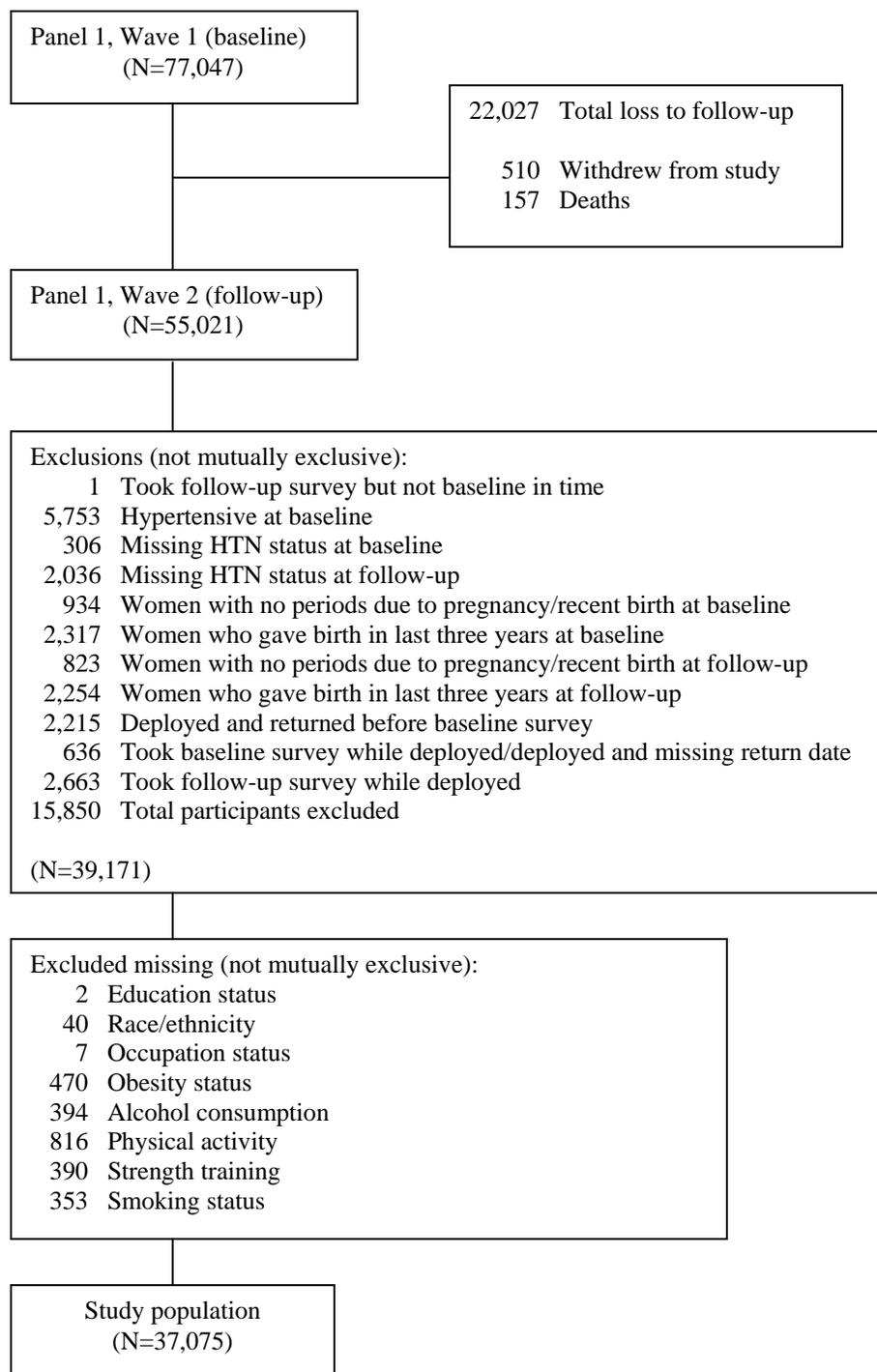
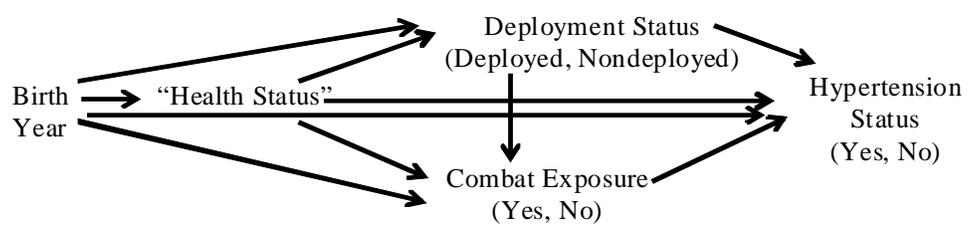


FIGURE 5: "Healthy Warrior" Diagram



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MILLENNIUM COHORT STUDY

www.MillenniumCohort.org

WE NEED YOUR HELP. This questionnaire is an important part of providing you with the best military and veterans' health care policy possible. Your answers will help the Department of Defense to better understand how to prevent disease among military personnel by monitoring health status over time.

YOUR NAME WAS RANDOMLY CHOSEN for participation in this study through a scientific process, matching your service characteristics with those of approximately 100 other service members you will represent through your individual responses.

WE UNDERSTAND THAT YOU ARE BUSY. However, the results of this study will not truly portray the current health status of our military if we only include participants who have extra time to complete the questionnaire. Your individual response is critical to capture important information regarding the health of the military.

EVEN IF YOU HAVE RETIRED OR LEFT MILITARY SERVICE, we need you to complete the questionnaire. You still provide information important to our understanding of military service and subsequent health status.

THE QUESTIONNAIRE CAN BE COMPLETED ONE OF TWO WAYS. You may complete this paper questionnaire with pencil or pen and return it through the mail in the enclosed business reply envelope. Or, you may go to www.MillenniumCohort.org and complete the same questionnaire over the secure web site. To do so, use the last four digits of your social security number and your Subject ID number, found below the barcode on this page. ***The choice is yours!***

THIS INFORMATION IS FOR RESEARCH PURPOSES ONLY. According to the DoD Policy, "Interim Regulations to Improve Privacy Protections for DoD Medical Records" dated October 31, 2000, the information you provide is for research purposes only and may not be disclosed except for specifically authorized purposes or with the consent of the individual about whom the information pertains. Uses and disclosures of this information shall comply with provisions of the Privacy Act and implementing regulations.

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Consent Form

(Please Read and Sign Before Starting the Questionnaire)

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* What is the study about?

You are being asked to be a volunteer in a research study called "The Millennium Cohort Study." This study will follow the long-term health of military personnel during and after their military service. The purpose is to assess the health risks of military deployment, military occupations, and general military service. You have been scientifically selected to represent your service branch, gender, service type, military occupation, and age group from among the over two million military personnel serving as of October 2000 in the regular active duty, Reserve, and National Guard forces. ***It is very important that you participate because no one else can provide the data your country and fellow service men and women need from you.***

* What will participation involve?

You are being asked to do the following:

1. Complete the attached questionnaire today. The questionnaire asks about your physical and mental health. The questions are similar to those a doctor or mental health professional might ask you on your first visit, with specific questions related to possible traumatic life events or experiences of military service. You are also being asked to complete 6 similar surveys that will be sent to you once every 3 years, for a total of 21 years. Filling out the questionnaire will take about 30 minutes each time you complete it.
2. Grant permission for researchers to review electronic military records of your deployments, assignments, promotions, and health care use. These data are very important in determining if your military service, occupation, and operational exposures are likely to have caused any of your illnesses, injuries, or diseases.

You will be contacted annually by mail to verify your current address. In addition, there is a 3% chance that you will be contacted by telephone to confirm your original answers on the questionnaire. Participants will be selected at random for this verification. You are one of approximately 140,000 volunteers who are being asked to participate in this very important study.

* What risks are involved in the study?

The data collection procedures are not expected to involve any risk or discomfort to you. The only risks to you are those associated with the inappropriate disclosure of the data you provide. However, this research group has collected similar information from hundreds of studies during the past several years without any cases of inappropriate disclosure.

* How will your data be protected against those risks?

All questionnaires will be kept in locked files. When your data are entered into computer files for analysis, your answers will be identified only by a special study identification number known to you and research team members. This number is located on the barcode of your study envelope and survey. Your social security number and any other personal identification information will be removed from your questionnaire and data file upon return to the researchers. Even if someone outside the research team broke into the files, it would be impossible for them to identify your data. To minimize the risk of anyone breaking into the data files, those files will be maintained on Department of Defense (DoD) computers protected by all the measures required by DoD computer security regulations. All members of the research team with access to the data files will be trained in DoD computer security procedures specifically designed to protect sensitive data. Reports of the study findings will contain only group data (e.g., all males or all privates), so that no individual study participant can be identified. Similar procedures have been used to protect data in previous studies conducted within the Naval Health Research Center.

According to the DoD Policy "Interim Regulations to Improve Privacy Protections for DoD Medical Records" dated October 31, 2000, the information you provide is for research purposes only and may not be disclosed except for specifically authorized purposes or with the consent of the individual about whom the information pertains. Uses and disclosures of this information shall comply with provisions of the Privacy Act and implementing regulations.

continued on page 4.....

continued from page 3.....

*** How is your data protected if you complete the questionnaire using the Internet web site option?**

All information collected through the Internet questionnaire option is done by using Secure Sockets Layer (SSL) data transmission lines. SSL encrypts, or scrambles, all the questionnaire data sent over the Internet. The data will only be understandable when it reaches the investigator database. The same methods of protection listed above will then be followed to further protect your information.

*** What are the benefits of participating in the study?**

While we cannot guarantee that your participation in this study will directly benefit you, it is possible that, should we learn that your military service has put you at risk for disease, we may be able to notify you that such a disease risk might be reduced. **More importantly, your participation will help define health care policy for future generations of military personnel and guide prevention and treatment programs for years to come.**

*** Do you have to participate?**

No, you do not! Your participation must be completely voluntary. If you decide to participate, you can stop at any time you wish or skip any question you choose. If you choose not to participate or if you later drop out of the study, you will not lose any rights or benefits to which you are otherwise entitled.

*** Who can provide additional information if you need it?**

Questions about the research (science) aspects of this study should be directed to the principal investigator of the Millennium Cohort Study, at telephone (619) 553-7027. You may also refer to the web site at www.MillenniumCohort.org for more information. Questions about the ethical aspects of this study, your rights as a volunteer, or any problem related to the protection of research volunteers should be directed to Dr. Ross Vickers, Chairperson, Committee for the Protection of Human Subjects, Naval Health Research Center, at telephone (619) 553-0633.

*** Where can you find your records if you wish to review them?**

The principal investigator will be responsible for storing the consent form and other research records related to this study. The records will be stored at the DoD Center for Deployment Health Research, Naval Health Research Center, P.O. Box 85122, San Diego, CA, 92186-85122.

Voluntary Consent

I consent to participate in the study described above. My consent is completely voluntary and is based solely on the information provided in this consent form.

Volunteer's signature

Date (mm/dd/yy)

Volunteer's printed name (first, middle initial, last)

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 Consent For office use only


MILLENNIUM COHORT STUDY

Please turn the page to begin the questionnaire.

PRIVACY ACT STATEMENT: You have rights under the Privacy Act. The following statement describes how that Act applies to this study:

Authority: Authority to request this information is granted under Title 5, U.S. Code 136, the Department of Defense Regulations, Executive Order 9396, and DoD RCS#DD-HA(AR)2106 (expires 11-01-03). Personal identifiers will be used to link survey data with medical and other military records.

Purpose: Medical research information will be collected in a research project titled "Prospective Studies of U.S. Military Forces: The Millennium Cohort Study." The project objective is to enhance basic medical knowledge and to improve the treatment and prevention of illnesses that may be related to military service.

Routine Uses: The information provided in this questionnaire will be maintained in data files at the DoD Center for Deployment Health Research at the Naval Health Research Center and used only for medical research purposes. Use of these data may be granted to other federal and non-federal medical research agencies as approved by the Naval Health Research Center's Institutional Review Board. However, your personal identifiers will be protected. By signing the enclosed consent form, you are volunteering to disclose your information as identified above. If you do not agree to this disclosure, your failure will make the research less useful. The "Blanket Routine Uses" that appears at the beginning of the Department of Defense's compilation of medical data bases also applies to this system.

Anonymity: All responses will be held in confidence by the DoD Center for Deployment Health Research. Information you provide will be considered only when statistically summarized with the responses of others. Your personal identifiers (name, etc) will only be used to link data sets and then the identifiers will be stripped from study data such that medical researchers cannot identify you individually.

Voluntary Disclosure: Completion of the questionnaire is voluntary. Failure to respond to any of the questions will NOT result in any penalties except possible lack of representation of your views in the final results and outcomes.

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5. What is the highest level of education that you have **COMPLETED**? Choose the single best answer:

- Less than high school completion/diploma
- High school degree/GED/or equivalent
- Some college, no degree
- Associate's degree
- Bachelor's degree
- Master's, doctorate, or professional degree

6. Are you a twin? ----- NO YES

7. Approximately how much do you weigh (in pounds)?

			pounds
--	--	--	--------

8. How tall are you? For example, a person who is 5'8" tall would write 5 feet 08 inches.

	feet			inches
--	------	--	--	--------

9. Has your doctor or other health professional **EVER** told you that you have any of the following conditions?

NO **YES** **If YES, what year did the problem begin?**

	NO	YES	If YES, what year did the problem begin?			
a. Hypertension (high blood pressure) -----	<input type="radio"/>	<input type="radio"/>				
b. Coronary heart disease -----	<input type="radio"/>	<input type="radio"/>				
c. Heart attack -----	<input type="radio"/>	<input type="radio"/>				
d. Angina (chest pain) -----	<input type="radio"/>	<input type="radio"/>				
e. Any other heart condition please specify <input style="width: 250px;" type="text"/>	<input type="radio"/>	<input type="radio"/>				
f. Sinusitis -----	<input type="radio"/>	<input type="radio"/>				
g. Chronic bronchitis -----	<input type="radio"/>	<input type="radio"/>				
h. Emphysema -----	<input type="radio"/>	<input type="radio"/>				
i. Asthma -----	<input type="radio"/>	<input type="radio"/>				
j. Kidney failure requiring dialysis -----	<input type="radio"/>	<input type="radio"/>				
k. Bladder infection -----	<input type="radio"/>	<input type="radio"/>				
l. Pancreatitis -----	<input type="radio"/>	<input type="radio"/>				
m. Diabetes or sugar diabetes -----	<input type="radio"/>	<input type="radio"/>				
n. Gallstones -----	<input type="radio"/>	<input type="radio"/>				
o. Hepatitis B -----	<input type="radio"/>	<input type="radio"/>				
p. Hepatitis C -----	<input type="radio"/>	<input type="radio"/>				
q. Any other hepatitis -----	<input type="radio"/>	<input type="radio"/>				
r. Cirrhosis -----	<input type="radio"/>	<input type="radio"/>				
s. Rheumatoid arthritis -----	<input type="radio"/>	<input type="radio"/>				
t. Lupus -----	<input type="radio"/>	<input type="radio"/>				
u. Multiple sclerosis -----	<input type="radio"/>	<input type="radio"/>				
v. Crohn's disease -----	<input type="radio"/>	<input type="radio"/>				
w. Stomach, duodenal, or peptic ulcer -----	<input type="radio"/>	<input type="radio"/>				
x. Ulcerative colitis or proctitis -----	<input type="radio"/>	<input type="radio"/>				
y. Significant hearing loss -----	<input type="radio"/>	<input type="radio"/>				

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Question 9 continued.....

	NO	YES	If YES, what year did the problem begin?			
z. Migraine headaches	<input type="radio"/>	<input type="radio"/>				
aa. Stroke	<input type="radio"/>	<input type="radio"/>				
bb. Neuropathy-caused reduced sensation in hands or feet	<input type="radio"/>	<input type="radio"/>				
cc. Seizures	<input type="radio"/>	<input type="radio"/>				
dd. Sleep apnea	<input type="radio"/>	<input type="radio"/>				
ee. Anemia	<input type="radio"/>	<input type="radio"/>				
ff. Thyroid condition other than cancer	<input type="radio"/>	<input type="radio"/>				
gg. Cancer please specify <input type="text"/>	<input type="radio"/>	<input type="radio"/>				
hh. Chronic fatigue syndrome	<input type="radio"/>	<input type="radio"/>				
ii. Depression	<input type="radio"/>	<input type="radio"/>				
jj. Schizophrenia or psychosis	<input type="radio"/>	<input type="radio"/>				
kk. Manic-depressive disorder	<input type="radio"/>	<input type="radio"/>				
ll. Posttraumatic stress disorder	<input type="radio"/>	<input type="radio"/>				
mm. Other please specify <input type="text"/>	<input type="radio"/>	<input type="radio"/>				

10. **DURING THE LAST 12 MONTHS**, have you had persistent or recurring problems with any of the following conditions?

	NO	YES	If YES, what year did the problem begin?			
a. Severe headache	<input type="radio"/>	<input type="radio"/>				
b. Diarrhea	<input type="radio"/>	<input type="radio"/>				
c. Rash or skin ulcer	<input type="radio"/>	<input type="radio"/>				
d. Sore throat	<input type="radio"/>	<input type="radio"/>				
e. Frequent bladder infections	<input type="radio"/>	<input type="radio"/>				
f. Cough	<input type="radio"/>	<input type="radio"/>				
g. Fever	<input type="radio"/>	<input type="radio"/>				
h. Sudden unexplained hair loss	<input type="radio"/>	<input type="radio"/>				
i. Earlobe pain	<input type="radio"/>	<input type="radio"/>				
j. Sleepy all the time	<input type="radio"/>	<input type="radio"/>				
k. Night sweats	<input type="radio"/>	<input type="radio"/>				
l. Chest pain	<input type="radio"/>	<input type="radio"/>				
m. Unusual muscle pains	<input type="radio"/>	<input type="radio"/>				
n. Shortness of breath	<input type="radio"/>	<input type="radio"/>				
o. Trouble sleeping	<input type="radio"/>	<input type="radio"/>				
p. Unusual fatigue	<input type="radio"/>	<input type="radio"/>				
q. Forgetfulness	<input type="radio"/>	<input type="radio"/>				
r. Confusion	<input type="radio"/>	<input type="radio"/>				
s. Other please specify <input type="text"/>	<input type="radio"/>	<input type="radio"/>				

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11. **DURING THE LAST 4 WEEKS**, how much have you been bothered by any of the following problems?

	NOT BOTHERED	BOTHERED A LITTLE	BOTHERED A LOT
a. Stomach pain	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Back pain	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Pain in your arms, legs, or joints (knees, hips, etc).....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Pain or problems during sexual intercourse	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. Headaches	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f. Chest pain	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g. Dizziness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h. Fainting spells	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i. Feeling your heart pound or race	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
j. Shortness of breath	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
k. Constipation, loose bowels, or diarrhea	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
l. Nausea, gas, or indigestion	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
m. Women only: menstrual cramps or other problems with your periods	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

12. **OVER THE LAST 2 WEEKS**, how often have you been bothered by any of the following problems?

	NOT AT ALL	SEVERAL DAYS	MORE THAN HALF THE DAYS	NEARLY EVERY DAY
a. Little interest or pleasure in doing things	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Feeling down, depressed, or hopeless	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Trouble falling or staying asleep or sleeping too much	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Feeling tired or having little energy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. Poor appetite or overeating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f. Feeling bad about yourself - or that you are a failure or have let yourself or your family down	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g. Trouble concentrating on things, such as reading the newspaper or watching television	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h. Moving or speaking so slowly that other people could have noticed? Or the opposite - being so fidgety or restless that you have been moving around a lot more than usual	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i. Thoughts that you would be better off dead or of hurting yourself in some way	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

If you have been frequently bothered by several of the items listed above, you may want to seek help from a health professional in your area.

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13. Questions about anxiety.

NO YES

- a. **IN THE LAST 4 WEEKS**, have you had an anxiety attack - suddenly feeling fear or panic? -----

If you checked "NO," please go to question 15.

- b. Has this ever happened to you before? -----
- c. Do some of these attacks come **suddenly out of the blue** - that is, in situations where you don't expect to be nervous or uncomfortable? -----
- d. Do these attacks bother you a lot, or are you worried about having another attack? -----

14. Think about your last bad anxiety attack.

NO YES

- a. Were you short of breath? -----
- b. Did your heart race, pound, or skip? -----
- c. Did you have chest pain or pressure? -----
- d. Did you sweat? -----
- e. Did you feel as if you were choking? -----
- f. Did you have hot flashes or chills? -----
- g. Did you have nausea or an upset stomach, or the feeling that you were going to have diarrhea? -----
- h. Did you feel dizzy, unsteady, or faint? -----
- i. Did you have tingling or numbness in parts of your body? -----
- j. Did you tremble or shake? -----
- k. Were you afraid you were dying? -----

15. **OVER THE LAST 4 WEEKS**, how often have you been bothered by any of the following problems?

NOT AT ALL

SEVERAL DAYS

MORE THAN HALF THE DAYS

- a. Feeling nervous, anxious, on edge, or worrying a lot about different things. -----

If you checked "NOT AT ALL," go to question 16.

- b. Feeling restless so that it is hard to sit still. -----
- c. Getting tired very easily. -----
- d. Muscle tension, aches, or soreness. -----
- e. Trouble falling asleep or staying asleep. -----
- f. Trouble concentrating on things, such as reading a book or watching TV. -----
- g. Becoming easily annoyed or irritable. -----

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16. Questions about eating.

NO YES

- a. Do you often feel that you can't control what or how much you eat? ----- NO YES
- b. Do you often eat, within any 2 hour period, what most people would regard as an unusually large amount of food? ----- NO YES

If you checked "NO," to either question 16a or 16b, go to question 19.

- c. Has this been as often, on average, as twice a week for the last 3 months? ----- NO YES

17. **IN THE LAST 3 MONTHS**, have you done any of the following in order to avoid gaining weight?

NO YES

- a. Made yourself vomit? ----- NO YES
- b. Took more than twice the recommended dose of laxatives? ----- NO YES
- c. Fasted - not eaten anything at all for at least 24 hours? ----- NO YES
- d. Exercised for more than an hour specifically to avoid gaining weight after binge eating? ----- NO YES

18. If you checked "**YES**" to any of these ways of avoiding gaining weight, were any as often, on average, as twice a week? ----- NO YES

19. If you checked any problems on this questionnaire so far, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?

NOT DIFFICULT AT ALL SOMEWHAT DIFFICULT VERY DIFFICULT EXTREMELY DIFFICULT

20. **IN THE LAST 4 WEEKS**, how much have you been bothered by any of the following problems?

NOT
BOTHEREDBOTHERED
A LITTLEBOTHERED
A LOT

- | | | | |
|---|-----------------------|-----------------------|-----------------------|
| a. Worrying about your health ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| b. Your weight or how you look ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| c. Little or no sexual desire or pleasure during sex ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| d. Difficulties with husband/wife, partner/lover, or boyfriend/girlfriend ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| e. The stress of taking care of children, parents, or other family members ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| f. Stress at work outside of the home or at school ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| g. Financial problems or worries ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| h. Having no one to turn to when you have a problem ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| i. Something bad that happened <u>recently</u> ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| j. Thinking or dreaming about something terrible that happened to you in <u>the past</u> - like your house being destroyed, a severe accident, being hit or assaulted, or being forced to commit a sexual act ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

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21. **IN THE LAST YEAR**, have you been hit, slapped, kicked, or otherwise physically hurt by someone, or has anyone forced you to have an unwanted sexual act? ----- NO YES

22. Are you **CURRENTLY** taking any medicine for anxiety, depression, or stress? ----- NO YES

23. **OVER THE PAST MONTH**, how many hours of sleep did you get in an average 24-hour period? ----- hours

**If you are MALE, please go to question 25.
If you are FEMALE, please go to question 24.**

24. **FOR WOMEN ONLY: Questions about menstruation, pregnancy, and childbirth.**

a. Which best describes your menstrual periods?

- No periods because pregnant or recently gave birth
- No periods for over a year and unrelated to pregnancy or childbirth
- Periods regulated by hormone replacement (estrogen) therapy or oral contraceptives
- Periods unregulated and unchanged for over a year
- Periods have become irregular or changed in frequency, duration, and/or amount in last year

- | | NO | YES | DOES NOT APPLY |
|--|-----------------------|-----------------------|-----------------------|
| b. During the week before your period starts, do you have a <u>serious</u> problem with your mood - like depression, anxiety, irritability, anger, or mood swings? ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| c. If YES : Do these problems go away by the end of your period? ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| d. Have you given birth within the last 3 years? ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| e. Have you had a miscarriage within the last 3 years? ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| f. During the last 3 years have you tried and been unable to become pregnant? ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

- | | NOT AT ALL | A LITTLE BIT | MODERATELY | QUITE A BIT | EXTREMELY |
|--|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| a. Repeated, disturbing memories of stressful experiences from the past. ----- | <input type="radio"/> |
| b. Repeated, disturbing dreams of stressful experiences from the past. ----- | <input type="radio"/> |
| c. Suddenly acting or feeling as if stressful experiences were happening again. ----- | <input type="radio"/> |
| d. Feeling very upset when something happened that reminds you of stressful experiences from the past. ----- | <input type="radio"/> |
| e. Trouble remembering important parts of stressful experiences from the past. ----- | <input type="radio"/> |

Question 25 continued on page 13

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Question 25 continued.....

	NOT AT ALL	A LITTLE BIT	MODERATELY	QUITE A BIT	EXTREMELY
f. Loss of interest in activities that you used to enjoy. -----	<input type="radio"/>				
g. Feeling distant or cut off from other people. --	<input type="radio"/>				
h. Feeling emotionally numb, or being unable to have loving feelings for those close to you.	<input type="radio"/>				
i. Feeling as if your future will somehow be cut short. -----	<input type="radio"/>				
j. Trouble falling asleep or staying asleep. ----	<input type="radio"/>				
k. Feeling irritable or having angry outbursts. -----	<input type="radio"/>				
l. Having difficulty concentrating. -----	<input type="radio"/>				
m. Being "super-alert" or watchful or on guard. -----	<input type="radio"/>				
n. Feeling jumpy or easily startled. -----	<input type="radio"/>				
o. Having physical reactions when something reminds you of stressful experiences from the past. -----	<input type="radio"/>				
p. Avoid thinking about your stressful experiences from the past or avoid having feelings about them. -----	<input type="radio"/>				
q. Avoid activities or situations because they remind you of stressful experiences from the past. -----	<input type="radio"/>				

26. In general, would you say your health is: **(Please check only one.)**

- EXCELLENT
 VERY GOOD
 GOOD
 FAIR
 POOR

27. The following questions are about activities you might do during a typical day. Does *your health now limit you* in these activities? If so, how much?

	YES, LIMITED A LOT	YES, LIMITED A LITTLE	NO, NOT LIMITED AT ALL
a. Vigorous activities , such as running, lifting heavy objects, participating in strenuous sports? -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Moderate activities , such as moving a table, pushing a vacuum cleaner, bowling, or playing golf? -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Lifting or carrying groceries? -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Climbing several flights of stairs? -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. Climbing one flight of stairs? -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f. Bending, kneeling, or stooping? -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g. Walking more than a mile ? -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h. Walking several blocks? -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i. Walking one block? -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
j. Bathing or dressing yourself? -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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28. **DURING THE PAST 4 WEEKS**, have you had any of the following problems with your work or other regular daily activities *as a result of your physical health*?

	NO, NONE OF THE TIME	YES, A LITTLE OF THE TIME	YES, SOME OF THE TIME	YES, MOST OF THE TIME	YES, ALL OF THE TIME
a. Cut down the amount of time you spent on work or other activities. -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Accomplished less than you would like. -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Were limited in the kind of work or other activities. -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Had difficulty performing the work or other activities (for example, it took extra effort). -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

29. **DURING THE PAST 4 WEEKS**, have you had any of the following problems with your work or other regular daily activities *as a result of any emotional problems* (such as feeling depressed or anxious)?

	NO, NONE OF THE TIME	YES, A LITTLE OF THE TIME	YES, SOME OF THE TIME	YES, MOST OF THE TIME	YES, ALL OF THE TIME
a. Cut down the amount of time you spent on work or other activities. -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Accomplished less than you would like. -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Didn't do work or other activities as carefully as usual. -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

30. **DURING THE PAST 4 WEEKS**, *to what extent* has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?

- NOT AT ALL SLIGHTLY MODERATELY QUITE A BIT EXTREMELY

31. **DURING THE PAST 4 WEEKS**, how much bodily pain have you had?

- NONE VERY MILD MILD MODERATE SEVERE VERY SEVERE

32. **DURING THE PAST 4 WEEKS**, how much did *pain* interfere with your normal work (including both work outside the home and housework)?

- NOT AT ALL A LITTLE BIT MODERATELY QUITE A BIT EXTREMELY

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33. These questions are about how you feel and how things have been with you **DURING THE PAST 4 WEEKS**.

For each question, please give the one answer that comes closest to the way you have been feeling.

DURING THE PAST 4 WEEKS, how much of the time:

	ALL OF THE TIME	MOST OF THE TIME	A GOOD BIT OF THE TIME	SOME OF THE TIME	A LITTLE OF THE TIME	NONE OF THE TIME
a. Did you feel full of pep ?----- <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Have you been a very nervous person ? ----- <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Have you felt so down in the dumps that nothing could cheer you up ? ----- <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Have you felt calm and peaceful ? ----- <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. Did you have a lot of energy ? ----- <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f. Have you felt downhearted and blue ? ----- <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g. Did you feel worn out ? ----- <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h. Have you been a happy person ? ----- <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i. Did you feel tired ? ----- <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

34. **DURING THE PAST 4 WEEKS**, how much of the time has your **physical health or emotional problems** interfered with your social activities (like visiting with friends, relatives)?

- ALL OF THE TIME MOST OF THE TIME SOME OF THE TIME A LITTLE OF THE TIME NONE OF THE TIME

35. Please choose the answer that best describes how true or false **EACH** of the following statements is for you.

	DEFINITELY TRUE	MOSTLY TRUE	NOT SURE	MOSTLY FALSE	DEFINITELY FALSE
a. I seem to get sick a little easier than other people. ----- <input type="radio"/>	<input type="radio"/>				
b. I am as healthy as anybody I know. ----- <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. I expect my health to get worse. ----- <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. My health is excellent. ----- <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Now we'd like to ask you some questions about how your health may have changed.

36. **COMPARED TO 3 YEARS AGO**, how would you rate your **physical health** in general now?

- MUCH BETTER SOMEWHAT BETTER ABOUT THE SAME SOMEWHAT WORSE MUCH WORSE

37. **COMPARED TO 3 YEARS AGO**, how would you rate your **emotional health or well-being** (such as feeling anxious, depressed, or irritable) *now*?

- MUCH BETTER SOMEWHAT BETTER ABOUT THE SAME SOMEWHAT WORSE MUCH WORSE

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38. Besides your regular physician, we'd like to ask you about other ways you may treat your health problems.

IN THE LAST 12 MONTHS, have you used:

NO YES

- a. Acupuncture ----- NO YES
- b. Chiropractic care ----- NO YES
- c. Herbal therapy ----- NO YES
- d. High dose/megavitamin therapy ----- NO YES
- e. Special diet programs for weight loss ----- NO YES

If **YES**, how many shots of the anthrax vaccine have you received?

39. Have you received the anthrax vaccine? ----- NO YES ----- shots

These next few questions are about drinking alcoholic beverages. Some studies have shown that alcohol consumption is related to certain medical conditions. Alcoholic beverages include liquor such as whiskey, gin, beer, wine, wine coolers, and any other type of alcoholic beverage. For the purpose of this questionnaire:

One drink = one 12-ounce beer, one 4-ounce glass of wine, or one 1.5 ounce shot of liquor

40. **IN ANY ONE YEAR**, have you had a total of 12 drinks of any type of alcoholic beverage (including beer and wine)? ----- NO YES

41. **IN YOUR ENTIRE LIFE**, have you had at least 12 drinks of any type of alcoholic beverage (including beer and wine)? ----- NO YES

**If you checked "YES," go to question 42.
If you checked "NO," go to question 50.**

42. **IN THE PAST YEAR**, have you had at least 12 drinks of any type of alcoholic beverage? --- NO YES

**If you checked "YES," go to question 43.
If you checked "NO," go to question 50.**

43. **IN THE PAST YEAR**, how **OFTEN** did you typically drink any type of alcoholic beverage?

- NEVER
- RARELY
- MONTHLY
- WEEKLY
- DAILY

44. **IN THE PAST YEAR**, on those days that you drank alcoholic beverages, on average, how many drinks did you have? ----- drinks

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45. **IN A TYPICAL WEEK**, how many drinks do you have? drinks

46. **LAST WEEK**, how many drinks of alcoholic beverages did you have?

Monday

Tuesday

Wednesday

Thursday

Friday

Saturday

Sunday

47. **IN THE PAST YEAR**, on how many **DAYS** did you have 5 or more drinks of any alcoholic beverage? days

48. **IN THE LAST 12 MONTHS**, have any of the following happened to you **MORE THAN ONCE**? NO YES

- a. You drank alcohol even though a doctor suggested that you stop drinking because of a problem with your health NO YES
- b. You drank alcohol, were high from alcohol, or hung over while you were working, going to school, or taking care of children or other responsibilities NO YES
- c. You missed or were late for work, school, or other activities because you were drinking or hung over NO YES
- d. You had a problem getting along with people while you were drinking NO YES
- e. You drove a car after having several drinks or after drinking too much NO YES

49. Have you **EVER** felt any of the following? NO YES

- a. Felt you needed to cut back on your drinking NO YES
- b. Felt annoyed at anyone who suggested you cut back on your drinking NO YES
- c. Felt you needed an "eye-opener," or early morning drink NO YES
- d. Felt guilty about your drinking NO YES

50. **IN THE PAST YEAR**, have you used any of the following tobacco products? NO YES

- a. Cigarettes NO YES
- b. Cigars NO YES
- c. Pipes NO YES
- d. Smokless tobacco (chew, dip, snuff) NO YES

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51. **IN YOUR LIFETIME**, have you smoked at least 100 cigarettes (5 packs)? NO YES

**If you checked "YES," go to question 52.
If you checked "NO," go to question 56.**

52. At what age did you start smoking?

--	--

 years old

53. How many years have or did you smoke an average of at least 3 cigarettes per day (or one pack per week)?

--	--

 years

54. When smoking, how many packs per day did you or do you smoke?

Less than a half pack per day

1/2 to 1 pack per day

1 to 2 packs per day

More than 2 packs per day

55. Have you ever tried to quit smoking?

Yes, and succeeded

Yes, but not successfully

No

56. Have you **EVER** had any of the following life events happen to you?

	NO	YES	If YES, list most recent year				
a. You were divorced or separated	<input type="radio"/>	<input type="radio"/>	<table border="1" style="display: inline-table;"><tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td></tr></table>				
b. Suffered major financial problems (such as bankruptcy)	<input type="radio"/>	<input type="radio"/>	<table border="1" style="display: inline-table;"><tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td></tr></table>				
c. Suffered forced sexual relations or sexual assault	<input type="radio"/>	<input type="radio"/>	<table border="1" style="display: inline-table;"><tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td></tr></table>				
d. Experienced sexual harassment	<input type="radio"/>	<input type="radio"/>	<table border="1" style="display: inline-table;"><tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td></tr></table>				
e. Suffered a violent assault	<input type="radio"/>	<input type="radio"/>	<table border="1" style="display: inline-table;"><tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td></tr></table>				
f. Had a family member or loved one become severely ill or die	<input type="radio"/>	<input type="radio"/>	<table border="1" style="display: inline-table;"><tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td></tr></table>				
g. Suffered a disabling illness or injury	<input type="radio"/>	<input type="radio"/>	<table border="1" style="display: inline-table;"><tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td></tr></table>				

57. Have you **EVER** been exposed to any of the following?

	NO	YES, 1 TIME	YES, MORE THAN 1 TIME	If YES, list most recent year of exposure				
a. Witnessing a person's death due to war, disaster, or tragic event	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<table border="1" style="display: inline-table;"><tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td></tr></table>				
b. Knowledge of or witnessing instances of physical abuse (torture, beating, rape)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<table border="1" style="display: inline-table;"><tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td></tr></table>				
c. Dead and/or decomposing bodies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<table border="1" style="display: inline-table;"><tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td></tr></table>				

Question 57 continued on page 19...

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Question 57 continued...

	NO	YES, 1 TIME	YES, MORE THAN 1 TIME	If YES, list most recent year of exposure
d. Maimed soldiers/civilians -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
e. Prisoners of war/refugees -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
f. Chemical or biological warfare agents -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
g. Other medical countermeasures for chemical or biological warfare agent exposure -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
h. Alarms necessitating wearing of chemical/biological warfare protective gear -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>

58. **DURING THE PAST 3 YEARS**, were you exposed to any of the following?

	NO	DON'T KNOW	YES	If YES, list most recent year of exposure
a. Occupational hazards requiring protective equipment, such as respirators or hearing protection -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
b. Routine skin contact with paint and/or solvent and/or substances -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
c. Depleted uranium (DU) -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
d. Microwaves (excluding small microwave ovens) -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
e. Pesticides, including creams, sprays, or uniform treatments -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
f. Pesticides applied in the environment or around living facilities -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
g. Any exposure, physical or psychological, during a military deployment that had a significant impact on your health? ----- please specify <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>

59. What is your current military status? Please choose the single best answer.

- Enlisted (Active Duty, Reserve, or National Guard) ----- **Go to question 60**
- Officer (Active Duty, Reserve, or National Guard) ----- **Go to question 61**
- Retired ----- **Go to question 62**
- Disabled ----- **Go to question 62**
- Other ----- **Go to question 62**
- No Longer In The Military ----- **Go to question 62**

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60. Answer this question only if you are **ENLISTED (Active Duty, Reserve, or National Guard)**. (All others skip to question 61.) Please review the list of military occupational categories and select the **TWO** that **BEST MATCH** your military job. Please fill in the two-digit code listed for your **PRIMARY** job code and your **SECONDARY** job code.

--	--

PRIMARY JOB CODE

--	--

SECONDARY JOB CODE

INFANTRY, GUN CREWS & SEAMANSHIP SPECIALISTS	
01	Infantry
02	Armor & Amphibious
03	Combat Engineering
04	Artillery/Gunnery, Rockets & Missiles
05	Air Crew
06	Seamanship
07	Installation Security

COMMUNICATIONS & INTELLIGENCE SPECIALISTS	
20	Radio & Radio Code
21	Sonar
22	Radar & Air Traffic Control
23	Signal Intel/Electronic Warfare
24	Intelligence
25	Combat Operations Control
26	Communications Center Operations

CRAFTWORKERS	
70	Metalworking
71	Construction
72	Utilities
74	Lithography
75	Industrial Gas & Fuel Production
76	Fabric, Leather & Rubber
79	Other Craftworker

SERVICE & SUPPLY HANDLERS	
80	Food Service
81	Motor Transport
82	Material Receipt, Storage & Issue
83	Law Enforcement
84	Personnel Service
85	Auxiliary Labor
86	Forward Area Equipment Support
87	Other Services

ELECTRONIC EQUIPMENT REPAIRERS	
10	Radio/Radar
11	Fire Control Electric Systems (Non-Missile)
12	Missile Guidance, Control & Check-out
13	Sonar Equipment
14	Nuclear Weapons Equipment
15	ADP Computers
16	Teletype & Cryptographic Equipment
19	Other Electronic Equipment

HEALTH CARE SPECIALISTS	
30	Medical Care
31	Ancillary Medical Support
32	Biomedical Sciences & Allied Health
33	Dental Care
34	Medical Admin & Logistics
35	Other Technical & Allied Specialists

ELECTRICAL/MECHANICAL EQUIPMENT REPAIRERS	
60	Aircraft & Aircraft-Related
61	Automotive
62	Wire Communications
63	Missile Mechanical & Electrical
64	Armament & Munitions
65	Shipboard Propulsion
66	Power Generating Equipment
67	Precision Equipment
69	Other Mechanical & Electrical Equipment

FUNCTIONAL SUPPORT & ADMINISTRATION	
50	Personnel
51	Administration
52	Clerical/Personnel
53	Data Processing
54	Accounting, Finance & Disbursing
55	Other Functional Support
56	Religious, Morale & Welfare
57	Information & Education

PHOTOGRAPHY	
41	Mapping, Surveying, Drafting & Illustrating
42	Weather
43	Ordnance Disposal & Diving
45	Musician
49	Technical Specialist

NON-OCCUPATIONAL	
90	Patients & Prisoners
91	Officer Candidate & Student
92	Undesignated Occupations
95	Not Occupationally Qualified

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61. Answer this question only if you are an **OFFICER (Active Duty, Reserve, or National Guard)**. (All others skip to question 62). Please review the list of military occupational categories and select the **TWO** that **BEST MATCH** your military job. Please fill in the two-digit code listed for your **PRIMARY** job code and your **SECONDARY** job code.

--	--

PRIMARY JOB CODE

--	--

SECONDARY JOB CODE

ENGINEERING & MAINTENANCE OFFICERS

4A Construction & Utilities
 4B Electrical/Electronic
 4C Communications & Radar
 4D Aviation Maintenance & Allied
 4E Ordnance
 4F Missile Maintenance
 4G Ship Construction & Maintenance
 4H Ship Machinery
 4J Safety
 4K Chemical
 4L Automotive & Allied
 4M Surveying & Mapping
 4N Other

NON-OCCUPATIONAL

9A Patient
 9B Student
 9E Other

GENERAL OFFICERS & EXECUTIVES

1A General & Flag
 1B Executive

SCIENTISTS & PROFESSIONALS

5A Physical Scientist
 5B Meteorologist
 5C Biological Scientist
 5D Social Scientist
 5E Psychologist
 5F Legal
 5G Chaplain
 5J Mathematician & Statistician
 5K Educator & Instructor
 5L Research & Development Coordinator
 5M Community Activities Officers
 5N Scientist & Professional

INTELLIGENCE OFFICERS

3A Intelligence, General
 3B Communications Intelligence
 3C Counter-intelligence

ADMINISTRATORS

7A Administrator, General
 7B Training Administrator
 7C Manpower & Personnel
 7D Comptroller & Fiscal
 7E Data Processing
 7F Pictorial
 7G Information
 7H Police
 7L Inspection
 7N Morale & Welfare

TACTICAL OPERATIONS OFFICERS

2A Fixed-Wing Fighter & Bomber Pilot
 2C Helicopter Pilot
 2D Aircraft Crew
 2E Ground & Naval Arms
 2F Missiles
 2G Operations Staff
 2H Civilian Pilot

SUPPLY, PROCUREMENT & ALLIED OFFICERS

8A Logistics, General
 8B Supply
 8C Transportation
 8D Procurement & Production
 8E Food Service
 8F Exchange & Commissary
 8G Other

HEALTH CARE OFFICERS

6A Physician
 6C Dentist
 6E Nurse
 6G Veterinarian
 6H Biomedical Sciences & Allied Health
 6I Health Service Administration

62. Do you have a civilian job at this time?

- YES ----- Go to question 63
 NO civilian employment at this time ----- Go to question 64
 Homemaker ----- Go to question 64

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63. If you checked **"YES"** to question 62, please review the list of **CIVILIAN** occupational categories on this page and the next page. (All others skip to question 64.) Then select the **TWO** that **BEST MATCH** your civilian job. Please fill in the three digit code listed for your **PRIMARY** job code and your **SECONDARY** job code.

--	--	--

PRIMARY JOB CODE

--	--	--

SECONDARY JOB CODE

**OFFICE & ADMINISTRATION
SUPPORT**

- 431 Supervisors, Office & Administrative Support
- 432 Communications Equipment Operator
- 433 Financial Clerk
- 434 Information & Record Clerk
- 435 Material Recording, Scheduling, Dispatching & Distributing Worker
- 436 Secretaries & Admin Assistants
- 439 Other Office & Admin Support

PRODUCTION OCCUPATIONS

- 511 Supervisor, Production Worker
- 512 Assembler, Fabricator
- 513 Food Processing Worker
- 514 Metal & Plastic Worker
- 515 Printing Worker
- 516 Textile, Apparel & Furnishing Worker
- 517 Woodworker
- 518 Plant & Systems Operator
- 519 Other Production Occupation

PERSONAL CARE SERVICE

- 391 Supervisor, Personal Care & Service
- 392 Animal Care & Service
- 393 Entertainment Attendant & Related Worker
- 394 Funeral Worker
- 395 Personal Appearance
- 396 Transportation, Tourism & Lodging Attendant
- 399 Other Personal Care & Service Worker

**INSTALLATION, REPAIR &
MAINTENANCE OCCUPATIONS**

- 491 Supervisor of Installation, Maintenance & Repair Worker
- 492 Electrical & Electric Equipment Mechanic, Installer & Repairer
- 493 Vehicle & Mobile Equipment Mechanic, Installer, & Repairer
- 499 Other Installation, Maintenance & Repair

**FARMING, FISHING &
FORESTRY WORKERS**

- 451 Supervisor, Farming, Fishing & Forestry Worker
- 452 Agricultural Worker
- 453 Fishing & Hunting Worker
- 454 Forest, Conservation & Logging Worker
- 459 Other Farming, Fishing & Forestry

**EDUCATION, TRAINING
& LIBRARY**

- 251 Postsecondary Teacher
- 252 Primary, Secondary & Special Education School Teacher
- 253 Other Teacher & Instructor
- 254 Librarian, Curator & Archivist
- 259 Other Education, Training & Library Occupations

COMPUTER & MATHEMATICAL

- 151 Computer Specialist
- 152 Mathematical Specialist
- 153 Mathematical Tech

**BUSINESS & FINANCIAL
OPERATIONS**

- 131 Business Operations Specialist
- 132 Financial Specialist

LEGAL

- 231 Lawyer, Judge & Related Worker
- 232 Legal Support Worker

**ARTS, DESIGN, MEDIA,
ENTERTAINMENT & SPORTS**

- 271 Art & Design
- 272 Entertainer & Performer Sports & Related Worker
- 273 Media Communication Worker
- 274 Media Communication Equipment Worker

**ARCHITECTURE &
ENGINEERING**

- 171 Architect, Surveyor & Cartographer
- 172 Engineer
- 173 Drafters, Engineering & Mapping Technician

**COMMUNITY &
SOCIAL SERVICES**

- 211 Counselor, Social Worker & Other Community & Social Service Specialist
- 212 Religious Worker

Question 63 continued, Civilian Occupational categories...

CONSTRUCTION & EXTRACTION	
471	Supervisor, Construction & Extraction Worker
472	Construction Trades Worker
473	Helper, Construction Trades
474	Other Construction & Related Worker
475	Extraction Worker

FOOD PREPARATION & SERVING RELATED	
351	Supervisor, Food Preparation & Serving
352	Cook & Food Preparation Worker
353	Food and Beverage Worker
359	Other Food Preparation & Serving Related Worker

BUILDING & GROUNDS CLEANING & MAINTENANCE	
371	Supervisor, Building & Grounds & Cleaning & Maintenance Worker
372	Building Cleaning & Pest Control
373	Ground Maintenance

TRANSPORTATION & MATERIAL MOVING	
531	Supervisor, Transportation & Material Moving
533	Motor Vehicle Operator
534	Rail Transportation Worker
535	Water Transportation
536	Other Transportation
537	Material Moving Worker

HEALTH CARE	
295	Physician
311	Nursing, Psychiatric & Home Health Aid
312	Occupational & Physical Therapist Assistant and Aid
319	Other Health Care Occupations

SALES-RELATED OCCUPATIONS	
411	Supervisor, Sales
412	Retail Sales Worker
413	Sales Rep, Services
414	Sales Rep, Wholesale & Manufacturing
415	Counter & Rental Clerks & Parts Salesperson
419	Other Sales & Related Worker

LIFE, PHYSICAL & SOCIAL SCIENCES	
191	Life Scientist
192	Physical Scientist
193	Social Scientist & Related Worker
194	Life, Physical & Social Sciences Technician

PROTECTIVE SERVICES	
331	First Line Supervisor/ Manager, Protective Services
332	Firefighting & Prevention Worker
333	Law Enforcement Worker
339	Other Protective Service Worker

MANAGEMENT	
111	Top Executive
112	Advertising, Marketing, Promotions, PR & Sales Manager
113	Operations Specialties Manager
119	Other Management Occupations

64. Do you have any concerns about your health that are not covered in this survey that you would like to share?
(Continue on a separate sheet if necessary.)

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65. May we contact you by phone if we have questions about your responses to any of the items on this survey?

Please list your daytime phone number.

66. May we contact you by email if we have questions about your responses to any of the items on this survey?

Please list your email address. (Note: you may also update your email address at www.MillenniumCohort.org)

68. If you should move, it is important that we know your most current address. Please provide names, addresses, phone numbers, and email addresses of individuals who will always know your location who we may contact to learn your latest address. *We will **NOT** share your questionnaire responses with these individuals.*

Contact #1

First

Last

Number

Street Name

Apt/Unit #

City/APO/FPO

STATE

Zip Code

Phone Number

Email address

Contact #2

First

Last

Number

Street Name

Apt/Unit #

City/APO/FPO

STATE

Zip Code

Phone Number

Email address

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[] For office use only

Panel 1, Wave 2



MILLENNIUM COHORT STUDY

OMB #0720-0029 exp 09/30/06
DoD RCS#DD-HA(AR)2106 Part B exp 11/30/06



2262168625



0843168628



You may also complete this questionnaire online at
www.MillenniumCohort.org

MARKING INSTRUCTIONS

- Use BLACK or BLUE ink.
- Shade circles like this: ● Not like this: ⊗ ⊙
- Mistakes must be crossed out with an "X".
- Print in CAPITAL LETTERS and avoid contact with the edge of the box. EXAMPLE:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

- Answer every question to the best of your ability.
- It will take approximately 30 minutes to complete the questionnaire.

1. What is your current mailing address?

Address Line 1:

Address Line 2
(optional):

City (or FPO/APO):

State/Province/Region
(or AA/AE/AP):

ZIP/Postal Code:

Country:

2. Please provide your daytime phone number:

3. Please provide your email address:

If any of your contact information changes, please log on to www.MillenniumCohort.org
 or call our toll-free number at (888) 942-5222 to provide an update.

4. What is today's date?

M M / D D / Y Y Y Y
 / / 2 0 0

5. What are the last four digits of your Social Security number?

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6. What is your **current** marital status?

Choose the single best answer:

- Single, never married
- Now married
- Separated
- Divorced
- Widowed

7. What is the **highest level** of education that you have **completed**?

Choose the single best answer:

- Less than high school completion/diploma
- High school degree/GED/or equivalent
- Some college, no degree
- Associate's degree
- Bachelor's degree
- Master's, doctorate, or professional degree

8. In the **last 3 years**, has your doctor or other health professional told you that you have any of the following conditions?

If **YES**, in what year were you **first** diagnosed?

Mark here if you were hospitalized for the condition in the **last 3 years**

	<input type="radio"/> No	<input type="radio"/> Yes		<input type="radio"/> Hospitalized
a. Hypertension (high blood pressure)			<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	
b. Coronary heart disease			<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	
c. Heart attack			<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	
d. Angina (chest pain)			<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	
e. Any other heart condition please specify <input type="text"/>			<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	
f. Sinusitis			<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	
g. Chronic bronchitis			<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	
h. Emphysema			<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	
i. Asthma			<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	
j. Kidney failure requiring dialysis			<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	
k. Bladder infection			<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	
l. Pancreatitis			<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	
m. Diabetes or sugar diabetes			<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	
n. Gallstones			<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	
o. Hepatitis B			<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	
p. Hepatitis C			<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	
q. Any other hepatitis			<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	
r. Cirrhosis			<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	

Question 8 continued on page 5...

Question 8 continued...

If **YES**, in what
year were you
first diagnosed?

Mark here if you
were hospitalized
for the condition in
the **last 3 years**

s. Rheumatoid arthritis	<input type="radio"/> No	<input type="radio"/> Yes	<input type="text"/>	<input type="radio"/> Hospitalized
t. Lupus	<input type="radio"/> No	<input type="radio"/> Yes	<input type="text"/>	<input type="radio"/> Hospitalized
u. Multiple sclerosis	<input type="radio"/> No	<input type="radio"/> Yes	<input type="text"/>	<input type="radio"/> Hospitalized
v. Crohn's disease	<input type="radio"/> No	<input type="radio"/> Yes	<input type="text"/>	<input type="radio"/> Hospitalized
w. Stomach, duodenal, or peptic ulcer	<input type="radio"/> No	<input type="radio"/> Yes	<input type="text"/>	<input type="radio"/> Hospitalized
x. Ulcerative colitis or proctitis	<input type="radio"/> No	<input type="radio"/> Yes	<input type="text"/>	<input type="radio"/> Hospitalized
y. Significant hearing loss	<input type="radio"/> No	<input type="radio"/> Yes	<input type="text"/>	<input type="radio"/> Hospitalized
z. Significant vision loss even with glasses or contact lenses	<input type="radio"/> No	<input type="radio"/> Yes	<input type="text"/>	<input type="radio"/> Hospitalized
aa. Migraine headaches	<input type="radio"/> No	<input type="radio"/> Yes	<input type="text"/>	<input type="radio"/> Hospitalized
bb. Stroke	<input type="radio"/> No	<input type="radio"/> Yes	<input type="text"/>	<input type="radio"/> Hospitalized
cc. Neuropathy-caused reduced sensation in hands or feet --	<input type="radio"/> No	<input type="radio"/> Yes	<input type="text"/>	<input type="radio"/> Hospitalized
dd. Seizures	<input type="radio"/> No	<input type="radio"/> Yes	<input type="text"/>	<input type="radio"/> Hospitalized
ee. Sleep apnea	<input type="radio"/> No	<input type="radio"/> Yes	<input type="text"/>	<input type="radio"/> Hospitalized
ff. Anemia	<input type="radio"/> No	<input type="radio"/> Yes	<input type="text"/>	<input type="radio"/> Hospitalized
gg. Thyroid condition other than cancer	<input type="radio"/> No	<input type="radio"/> Yes	<input type="text"/>	<input type="radio"/> Hospitalized
hh. Cancer please specify <input type="text"/>	<input type="radio"/> No	<input type="radio"/> Yes	<input type="text"/>	<input type="radio"/> Hospitalized
ii. Chronic fatigue syndrome	<input type="radio"/> No	<input type="radio"/> Yes	<input type="text"/>	<input type="radio"/> Hospitalized
jj. Depression	<input type="radio"/> No	<input type="radio"/> Yes	<input type="text"/>	<input type="radio"/> Hospitalized
kk. Schizophrenia or psychosis	<input type="radio"/> No	<input type="radio"/> Yes	<input type="text"/>	<input type="radio"/> Hospitalized
ll. Manic-depressive disorder	<input type="radio"/> No	<input type="radio"/> Yes	<input type="text"/>	<input type="radio"/> Hospitalized
mm. Posttraumatic stress disorder	<input type="radio"/> No	<input type="radio"/> Yes	<input type="text"/>	<input type="radio"/> Hospitalized
nn. Other please specify <input type="text"/>	<input type="radio"/> No	<input type="radio"/> Yes	<input type="text"/>	<input type="radio"/> Hospitalized

7213168626

9. In the **last 3 years**, have you had persistent or recurring problems with any of the following?

a. Severe headache <input type="radio"/> No <input type="radio"/> Yes	k. Night sweats <input type="radio"/> No <input type="radio"/> Yes
b. Diarrhea <input type="radio"/> No <input type="radio"/> Yes	l. Chest pain <input type="radio"/> No <input type="radio"/> Yes
c. Rash or skin ulcer <input type="radio"/> No <input type="radio"/> Yes	m. Unusual muscle pains <input type="radio"/> No <input type="radio"/> Yes
d. Sore throat <input type="radio"/> No <input type="radio"/> Yes	n. Shortness of breath <input type="radio"/> No <input type="radio"/> Yes
e. Frequent bladder infections <input type="radio"/> No <input type="radio"/> Yes	o. Trouble sleeping <input type="radio"/> No <input type="radio"/> Yes
f. Cough <input type="radio"/> No <input type="radio"/> Yes	p. Unusual fatigue <input type="radio"/> No <input type="radio"/> Yes
g. Fever <input type="radio"/> No <input type="radio"/> Yes	q. Forgetfulness <input type="radio"/> No <input type="radio"/> Yes
h. Sudden unexplained hair loss <input type="radio"/> No <input type="radio"/> Yes	r. Confusion <input type="radio"/> No <input type="radio"/> Yes
i. Earlobe pain <input type="radio"/> No <input type="radio"/> Yes	s. Other <input type="radio"/> No <input type="radio"/> Yes
j. Sleepy all the time <input type="radio"/> No <input type="radio"/> Yes	please specify <input type="text"/>

10. Over the **past 3 years**, approximately how many days were you hospitalized because of illness or injury?
(exclude hospitalization for pregnancy and childbirth)

- None
 1 day
 2-5 days
 6-10 days
 11-15 days
 16-20 days
 21 days or more

11. Over the **past 3 years**, approximately how many days were you unable to work or perform your usual activities because of illness or injury? (exclude lost time for pregnancy and childbirth)

- None
 1 day
 2-5 days
 6-10 days
 11-15 days
 16-20 days
 21 days or more

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12. During the **last 4 weeks**, how much have you been bothered by any of the following problems?

	Not bothered	Bothered a little	Bothered a lot
a. Stomach pain	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Back pain	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Pain in your arms, legs, or joints (knees, hips, etc)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Pain or problems during sexual intercourse	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. Headaches	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f. Chest pain	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g. Dizziness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h. Fainting spells	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i. Feeling your heart pound or race	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
j. Shortness of breath	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
k. Constipation, loose bowels, or diarrhea	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
l. Nausea, gas, or indigestion	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
m. Women only: menstrual cramps or other problems with your periods	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

13. Over the **last 2 weeks**, how often have you been bothered by any of the following problems?

	Not at all	Several days	More than half the days	Nearly every day
a. Little interest or pleasure in doing things	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Feeling down, depressed, or hopeless	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Trouble falling or staying asleep or sleeping too much	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Feeling tired or having little energy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. Poor appetite or overeating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f. Feeling bad about yourself, or that you are a failure or have let yourself or your family down	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g. Trouble concentrating on things, such as reading the newspaper or watching television	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h. Moving or speaking so slowly that other people could have noticed, or the opposite - being so fidgety or restless that you have been moving around a lot more than usual	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i. Thoughts that you would be better off dead or of hurting yourself in some way	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

If you have been bothered by any of the items listed above, you may want to seek help from a health professional in your area.

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14. a. In the **last 4 weeks**, have you had an anxiety attack - suddenly feeling fear or panic? No Yes

If you marked "NO," please skip to question 16

- b. Has this ever happened to you before? No Yes
- c. Do some of these attacks come **suddenly out of the blue** - that is, in situations where you don't expect to be nervous or uncomfortable? No Yes
- d. Do these attacks bother you a lot, or are you worried about having another attack? No Yes

15. Think about your last bad anxiety attack.

- a. Were you short of breath? No Yes
- b. Did your heart race, pound, or skip? No Yes
- c. Did you have chest pain or pressure? No Yes
- d. Did you sweat? No Yes
- e. Did you feel as if you were choking? No Yes
- f. Did you have hot flashes or chills? No Yes
- g. Did you have nausea or an upset stomach, or the feeling that you were going to have diarrhea? No Yes
- h. Did you feel dizzy, unsteady, or faint? No Yes
- i. Did you have tingling or numbness in parts of your body? No Yes
- j. Did you tremble or shake? No Yes
- k. Were you afraid you were dying? No Yes

16. Over the **last 4 weeks**, how often have you been bothered by any of the following problems?

	Not at all	Several days	More than half the days
a. Feeling nervous, anxious, on edge, or worrying a lot about different things	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

If you marked "NOT AT ALL," skip to question 17

b. Feeling restless so that it is hard to sit still	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Getting tired very easily	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Muscle tension, aches, or soreness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. Trouble falling asleep or staying asleep	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f. Trouble concentrating on things, such as reading a book or watching TV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g. Becoming easily annoyed or irritable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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17. How tall are you? For example, a person who is 5'8" tall would write 5 feet 08 inches.

feet inches

18. What is your **current** weight? pounds

19. How much did you weigh a **year ago**? pounds

20. On an **average day**, how many 8-12 oz beverages containing caffeine do you drink (e.g. coffee, tea, soda)?

- None 1-2 per day 3-5 per day 6-10 per day 11 or more per day

21. About how many times **each week** do you eat from a fast food restaurant (like hamburgers, tacos, or pizza)?

- None Once a week 2-3 times/week 4-7 times/week 8-14 times/week 15 or more times/week

22. In the **past year**, have you been on any high protein, low carbohydrate diets (like Atkins) for more than a month?

- No Yes

23. a. Do you often feel that you can't control **what** or **how much** you eat?..... No Yes

b. Do you often eat, within any **2 hour period**, what most people would regard as an unusually **large** amount of food?..... No Yes

c. If you answered "**YES**" to either of the above, has this been as often, on average, as **twice a week** for the **LAST 3 MONTHS**?..... No Yes

24. In the **last 3 months**, have you done any of the following in order to avoid gaining weight?

a. Made yourself vomit?..... No Yes

b. Took more than twice the recommended dose of laxatives?..... No Yes

c. Fasted - not eaten anything at all for at least 24 hours?..... No Yes

d. Exercised for more than an hour specifically to avoid gaining weight after binge eating?..... No Yes

e. If you checked "**YES**" to any of these ways of avoiding gaining weight, were any as often, on average, as **twice a week**?..... No Yes

25. In the **last 4 weeks**, how much have you been bothered by any of the following problems?

	Not bothered	Bothered a little	Bothered a lot
a. Worrying about your health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Your weight or how you look	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Little or no sexual desire or pleasure during sex	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Difficulties with husband/wife, partner/lover, or boyfriend/girlfriend	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. The stress of taking care of children, parents, or other family members	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f. Stress at work outside of the home or at school	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g. Financial problems or worries	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h. Having no one to turn to when you have a problem	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i. Something bad that happened recently	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
j. Thinking or dreaming about something terrible that happened to you in the past - like your house being destroyed, a severe accident, being hit or assaulted, or being forced into a sexual act	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

26. In the **last year**, have you been hit, slapped, kicked, or otherwise physically hurt by someone, or has anyone forced you to have an unwanted sexual act? No Yes

27. Are you **currently** taking any medicine for anxiety, depression, or stress? No Yes

28. Over the **past month**, how many hours of sleep did you get in an average 24-hour period? hours

If you are FEMALE, please go to question 29
If you are MALE, please skip to question 30

29. **FOR WOMEN ONLY:**

a. Which best describes your menstrual periods?

- No periods because pregnant or recently gave birth
- No periods for over a year and unrelated to pregnancy or childbirth
- Periods regulated by hormone replacement (estrogen) therapy or oral contraceptives
- Periods unregulated and unchanged for over a year
- Periods have become irregular or changed in frequency, duration, and/or amount in last year

- | | No | Yes | Does not apply |
|--|-----------------------|-----------------------|-----------------------|
| b. During the week before your period starts, do you have a serious problem with your mood - like depression, anxiety, irritability, anger, or mood swings? ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| c. If YES : Do these problems go away by the end of your period? ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| d. Have you given birth within the last 3 years ? ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| e. Have you had a miscarriage within the last 3 years ? ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| f. During the last 3 years , have you tried and been unable to become pregnant? ----- | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

30. In the **past month** have you experienced...?

- | | Not at all | A little bit | Moderately | Quite a bit | Extremely |
|--|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| a. Repeated, disturbing memories of stressful experiences from the past ----- | <input type="radio"/> |
| b. Repeated, disturbing dreams of stressful experiences from the past ----- | <input type="radio"/> |
| c. Suddenly acting or feeling as if stressful experiences were happening again ----- | <input type="radio"/> |
| d. Feeling very upset when something happened that reminds you of stressful experiences from the past -- | <input type="radio"/> |
| e. Trouble remembering important parts of stressful experiences from the past ----- | <input type="radio"/> |
| f. Loss of interest in activities that you used to enjoy --- | <input type="radio"/> |
| g. Feeling distant or cut off from other people ----- | <input type="radio"/> |
| h. Feeling emotionally numb, or being unable to have loving feelings for those close to you ----- | <input type="radio"/> |
| i. Feeling as if your future will somehow be cut short -- | <input type="radio"/> |
| j. Trouble falling asleep or staying asleep ----- | <input type="radio"/> |
| k. Feeling irritable or having angry outbursts ----- | <input type="radio"/> |

Question 30 continued on page 12 ...

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Question 30 continued...

	Not at all	A little bit	Moderately	Quite a bit	Extremely
l. Difficulty concentrating -----	<input type="radio"/>				
m. Feeling "super-alert" or watchful or on guard -----	<input type="radio"/>				
n. Feeling jumpy or easily startled -----	<input type="radio"/>				
o. Physical reactions when something reminds you of stressful experiences from the past -----	<input type="radio"/>				
p. Efforts to avoid thinking about your stressful experiences from the past -----	<input type="radio"/>				
q. Efforts to avoid activities or situations because they remind you of stressful experiences from the past -----	<input type="radio"/>				

31. In general, would you say your health is: (Please select only one.)

- Excellent
- Very good
- Good
- Fair
- Poor

32. In a **typical week**, how much time do you spend participating in... (Please mark both your typical "days per week" and "minutes per day" doing these activities)

a. STRENGTH TRAINING or work that strengthens your muscles? (e.g. lifting/pushing/pulling weights)	<input style="width: 30px; height: 30px;" type="text"/> Days per week	<input style="width: 30px; height: 30px;" type="text"/> <input style="width: 30px; height: 30px;" type="text"/> <input style="width: 30px; height: 30px;" type="text"/> Minutes per day	<input type="radio"/> None <input type="radio"/> Cannot physically do
b. VIGOROUS exercise or work that causes heavy sweating or large increases in breathing or heart rate? (e.g. running, active sports, marching, biking)	<input style="width: 30px; height: 30px;" type="text"/> Days per week	<input style="width: 30px; height: 30px;" type="text"/> <input style="width: 30px; height: 30px;" type="text"/> <input style="width: 30px; height: 30px;" type="text"/> Minutes per day	<input type="radio"/> None <input type="radio"/> Cannot physically do
c. MODERATE or LIGHT exercise or work that causes light sweating or slight increases in breathing or heart rate? (e.g. walking, cleaning, slow jogging)	<input style="width: 30px; height: 30px;" type="text"/> Days per week	<input style="width: 30px; height: 30px;" type="text"/> <input style="width: 30px; height: 30px;" type="text"/> <input style="width: 30px; height: 30px;" type="text"/> Minutes per day	<input type="radio"/> None <input type="radio"/> Cannot physically do

33. Choose the single best description of your **USUAL** daily activities.

- You sit during the day and do not walk much.
- You stand or walk a lot during the day, but do not carry or lift things often.
- You lift or carry light loads, or climb stairs or hills often.
- You do heavy work or carry heavy loads often.

34. On a **typical day**, how much time do you spend sitting and watching TV or videos or using a computer?

Hours per day

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35. The following questions are about activities you might do during a **typical day**. Does your health **now** limit you in these activities? If so, how much?

	No, not limited at all	Yes, limited a little	Yes, limited a lot
a. Vigorous activities , such as running, lifting heavy objects, or participating in strenuous sports?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Moderate activities , such as moving a table, pushing a vacuum cleaner, bowling, or playing golf?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Lifting or carrying groceries?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Climbing several flights of stairs?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. Climbing one flight of stairs?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f. Bending, kneeling, or stooping?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g. Walking more than a mile ?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h. Walking several blocks?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i. Walking one block?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
j. Bathing or dressing yourself?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

36. During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities as a result of your **physical health**?

	No, none of the time	Yes, a little of the time	Yes, some of the time	Yes, most of the time	Yes, all of the time
a. Cut down the amount of time you spent on work or other activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Accomplished less than you would like	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Were limited in the kind of work or other activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Had difficulty performing the work or other activities (for example, it took extra effort)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

37. During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities as a result of any **emotional problems** (such as feeling depressed or anxious)?

	No, none of the time	Yes, a little of the time	Yes, some of the time	Yes, most of the time	Yes, all of the time
a. Cut down the amount of time you spent on work or other activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Accomplished less than you would like	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Didn't do work or other activities as carefully as usual	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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38. During the **past 4 weeks**, to what extent has your **physical health** or **emotional problems** interfered with your normal social activities with family, friends, neighbors, or groups?

- Not at all Slightly Moderately Quite a bit Extremely

39. During the **past 4 weeks**, how much bodily pain have you had?

- None Very mild Mild Moderate Severe Very severe

40. During the **past 4 weeks**, how much did **pain** interfere with your normal work (including both work outside the home and housework)?

- Not at all A little bit Moderately Quite a bit Extremely

41. During the **past 4 weeks**, how much of the time:
(Select the **single best** answer for each question.)

	None of the time	A little of the time	Some of the time	A good bit of the time	Most of the time	All of the time
a. Did you feel full of pep ?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Have you been a very nervous person ? ..	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Have you felt so down in the dumps that nothing could cheer you up ?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Have you felt calm and peaceful ?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. Did you have a lot of energy ?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f. Have you felt downhearted and blue ? ...	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g. Did you feel worn out ?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h. Have you been a happy person ?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i. Did you feel tired ?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

42. During the **past 4 weeks**, how much of the time has your **physical health** or **emotional problems** interfered with your social activities (like visiting with friends, relatives)?

- None of the time A little of the time Some of the time Most of the time All of the time

43. Please choose the answer that best describes how **true** or **false** each of the following statements is for you.

	Definitely true	Mostly true	Not sure	Mostly false	Definitely false
a. I seem to get sick a little easier than other people -----	<input type="radio"/>				
b. I am as healthy as anybody I know -----	<input type="radio"/>				
c. I expect my health to get worse -----	<input type="radio"/>				
d. My health is excellent -----	<input type="radio"/>				

44. **Compared to 3 years ago**, how would you rate your **physical health** in general now?

- Much better
 Somewhat better
 About the same
 Somewhat worse
 Much worse

45. **Compared to 3 years ago**, how would you rate your **emotional health** or **well-being** (such as feeling anxious, depressed, or irritable) now?

- Much better
 Somewhat better
 About the same
 Somewhat worse
 Much worse

46. Other than conventional medicine, what other health treatments have you used **in the last 12 months**?

a. Acupuncture -----	<input type="radio"/> No	<input type="radio"/> Yes	g. High dose/megavitamin therapy ---	<input type="radio"/> No	<input type="radio"/> Yes
b. Biofeedback -----	<input type="radio"/> No	<input type="radio"/> Yes	h. Homeopathy -----	<input type="radio"/> No	<input type="radio"/> Yes
c. Chiropractic care -----	<input type="radio"/> No	<input type="radio"/> Yes	i. Hypnosis -----	<input type="radio"/> No	<input type="radio"/> Yes
d. Energy healing -----	<input type="radio"/> No	<input type="radio"/> Yes	j. Massage -----	<input type="radio"/> No	<input type="radio"/> Yes
e. Folk remedies -----	<input type="radio"/> No	<input type="radio"/> Yes	k. Relaxation -----	<input type="radio"/> No	<input type="radio"/> Yes
f. Herbal therapy -----	<input type="radio"/> No	<input type="radio"/> Yes	l. Spiritual healing -----	<input type="radio"/> No	<input type="radio"/> Yes

47. Have you ever received the anthrax vaccine? ----- No Yes

If **YES**, how many shots of the anthrax vaccine have you received?

--	--

48. In the **past 3 years**, have you received the smallpox vaccine? ----- No Yes

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These next few questions are about drinking alcoholic beverages. Alcoholic beverages include liquor such as whiskey, gin, beer, wine, wine coolers, etc. For the purpose of this questionnaire:

One drink = one 12-ounce beer, one 4-ounce glass of wine, or one 1.5-ounce shot of liquor

49. In the **past year**, how often did you have a drink containing alcohol?

- Never Monthly or less 2-4 times a month 2-3 times a week 4 or more times a week

If you marked "Never," skip to question 55.

50. In the **past year**, on those days that you drank alcoholic beverages, on average, how many drinks did you have?

		drinks
--	--	--------

51. In the **past year**, how often did you have 5 or more alcoholic beverages on one occasion?

- Never Monthly or less 2-4 times a month 5-10 times a month 11 or more times a month

52. **Last week**, how many drinks of alcoholic beverages did you have?

Monday

--	--

Tuesday

--	--

Wednesday

--	--

Thursday

--	--

Friday

--	--

Saturday

--	--

Sunday

--	--

53. Review the answers you provided to question 52.

Does this represent the number of alcoholic beverages you drink in a **typical week**?

- No, I usually drink LESS than this amount
 No, I usually drink MORE than this amount
 Yes, this represents how much I drink in a typical week

54. In the **last 12 months**, have any of the following happened to you **more than once**?

- a. You drank alcohol even though a doctor suggested that you stop drinking because of a problem with your health No Yes
- b. You drank alcohol, were high from alcohol, or hung over while you were working, going to school, or taking care of children or other responsibilities No Yes
- c. You missed or were late for work, school, or other activities because you were drinking or hung over No Yes
- d. You had a problem getting along with people while you were drinking No Yes
- e. You drove a car after having several drinks or after drinking too much No Yes

55. Have you **ever** felt any of the following?

- a. Felt you needed to cut back on your drinking No Yes
- b. Felt annoyed at anyone who suggested you cut back on your drinking No Yes
- c. Felt you needed an "eye-opener," or early morning drink No Yes
- d. Felt guilty about your drinking No Yes

56. In the **past year**, have you used any of the following tobacco products?

- a. Cigarettes No Yes
- b. Cigars No Yes
- c. Pipes No Yes
- d. Smokeless tobacco (chew, dip, snuff) No Yes

57. **In your lifetime**, have you smoked at least 100 cigarettes (5 packs)? No Yes

If you checked "YES," go to question 58
 If you checked "NO," skip to question 62

58. At what age did you start smoking? years old

59. How many years have or did you smoke an average of at least 3 cigarettes per day
 (or one pack per week)? years

60. When smoking, how many packs per day did you or do you smoke?
- Less than half a pack per day
 - Half to 1 pack per day
 - 1 to 2 packs per day
 - More than 2 packs per day

61. Have you ever tried to quit smoking?

- Yes, and succeeded
- Yes, but not successfully
- No

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62. In the **past 3 years**, have any of the following life events happened to you?

If **YES**, list
most recent year

a. You were divorced or separated	<input type="radio"/> No	<input type="radio"/> Yes	2	0	0	
b. Suffered major financial problems (such as bankruptcy)	<input type="radio"/> No	<input type="radio"/> Yes	2	0	0	
c. Suffered forced sexual relations or sexual assault	<input type="radio"/> No	<input type="radio"/> Yes	2	0	0	
d. Experienced sexual harassment	<input type="radio"/> No	<input type="radio"/> Yes	2	0	0	
e. Suffered a violent assault	<input type="radio"/> No	<input type="radio"/> Yes	2	0	0	
f. Had a family member or loved one become severely ill or die	<input type="radio"/> No	<input type="radio"/> Yes	2	0	0	
g. Suffered a disabling illness or injury	<input type="radio"/> No	<input type="radio"/> Yes	2	0	0	

63. During the **past 3 years**, have you been **PERSONALLY** exposed to any of the following?
(do not include TV, video, movies, computers, or theater)

	No	Yes, 1 time	Yes, more than 1 time	If YES , list most recent year of exposure
a. Witnessing a person's death due to war, disaster, or tragic event	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	2 0 0
b. Witnessing instances of physical abuse (torture, beating, rape)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	2 0 0
c. Dead and/or decomposing bodies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	2 0 0
d. Maimed soldiers or civilians	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	2 0 0
e. Prisoners of war or refugees	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	2 0 0
f. Chemical or biological warfare agents	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	2 0 0
g. Medical countermeasures for chemical or biological warfare agent exposure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	2 0 0
h. Alarms necessitating wearing of chemical or biological warfare protective gear	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	2 0 0

64. During the **past 3 years**, were you exposed to any of the following?

	No	Don't know	Yes	If YES , list most recent year of exposure
a. Occupational hazards requiring protective equipment, such as respirators or hearing protection	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	2 0 0
b. Routine skin contact with paint and/or solvent and/or substances	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	2 0 0
c. Depleted uranium (DU)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	2 0 0
d. Microwaves (excluding microwave ovens)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	2 0 0

Question 64 continued on page 19...

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Question 64 continued...

	No	Don't know	Yes	If YES , list most recent year of exposure
e. Pesticides, including creams, sprays, or uniform treatments -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	2 0 0
f. Pesticides applied in the environment or around living facilities --	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	2 0 0
g. Any exposure, physical or psychological, during a military deployment that had a significant impact on your health? -----	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	2 0 0

please specify

65. Over the **past 3 years**, did you receive imminent danger pay, hardship duty pay, or combat zone tax exclusion benefits for deployment to any of the regions listed below?

No → **Skip to question 68**

Yes → **Continue to question 66**

Country Codes		Sea Codes	
01 Afghanistan	10 Philippines	19 Arabian Sea	
02 Bahrain	11 Qatar	20 Gulf of Aden	
03 Croatia	12 Saudi Arabia	21 Gulf of Oman	
04 Kuwait or Iraq	13 Serbia (includes Kosovo)	22 Persian Gulf	
05 Kyrgyzstan	14 Tajikistan	23 Red Sea	
06 Macedonia	15 Turkey	24 Other sea area <input type="text"/>	please specify
07 Montenegro	16 United Arab Emirates		
08 Oman	17 Uzbekistan		
09 Pakistan	18 Other country <input type="text"/>		please specify

66. If "**YES**", use the country and sea codes assigned to the locations above to indicate the region(s) where you received imminent danger pay, hardship duty pay, or combat zone tax exclusion benefits.

	Location	Date Arrived		TO	Date Departed	
		Month	Year		Month	Year
a.	<input type="text"/>	<input type="text"/>	2 0 0		<input type="text"/>	2 0 0
b.	<input type="text"/>	<input type="text"/>	2 0 0		<input type="text"/>	2 0 0
c.	<input type="text"/>	<input type="text"/>	2 0 0		<input type="text"/>	2 0 0
d.	<input type="text"/>	<input type="text"/>	2 0 0		<input type="text"/>	2 0 0
e.	<input type="text"/>	<input type="text"/>	2 0 0		<input type="text"/>	2 0 0

67. In the **past 3 years**, have you been to more regions where you received imminent danger pay, hardship duty pay, or combat zone tax exclusion benefits than fit into the space allowed above? ----- No Yes

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Please answer question 68 ONLY if you are ENLISTED (Active Duty, Reserve, or National Guard)
All others please skip to question 69

68. Review the list of military occupational categories below. Select the **two** categories that **best match** your military job and fill in the two-digit codes for your **primary** job code and your **secondary** job code.

--	--

PRIMARY JOB CODE

--	--

SECONDARY JOB CODE

INFANTRY, GUN CREWS & SEAMANSHIP SPECIALISTS

- Infantry (01)
- Armor or Amphibious (02)
- Combat Engineering (03)
- Artillery/Gunnery, Rockets or Missiles (04)
- Air Crew (05)
- Seamanship (06)
- Installation Security (07)

COMMUNICATIONS & INTELLIGENCE SPECIALISTS

- Radio or Radio Code (20)
- Sonar (21)
- Radar or Air Traffic Control (22)
- Signal Intel/Electronic Warfare (23)
- Intelligence (24)
- Combat Operations Control (25)
- Communications Center Operations (26)

FUNCTIONAL SUPPORT & ADMINISTRATION

- Personnel (50)
- Administration (51)
- Clerical/Personnel (52)
- Data Processing (53)
- Accounting, Finance or Disbursing (54)
- Other Functional Support (55)
- Religious, Morale or Welfare (56)
- Information or Education (57)

HEALTH CARE SPECIALISTS

- Medical Care (30)
- Ancillary Medical Support (31)
- Biomedical Sciences or Allied Health (32)
- Dental Care (33)
- Medical Administration or Logistics (34)
- Other Technical or Allied Specialists (35)

SERVICE & SUPPLY HANDLERS

- Food Service (80)
- Motor Transport (81)
- Material Receipt, Storage or Issue (82)
- Law Enforcement (83)
- Personnel Service (84)
- Auxiliary Labor (85)
- Forward Area Equipment Support (86)
- Other Services (87)

PHOTOGRAPHY

- Mapping, Surveying, Drafting or Illustrating (41)
- Weather (42)
- Ordnance Disposal or Diving (43)
- Musician (45)
- Technical Specialist (49)

CRAFTWORKERS

- Metalworking (70)
- Construction (71)
- Utilities (72)
- Lithography (74)
- Industrial Gas or Fuel Production (75)
- Fabric, Leather or Rubber (76)
- Other Craftworker (79)

ELECTRONIC EQUIPMENT REPAIRERS

- Radio/Radar (10)
- Fire Control Electric Systems, Non-Missile (11)
- Missile Guidance, Control or Check-out (12)
- Sonar Equipment (13)
- Nuclear Weapons Equipment (14)
- ADP Computers (15)
- Teletype or Cryptographic Equipment (16)
- Other Electronic Equipment (19)

ELECTRICAL/MECHANICAL EQUIPMENT REPAIRERS

- Aircraft or Aircraft Related (60)
- Automotive (61)
- Wire Communications (62)
- Missile Mechanical or Electrical (63)
- Armament or Munitions (64)
- Shipboard Propulsion (65)
- Power Generating Equipment (66)
- Precision Equipment (67)
- Other Mechanical or Electrical Equipment (69)

OTHER

- Patients or Prisoners (90)
- Officer Candidate or Student (91)
- Undesignated Occupations (92)
- Not Occupationally Qualified (95)

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Please answer question 69 ONLY if you are an OFFICER or WARRANT OFFICER (Active Duty, Reserve, or National Guard)
All others please skip to question 70

69. Review the list of military occupational categories below. Select the **two** that **best match** your military job and fill in the two-digit codes for your **primary** job code and your **secondary** job code.

--	--

PRIMARY JOB CODE

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SECONDARY JOB CODE

<p>ADMINISTRATORS</p> <ul style="list-style-type: none"> • Administrator, General (7A) • Training Administrator (7B) • Manpower or Personnel (7C) • Comptroller or Fiscal (7D) • Data Processing (7E) • Pictorial (7F) • Information (7G) • Police (7H) • Inspection (7L) • Morale & Welfare (7N) <hr/> <p>ENGINEERING & MAINTENANCE OFFICERS</p> <ul style="list-style-type: none"> • Construction or Utilities (4A) • Electrical or Electronic (4B) • Communications or Radar (4C) • Aviation Maintenance or Allied (4D) • Ordnance (4E) • Missile Maintenance (4F) • Ship Construction or Maintenance (4G) • Ship Machinery (4H) • Safety (4J) • Chemical (4K) • Automotive or Allied (4L) • Surveying or Mapping (4M) • Other (4N) <hr/> <p>GENERAL OFFICERS & EXECUTIVES</p> <ul style="list-style-type: none"> • General or Flag (1A) • Executive (1B) 	<p>HEALTH CARE OFFICERS</p> <ul style="list-style-type: none"> • Physician (6A) • Dentist (6C) • Nurse (6E) • Veterinarian (6G) • Biomedical Sciences or Allied Health (6H) • Health Service Administration (6I) <hr/> <p>INTELLIGENCE OFFICERS</p> <ul style="list-style-type: none"> • Intelligence, General (3A) • Communications Intelligence (3B) • Counter-intelligence (3C) <hr/> <p>OTHER</p> <ul style="list-style-type: none"> • Patient (9A) • Student (9B) • Other (9E) <hr/> <p>SUPPLY, PROCUREMENT & ALLIED OFFICERS</p> <ul style="list-style-type: none"> • Logistics, General (8A) • Supply (8B) • Transportation (8C) • Procurement or Production (8D) • Food Service (8E) • Exchange or Commissary (8F) • Other (8G) 	<p>SCIENTISTS & PROFESSIONALS</p> <ul style="list-style-type: none"> • Physical Scientist (5A) • Meteorologist (5B) • Biological Scientist (5C) • Social Scientist (5D) • Psychologist (5E) • Legal (5F) • Chaplain (5G) • Mathematician or Statistician (5J) • Educator or Instructor (5K) • Research & Development Coordinator (5L) • Community Activities Officer (5M) • Scientist or Professional (5N) <hr/> <p>TACTICAL OPERATIONS OFFICERS</p> <ul style="list-style-type: none"> • Fixed-Wing Fighter or Bomber Pilot (2A) • Helicopter Pilot (2C) • Aircraft Crew (2D) • Ground or Naval Arms (2E) • Missiles (2F) • Operations Staff (2G) • Civilian Pilot (2H)
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70. Do you have a civilian job at this time?

- YES ----- Go to question 71
- NO civilian employment at this time ----- Go to question 72
- Homemaker ----- Go to question 72

Please answer question 71 ONLY if you answered "YES" to question 70
All others please skip to question 72

71. Review the list of **civilian** occupational categories on this page and the next page. Select the **two** categories that **best match** your civilian job and fill in the three-digit codes for your **primary** and your **secondary** job codes.

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PRIMARY JOB CODE

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SECONDARY JOB CODE

ARCHITECTURE & ENGINEERING

- Architect, Surveyor or Cartographer (171)
- Engineer (172)
- Drafter, Engineering or Mapping Technician (173)

ARTS, DESIGN, MEDIA, ENTERTAINMENT & SPORTS

- Art or Design (271)
- Entertainer, Performer, Sports or Related Worker (272)
- Media Communication Worker (273)
- Media Communication Equipment Worker (274)

BUILDING & GROUNDS CLEANING & MAINTENANCE

- Supervisor, Building & Grounds, Cleaning & Maintenance Worker (371)
- Building Cleaning or Pest Control (372)
- Ground Maintenance (373)

BUSINESS & FINANCIAL OPERATIONS

- Business Operations Specialist (131)
- Financial Specialist (132)

COMMUNITY & SOCIAL SERVICES

- Counselor, Social Worker or Other Community or Social Service Specialist (211)
- Religious Worker (212)

COMPUTER & MATHEMATICAL

- Computer Specialist (151)
- Mathematical Specialist (152)
- Mathematical Technician (153)

CONSTRUCTION & EXTRACTION

- Supervisor, Construction or Extraction Worker (471)
- Construction Trades Worker (472)
- Helper, Construction Trades (473)
- Other Construction or Related Worker (474)
- Extraction Worker (475)

EDUCATION, TRAINING & LIBRARY

- Postsecondary Teacher (251)
- Primary, Secondary or Special Education School Teacher (252)
- Other Teacher or Instructor (253)
- Librarian, Curator or Archivist (254)
- Other Education, Training or Library Occupation (259)

FARMING, FISHING & FORESTRY WORKERS

- Supervisor, Farming, Fishing or Forestry Worker (451)
- Agricultural Worker (452)
- Fishing or Hunting Worker (453)
- Forest, Conservation or Logging Worker (454)
- Other Farming, Fishing or Forestry (459)

FOOD PREPARATION & SERVING RELATED

- Supervisor, Food Preparation or Serving (351)
- Cook or Food Preparation Worker (352)
- Food and Beverage Worker (353)
- Other Food Preparation or Serving Related Worker (359)

HEALTH CARE

- Physician (295)
- Nursing, Psychiatric or Home Health Aid (311)
- Occupational or Physical Therapist Assistant or Aid (312)
- Other Health Care Occupation (319)

INSTALLATION, REPAIR & MAINTENANCE OCCUPATIONS

- Supervisor of Installation, Maintenance or Repair Worker (491)
- Electrical or Electric Equipment Mechanic, Installer or Repairer (492)
- Vehicle or Mobile Equipment Mechanic, Installer or Repairer (493)
- Other Installation, Maintenance or Repair (499)

LEGAL

- Lawyer, Judge or Related Worker (231)
- Legal Support Worker (232)

More categories listed on page 23.

Question 71 continued, Civilian Occupational categories...

LIFE, PHYSICAL & SOCIAL SCIENCES

- Life Scientist (191)
- Physical Scientist (192)
- Social Scientist or Related Worker (193)
- Life, Physical or Social Sciences Technician (194)

MANAGEMENT

- Top Executive (111)
- Advertising, Marketing, Promotions, PR or Sales Manager (112)
- Operations Specialties Manager (113)
- Other Management Occupation (119)

OFFICE & ADMINISTRATIVE SUPPORT

- Supervisor, Office or Administrative Support (431)
- Communications Equipment Operator (432)
- Financial Clerk (433)
- Information or Record Clerk (434)
- Material Recording, Scheduling, Dispatching or Distributing Worker (435)
- Secretary or Administrative Assistant (436)
- Other Office or Administrative Support (439)

PERSONAL CARE SERVICE

- Supervisor, Personal Care or Service (391)
- Animal Care or Service (392)
- Entertainment Attendant or Related Worker (393)
- Funeral Worker (394)
- Personal Appearance (395)
- Transportation, Tourism or Lodging Attendant (396)
- Other Personal Care or Service Worker (399)

PRODUCTION OCCUPATIONS

- Supervisor, Production Worker (511)
- Assembler, Fabricator (512)
- Food Processing Worker (513)
- Metal or Plastic Worker (514)
- Printing Worker (515)
- Textile, Apparel or Furnishing Worker (516)
- Woodworker (517)
- Plant or Systems Operator (518)
- Other Production Occupation (519)

PROTECTIVE SERVICES

- First Line Supervisor/Manager, Protective Services (331)
- Firefighting or Prevention Worker (332)
- Law Enforcement Worker (333)
- Other Protective Service Worker (339)

SALES-RELATED OCCUPATIONS

- Supervisor, Sales (411)
- Retail Sales Worker (412)
- Sales Representative, Services (413)
- Sales Representative, Wholesale or Manufacturing (414)
- Counter or Rental Clerk or Parts Salesperson (415)
- Other Sales or Related Worker (419)

TRANSPORTATION & MATERIAL MOVING

- Supervisor, Transportation or Material Moving (531)
- Motor Vehicle Operator (533)
- Rail Transportation Worker (534)
- Water Transportation (535)
- Other Transportation (536)
- Material Moving Worker (537)

72. Do you have any concerns about your health that are not covered in this survey that you would like to share?
(Continue on a separate sheet if necessary.)

Thank you for completing this important survey!



MILLENNIUM COHORT STUDY

More information regarding the Millennium Cohort Study can be found at

<http://www.Millennium Cohort.org>

Please also visit the website to update any changes to your mailing address,
phone number, email address, or last name