

A Summary of the 42-year Follow-up of Vietnam Prisoners of War: Mortality and Morbidity Findings

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It has been more than forty years since the last of the 662 US Military Prisoners of War (POW) were repatriated from Vietnam, 566 of whom came home together in the spring of 1973 as part of Operation Homecoming (O/H). The Department of Defense established a voluntary medical follow-up program in order to document those medical and psychological effects of captivity observed within the first five years following repatriation. The Army and the Air Force discontinued their programs as planned in 1978, but the Navy continued its' repatriate program and added a comparison group of combat experienced aviators in order to identify the more subtle immediate effects of captivity. Army and Air Force Vietnam repatriates were subsequently invited to join the Navy program and members of all services continue to be eligible for annual voluntary medical follow-up at the Robert E. Mitchell Center for POW Studies.

Repatriate health at the time of repatriation for those military personnel who participated in O/H (Thirteenth Air Force, 1973), as documented in the Initial Medical Evaluation Form (Center for Prisoner of War Studies, 1972), has been extensively summarized. The proceedings from three joint medical meetings held within the first five years following repatriation summarized the service-specific findings, which included effects of captivity on the POW's family (Spaulding, 1976, US Army, 1977 and Wetzler, 1979). In addition, a comprehensive listing of the specific diagnoses observed at the time of repatriation, unique captivity and torture experiences and risk factors associated with diagnoses aggregated within International Classification of Diseases (ICD) categories (National Center for Health Statistics, 2010) have been reported separately for the Navy (Berg and Richlin, 1977a; Raza et. al, 2016a), Army (Berg and Richlin, 1977b; Raza et. al, 2016b), Marine Corps (Berg and Richlin, 1977c; Raza et. al, 2016c), and Air Force (Raza et.al, 2017a). An analysis of the combined data addressing similarities and difference between the services with respect to the predictive strength of risk factors (age at time of capture, length of captivity, length of solitary confinement, torture severity and subjective medical complaints during captivity) has also been recently reported (Raza et.al, 2017b). To date, there has been no report addressing the Vietnam repatriate survival/mortality data and only one publication has addressed the long-term health consequences observed in this group.

A subset of the Navy repatriates (51%, representing only 11% of all Vietnam repatriates) and 40% of the comparison group (CG) were studied to determine the effects of captivity on 235 three-digit ICD diagnoses (Nice et. al, 1996). Subjects were selected if they had received voluntary follow-up in 1979 (six years post-repatriation) and 1993 (twenty years post-repatriation). Repatriates demonstrated an increased relative risk for conditions involving the peripheral nervous system (especially mononeuritis of the upper extremities, ICD 354), joint disorders (ICD 710-719) and disorders of the back (ICD 720-724). The groups were not different with respect to either the most prevalent conditions (i.e., hearing problems, benign prostatic hypertrophy or chronic obstructive pulmonary disease) or those conditions selected due to special clinical interest (i.e., peptic ulcer, hypertension, diabetes mellitus or adjustment disorder). Posttraumatic stress disorder was not analyzed as a subset of the ICD 309 code. No subsequent analysis of morbidity has been reported in the past twenty years and the study by Nice and colleagues did not address Navy repatriate survival/mortality. To be sure, however, several past epidemiologic studies have addressed the mortality and morbidity findings among World War II and Korean War repatriates.

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World War II and Korean War Mortality

The initial study regarding survival/mortality among World War II repatriates included 1,850 Pacific Theater personnel and 1,804 European Theater personnel (Cohen and Cooper, 1954). The captivity of these two groups varied on many levels, to include average length of captivity (38 months of captivity with 86% more than 3 years versus 10 months of captivity with 84% less than 18 months, respectively) and death rate during captivity (34% versus 1%, respectively). Of these 3,654 repatriates, 11% were Officers, 15% had more than a high school education and 85% unmarried. Standardized mortality ratios (SMR) using the 1949 age-adjusted US male life tables were calculated for each of the first six years following repatriation. During this brief follow-up, Pacific Theater SMR declined from 5.44 to 2.23, reflecting a significantly elevated risk of death relative to their civilian counterparts, with special emphasis on deaths due to tuberculosis and accidents. No special cause of death was found among European Theater repatriates, where SMR declined from 1.27 to 0.80 during the six years following their repatriation.

As the large-scale, carefully-designed epidemiologic study conducted by the Veterans Administration continued, repatriates from the Korean War and members of three comparison groups were added and the number of World War II repatriates was increased. Consequently, Nefzger (1970) was able to summarize the survival/mortality of 9,501 repatriates (Pacific Theater = 3,162; European Theater = 2,380 and Korea = 3,959), as well as 9,657 comparison group members (Pacific Theater = 2,192; European Theater = 3,512 and Korea = 3,953). Detailed information regarding length of captivity, death age and officer/enlisted status were not provided, but this study summarized the first 20 years for the World War II repatriates and the first 12 years for the repatriates from the Korean War. The median age at the time of repatriation was as follows: World War II "25-29"; Korean War "<25." By the end of 1965, the mortality rate for the repatriates (6.1%) was significantly greater than that of the comparison group (5.2%) as measured by relative risk (1.18, 95% confidence interval = 1.05 to 1.33). This difference was attributable to higher death rates in both Pacific Theater (RR = 1.34; 95% confidence interval = 1.12 to 1.61) and Korean War (RR = 1.29; 95% confidence interval = 1.01 to 1.64) repatriates. For the European Theater repatriates, the SMR was actually less than their matched comparison group (RR = 0.80; 95% confidence interval = 0.65 to 0.99). For all repatriate groups, there was an increase in deaths related to trauma/accidents, while tuberculosis and cirrhosis were also noted among the World War II repatriates.

Keehn (1980) continued the epidemiologic follow-up study conducted by the Veterans Administration an additional ten years (by the end of 1975), representing follow-up periods of 30 years and 22 years for the World War II and Korean War repatriates, respectively. At that point, the mortality rate for the repatriates had increased to 14.6% (from 6.1%) while that of the comparison group had increased to 13.6% (from 5.2%). This difference was not statistically significant (RR = 1.06; 95% confidence interval = 0.99 to 1.14). When compared to their specific comparison group, there was an increased risk of death during the first 9 years following repatriation for the Pacific Theater repatriates and for the first 13 years following repatriation for the Korean War repatriates. At no time during the follow-up period were European Theater repatriates at an increased risk of death relative to their comparison group. For all six groups, the risk of death among officers was less than that of enlisted personnel (RR averages: 0.66 for repatriates and 0.69 for comparison groups).

World War II and Korean War Morbidity

The previously mentioned mortality study conducted by Cohen and Cooper (1954) also included morbidity data from the first years of medical follow-up of 3654 World War II repatriates as well as 4037 members of a carefully selected comparison group. During that time period, admission rate to Veterans Administration hospitals was more than three times higher in Pacific Theater repatriates, while the admission rate to service hospitals were equivalent (Pacific Theater = 0.99 per 100 man-years; European Theater = 0.86 per 100 man-years). Using a 36-category grouping of ICD diagnostic codes, Pacific Theater repatriates had approximately 3.5 times more categorical diagnoses than European Theater repatriates and 7 times more categorical diagnoses than their comparison group. The number of categorical diagnoses among European Theater repatriates was only twice that of their comparison group, the two comparison groups were equivalent.

The next summary of the somatic and psychiatric sequelae of captivity compared 964 World War II (Pacific Theater = 648; European Theater = 316) and 577 Korean War repatriates to a total of 1,327 era-matched control subjects. Morbidity was measured using number of hospital admission, self-report subjective symptoms, and Veterans Administration disability ratings. Estimated weight loss (Pacific Theater) and the number of subjective captivity-related medical problems were the best predictors of long-term morbidity within the repatriate groups. When compared to era-matched controls, European Theater repatriates demonstrated a reduction of somatic sequelae, but a persistence of psychiatric sequelae. Psychiatric and somatic sequelae were consistently greater among Pacific Theater repatriates, while the observed sequelae among Korean War repatriates were mainly psychiatric. Admission rates were primarily attributable to respiratory (pulmonary tuberculosis) and digestive disorders, infections (parasitic disease) and psychiatric illness (predominately “anxiety reactions”). Subjective symptoms, as measured by the Cornell Medical Index (CMI), were higher in Pacific Theater and Korean War repatriates relative to controls, while European Theater repatriates did not differ from their controls. The CMI scores of the three control groups were equivalent. The rank ordering of disability among repatriates was as follows: Pacific Theater > Korean War > European Theater. Repatriate disability was consistently higher among repatriates than controls, especially for psychiatric illnesses. In this study, specific disability associated with “anxiety reaction” was nearly five times more common among repatriates than controls.

The Veterans Administration medical examination survey (Page, 1992) received complete documentation from 1,067 of 4,162 eligible participants (26%). Although the 41% of the eligible repatriates provided complete data, only 9% (184 of 1,981) completed this epidemiologic survey. This response rate resulted in the author taking a more conservative approach to data analysis and interpretation than originally planned, as “the low response rates raise justifiable concerns about potential nonresponse bias.” It is nevertheless important to review the diagnostic data that was aggregated to the three-digit ICD code level, as well as the total number of diagnoses and specific psychiatric conditions among the repatriates (Pacific Theater = 250; European Theater = 142 and Korean War = 408) and their controls (Pacific Theater = 54; European Theater = 27 and Korean War = 103). All three groups had ICD 719 (joint disease) list among their most prevalent conditions (top 15% of 60 diagnoses). The Nonspecific General Symptoms category (i.e., sleep disturbance, fatigue/malaise, fever, alterations of consciousness) was listed as one of the top two diagnostic codes in all three repatriate groups. Anxiety disorders (ICD 300) were in consistently listed within the top three categories among the repatriates, while “Non-specified Abuse of Drugs” (ICD305) was the most prevalent category for the controls from Pacific Theater and Korean War control. Surprisingly, abnormal findings from the examination of blood (ICD 790) was consistently within the top four categories for controls, but did not appear on any repatriate listing of the most prevalent condition. The Korean War repatriates were more likely than their controls to have conditions in 10 of the 22 ICD categories reported in this study, while both World War II repatriate groups differed from their control on only 4 of those categories. Collapsing across groups, the lifetime prevalence data revealed a 40% increase in number of separate diagnoses among the repatriates (64.7 diagnoses versus 45.9 diagnoses). Using the Structured Clinical Interview for DSM-III-R (SCID), lifetime repatriate PTSD prevalence was greatest among the Korean War (41%) and least in the European Theater (23%) and all three repatriate groups were more likely to higher SCID lifetime prevalence of PTSD than their matched control group. Overall, the lifetime prevalence of SCID-based PTSD was 60% higher among repatriates (35.3% versus 22.1%). In addition, the overall mean score on the Beck Depression Inventory was 73% higher among the repatriates (25.2 versus 14.6).

Summary

The purpose of this article is to report on, for the first time ever, not only the survival/mortality of the USN (USMC) RPWs, but also on the USAF RPWs, USA RPWs, and USN CGs from the Vietnam conflict. Another purpose is to report and analyze the morbidity at the 42-year milestone for each of these groups. Unlike the Nice et.al (1996) study with a “controlled” sample size, we’ll look at the entire REMC cohort. Based on our previous results regarding ICD diagnoses at the time of repatriation and the predictors of long-term resilience/health, as well the morbidity/mortal findings from WWII and Korea, we propose the following hypotheses:

H1 (Mortality): The survival rate for the USN CG will be greater than that for the other four groups due to a general “captivity” factor. Differences between the various captivity experiences would result in a lower survival rate among the USA RPWs and Non-OH repatriates, while the two groups of predominantly aviator repatriates (USN/USMC and USAF) held captive in North Vietnam would show similar survival rates.

H2 (Mortality): Among the OH repatriates, age at time of capture, length of captivity, length of solitary confinement, and torture severity will each contribute significantly to the prediction of survival.

H3 (Morbidity): Within the two groups with the longest REMC participation and greatest number of annual examinations, the USN/USMC repatriates will be more likely to receive diagnoses than the CG on most of the ICD categories, especially Mental disorders (PTSD related), Neurological disorders (mononeuritis) and Injuries (vertebral fractures due to shoot down/ejection).

H4 (Morbidity): Among the repatriates, the morbidity rates will be similar to the mortality rates with the USN/USMC and USAF repatriates being most similar. The USA repatriates will show the most morbidity across ICD categories, especially for mental disorders (PTSD). We also predict that the prevalence of ICD categorical diagnoses will be lower in officers than in enlisted personnel due to more stringent medical standards associated with their aviation duty.

H5 (Morbidity): Finally, we predict that the prevalence of long-term medical problems will be greater among Vietnam repatriates than among WWII or Korean War repatriates due to primarily to the longer duration of their captivity. We also predict that cohort differences will contribute to lower morbidity within the Vietnam-era CG and in the control groups from WWII and Korea.

Methods

We used all available data from our (REMC) longitudinal database of voluntary annual evaluations (aka physical exams). These evaluations included mental and physical diagnoses, which were made by providers from the REMC, Veteran’s Administration; commercial medical sector, and coded in accordance with ICD9-CM. The database originated in 1973 with only the USN/USMC RPWs (n=169). The USN Comparison Group (CG) started in 1978 (n=123), followed by the USAF RPWs in 1993 (n=251), and the USA RPWs in 1997 (n=65) yielding 485 RPWs (73%) and 123 USN CGs (89%). There were 8579 physical exams (PE), over the 42 years, which averaged 14 PEs and 29 diagnoses (Dx) per veteran. Each of the services’ contribution to the average was: USN (USMC) #PE = 22 (12), #Dx = 35(16), USAF #PE = 8(6), #Dx=25(14), and the USA #PE = 5(5), #Dx=21(13).

Consistent with our prior studies, we determined the diagnosis frequency at the ICD9-CM Category level (i.e.; 3-digits). To accurately account for code changes and new diagnoses, we rectified the early code for Sleep Apnea (780 Apnea) to the current ICD9-CM Code 327. Because of the intense interest in Post-Traumatic Stress Disorder (PTSD), we went to the 5-digit diagnosis level to separate PTSD (309.81) from Adjustment Disorders (309). We then listed the top 5 diagnoses per ICD9-CM Category for each group. Because of clinical interest, we chose specific diagnoses and computed Odds Ratios (95% CI). As with our prior studies, we chose the top diagnoses for each group and presented them in a table for reference.

All dates of death in our REMC longitudinal database were individually verified and cataloged in 5-year increments by group (USN (USMC), USAF, USA; USN CG; non-OH).

Results

Demographics

The 8,579 annual physical examinations summarized in the Morbidity section of this report were collected as part of forty-two year voluntary medical follow-up program for Vietnam-era military repatriates (88% of whom were officers during captivity). A group of 138 combat-experienced Naval aviator officers, each matched with the 138 Naval aviator (officer) repatriates, were also included. Unlike carefully controlled prospective studies or extremely large epidemiological studies, the frequency and recency of REMC examinations were primarily dependent on the patient's schedule. In the initial years following repatriation, most patients were on active duty, still participating in duty involving flight and subject to deployments. Following retirement from active duty and subsequent to civilian retirement, other factors contribute to their less than optimal participation. As shown in the far left portion of Table 1, the average age of the Comparison Group member at the time of naval aviator repatriate shoot down was 30.9 years (Table 1). The middle portion of Table 1 shows means for age at time of capture, length of captivity (months) and length of solitary confinement for the military repatriates who have received REMC medical follow-up examinations. Specific information regarding solitary confinement and torture were only collected as part of O/H and not available for the non-O/H repatriates. Morbidity data, based annual REMC examinations, were available for 89% of the Comparison Group and for 485 of the 662 service members who were held in Vietnam as prisoners of war (73%). Mortality data, through 12/31/2015, were available for the entire sample (138 Comparison Group, 566 O/H repatriates and 96 non-O/H repatriates).

Mortality

The forty-two year survival rate ranged from 70% (Comparison Group) to 75% (USA Repatriates), with a grand average survival rate of 72% (Table 2). The distribution of group rates did not differ from this mean ($X^2 = 0.96$, $df = 4$, $p = 0.9158$) and the differences in repatriate survival rates over time were statistically insignificant (Kaplan-Meier Log Rank $X^2 = 2.033$, $df = 3$, $p = 0.565$) from each other. Also, the survival rates of officers and enlisted repatriates did not differ (72% Officers; 73% Enlisted; Kaplan-Meier Log Rank $X^2 = 0.014$, $df = 1$). Among the 138 matched naval aviator pairs (Table 3), both members of 72 pairs were alive and both members of 16 pairs were deceased. An identical numbers of Navy repatriates and comparison group members were alive ($n = 97$, 70%) of each group at the end of 2015. The average age at time of death was 67.1 years (± 14.3 years) for the comparison group and 70.6 years (± 15.2 years) for the Navy repatriates ($t = -1.07$, $df = 40$, $p = 0.291$).

Cox regression survival analysis was conducted to assess the predicative significance of four risk factors (age at time of capture, months of captivity, weeks of solitary confinement and torture severity) in predicting mortality/survival. A logarithmic transformation was performed to reduce solitary confinement skewness and length of captivity was analyzed following a median split due that variables' bimodal distribution. These adjustments did not alter the results and only the unadjusted results are presented in Table 4. Repatriate age at the time of capture was significantly predictive of survival rate, with repatriates who were older at the time of capture being more likely to die within this 42 year period of follow-up ($\text{Exp(B)} = 1.112$, $p < 0.001$; an 11% increase in risk of death for each year since repatriation). Neither lengths of captivity and solitary nor torture severity were predicative of survival.

Morbidity

A listing of the five most frequent diagnoses within each of the sixteen ICD categories (neurological disorders and disorders of special senses are listed separately) for each group is presented in Tables 5a and 5b. For some ICD categories the most prevalent three-digit code is present in nearly every patient (special senses – SEN), while in others the most prevalent three-digit code is very rarely present (congenital disorders CON). In order to facilitate group comparisons, Tables 6a and 6b list the 30 most prevalent conditions within each group, regardless of ICD category. For example, PTSD was the fourth

most prevalent diagnosis among Army repatriates, but PTSD was not among the top 30 most prevalent diagnoses among the comparison group. Similarly, hearing loss was consistently in the top three most prevalent diagnoses in each of the four groups.

Group differences in the prevalence of ICD Categorical diagnoses were evaluated using Odds Ratios (with significant differences defined by 95% confidence intervals) and those results are presented in Table 7 (along with the prevalence values by Category and group). When compared to the comparison group, the USN (USMC) repatriates were 2-3 times more likely to have mental disorders, disorders of the nervous system and injuries/poisoning than the comparison group. There was no diagnostic category where the comparison group was more likely to have diagnoses than the USN (USMC) group. However, when compared with all repatriates, the comparison group was significantly more likely to have infectious or parasitic diseases, neoplasms, genitourinary disorders and ill-defined conditions and significantly less likely to have been diagnosed with mental disorders and disorders of the nervous system.

The USAF and USN (USMC) groups were primarily comprised of aviator officers who were held prisoner in North Vietnam, tortured regularly and often placed in solitary confinement. Despite these similarities, USN (USMC) repatriates were significantly more likely to have received diagnoses in ten of the 16 ICD categories during the follow-up period. There was no category where the USAF group was significantly more likely to have received a diagnosis than the USN (USMC) group. When the USA group was compared to the USN (USMC) group, our analyses revealed that Army repatriates were more than twice as likely to have received a mental disorder diagnosis, while USN (USMC) repatriates were significantly more likely to have received diagnoses in 11 of the 16 categories.

Although, as reported above, there was no difference in the mortality/survival rate between officer and enlisted personnel, we examined the differences in categorical ICD diagnostic prevalence using this variable (Table 8). The odds of receiving a diagnosis were significantly greater among officers for seven of the categories, but enlisted patients were nearly three times as likely to have been diagnosed with a mental disorder at some time during the follow-up period.

Our final morbidity analysis focused on twenty-one specific diagnoses that were selected based on specific clinical interests. Although there were no significant group differences in the prevalence of either malignant neoplasms of the prostate or essential hypertension, significant differences were observed on all of the other diagnoses. For the USN (USMC)/CG comparison, the repatriates were more than nine times as likely to have been diagnosed with PTSD (309p) and mononeuritis of the upper limb (354), and 2-3 times as likely to have been diagnosed with vertebral fractures (805), other skin/subcutaneous disorders (709) and mononeuritis of the lower limb (355). The odds for dermatophytosis (110), obesity (278), alcohol dependence (303) and cardiac dysrhythmias (427) were significantly higher for the comparison group than the USN (USMC) group.

Although sleep apnea (327) was significantly more likely in the USAF group than the USN (USMC) group, USN (USMC) repatriates were significantly more likely to have received seven of the other specific diagnoses of clinical interest. Army repatriates were significantly more likely to have been diagnosed with PTSD (309p) and mononeuritis of the lower limb (355), than either of the other repatriate groups and more than twice as likely as USN (USMC) repatriates to have been diagnosed with Diabetes Mellitus (250). When compared to the other groups, cardiac dysrhythmias (427), inguinal hernia (550), benign prostatic hypertrophy (600), osteoarthritis (715) and spondylosis (721) were significantly less common.

Discussion

This study has provided an initial glimpse of the morbidity and mortality data collected by the Robert E. Mitchell Center since 1973. In so doing, we have summarized the results of more than 8,500 annual physical examinations (person-years) obtained from 608 patients. We have also tabulated the

mortality/survival of an additional 192 former service members (100% of Vietnam-era repatriates and comparison group members). This clinical program is the only one of its' kind within the Department of Defense. On average, patients have had 14 annual examinations and many still come to the Center on a regular basis. This clinical follow-up program has allowed Center staff to address patients' requests to make treatment recommendations to their primary care providers, or to provide service-connected verification to disability raters at the Veterans Administration based on our long-term follow-up and awareness of medical problems that began during captivity.

Preliminary answers are available for each of the five study hypotheses. Contrary to our prediction, the CG survival rate was not greater than the four repatriate groups. This was unexpected given the lengthy captivity, torture and captivity-related medical problems associated with captivity. At the ten year point, only 2% of the repatriates were deceased. The death rate increased to 4% within the twenty years following repatriation and to 10% by the 30 year point. Each of these mortality rates were less than those previously reported for WWII Pacific Theater and Korea repatriates, despite the Vietnam repatriate's much longer imprisonment. In addition, the relative mortality risk for the Vietnam RPW comparison to the CG was insignificant. Although it is tempting to attribute the group differences to the fact that the Vietnam group was largely comprised of aviator officers, there was no mortality difference between officers and enlisted and the overall death rate was below expectation. Specifically, in 1973 at the time of repatriation, the average additional life expectancy of 34-year-old men was 37 years. According to this actuarial statistic, a mortality rate of 50% was predicted by the year 2010 and 72% were alive by the end of 2015. Of course these findings cannot rule out unique cause of death among the Vietnam repatriates, nor do they address the relationship between Vietnam repatriate mortality and captivity-related risk factors.

We also predicted that captivity-related risk would be reliably related to Vietnam repatriate mortality. Neither torture severity, nor length of solitary confinement, nor length of captivity were predictive once age at the time of capture was included in the equation. This finding does not suggest the relevancy of age alone, but also reflects the significant correlations between the four risk variables. It would have been counterintuitive to find no relationship between age and mortality and we remain interested in investigating the possible relationship between captivity-related medical problems and mortality.

With regards to morbidity differences between the CG and the USN/USMC repatriates, our specific hypotheses were confirmed regarding Mental disorders (PTSD related), Neurological disorders (mononeuritis) and Injuries (vertebral fractures due to shoot down/ejection) were confirmed. For each of these ICD categories, repatriates were 2-3 times as likely to have received diagnoses. This finding was supported and further elaborated for several specific diagnoses within the categories (PTSD, upper limb mononeuritis, and vertebral fractures). Our prediction that USN/USMC repatriates would show considerably more morbidity than the CG was not supported at the level of ICD categories as there were group differences on thirteen of the categories. USN/USMC repatriates were not, in general, more likely to receive more diagnoses than CG patients (holding constant age and number of examinations). The relationship between these morbidity results and captivity-related risk factors merits further study, as do those four specific diagnoses that were more likely in the CG than in the USN/USMC repatriates.

The prevalence rates for the eight most common ICD categories were lower among the repatriates than in comparison group, significantly so for genitourinary disorders (e.g. benign prostatic hypertrophy) and ill-defined conditions. Only twice were prevalence rates higher among repatriates: mental disorders (e.g. PTSD) and conditions involving the nervous system (e.g. mononeuritis). Contrary to our predictions, there was a striking dissimilarity between USN/USMC and USAF repatriates, despite similar age, location of captivity and aviation officer status. Significant differences were observed on ten of the sixteen ICD categories. Diagnoses were not more common among USAF repatriates for any of these ten categories, suggesting the possible impact of group differences with respect to number of REMC examinations. Although a similar explanation may explain the fact that officers were more likely to have received seven of the sixteen categorical diagnoses than enlisted (with enlisted more likely only for mental disorders – PTSD), this finding may also relate to group differences with respect to age, length of captivity and torture severity. The more stringent medical standards associated with aviation duty did not reduce the likelihood

of categorical diagnosis. These interpretations were supported at the specific diagnosis level, where PTSD and lower limb mononeuritis were the only instances where USA repatriates were consistently more likely to have been diagnosed within the follow-up period. For six of the 21 diagnoses, the younger Army repatriates were consistently less likely to have received diagnoses than members of the other repatriate groups.

The hypothesis regarding the prevalence differences between of Vietnam repatriates and WWII/Korean War repatriates was not supported despite the longer duration of their captivity among the Vietnam repatriates. When evaluating prevalence differences among the groups (WWI/Korean repatriates, WWII/Korean controls, Vietnam repatriates and Vietnam controls) we found no differences on five of the sixteen ICD categories. Disorders of the endocrine, special senses, circulatory, skin and musculoskeletal systems were equally common. Cohort differences (where repatriates and controls from one era differed from the other era) were found on ten of the sixteen ICD categories. Unique differences were found for respiratory disorders where the Vietnam CG had the highest prevalence due to screening pulmonary function testing as mentioned above. On five of the ICD categories the Vietnam era patients had a lower prevalence than the WWII/Korean subjects, while they exhibited a higher prevalence on the other five ICD categories where cohort differences were observed. Infectious diseases, mental disorders, digestive disease, ill-defined conditions were more prevalent in the WWII/Korean cohorts, while neoplasms and disorders of the blood, neurological, genitourinary disorders, as well as congenital conditions were more prevalent in the patients from the Vietnam era. Neurotic mental disorders (e.g. PTSD was the only ICD category that demonstrated the effects of captivity and cohort differences. Repatriates from both WWII/Korea and Vietnam exhibited a higher prevalence of neurosis (e.g. PTSD) than did the comparison subjects from their era. Although the effects of specific risk factors on these cohorts will require additional investigation, Vietnam repatriates with higher dispositional optimism have a lower risk of psychiatric illness and better long-term physical and psychological health than repatriates who are more pessimistic.

Our study was not without limitations. As a clinical program, as opposed to a carefully designed epidemiological study, there were various issues that were beyond our control. With regards to the morbidity data, many diagnoses were made elsewhere by either private practitioners and/or clinicians employed by the Veterans Administration. In some cases diagnostic criteria may have been strictly employed while in others diagnoses may have reflected the clinician's most parsimonious explanation of disparate signs, symptoms and laboratory results. We have "severity" information on only a few of our patients and do not routinely annotate diagnosis with qualifiers such as "in remission" or "controlled by medications. Different group accession dates and attrition resulted in a variable number of evaluations per patient and some eligible patients have never taken advantage of this voluntary program. For those Navy/USMC patients who have participated since the program's inception, the number of diagnoses may be inflated. This would include those conditions that evolve over time, as well as those diagnoses that reflected a more in depth evaluation due to the patient's aviation status (e.g., special senses and respiratory conditions associated with annual routine pulmonary function tests). In addition, some patients may have elected to discontinue participation for reasons other than personal health (e.g., poor spousal health or adequate care from their primary care provider), while others may be too ill to travel due to disabling conditions that are unknown to us at this time. Finally, it must be noted that the mortality data reflected only date of death and not cause of death.

In summary, the forty-two year mortality was much lower than expected with no difference between repatriates and comparison group members. Age at time of capture was the only significant predictor of mortality rate. Within the Vietnam repatriates, age also appeared to be a significant predictor of morbidity and the most prominent group difference was associated with PTSD, which was also prominent among repatriates from WWII and Korea. Future research will analyze the ability of age at capture, length of captivity, length of solitary confinement, torture severity and captivity-related medical problems to predict long-term physical and psychological disorders.

References

1. Beebe, G. (1975). Follow-up studies of World War II and Korean War prisoners: II. Morbidity, disability, and maladjustment. *American Journal of Epidemiology*, 101, 400-422.
2. Berg, S.W. & Richlin, M. (1977a). Injuries and illnesses of Vietnam War POWs. I. Navy POWs. *Military Medicine*, 142, 514-518.
3. Berg, S.W. & Richlin, M. (1977b). Injuries and illnesses of Vietnam War POWs. II. Army POWs. *Military Medicine*, 142, 598-602.
4. Berg, S.W. & Richlin, M. (1977c). Injuries and illnesses of Vietnam War POWs. III. Marine Corps POWs. *Military Medicine*, 142, 678-680.
5. Center for Prisoner of War Studies (1972). *Repatriated Prisoner of War Initial Medical Evaluation Forms*. Department of Defense. Washington, D.C.
6. Cohen, B.M. and Cooper, M.Z. (1954). *A follow-up study of World War II prisoners of war*. VA Medical Monograph, Veterans Administration. Washington, D.C.
7. IBM Corporation (2010). IBM SPSS Statistics for Windows, Version 19.0. IBM Corporation: Armonk, New York.
8. Keehn, R.J. (1980). Follow-up studies of World War II and Korean War prisoners: III. Mortality to January 1, 1976. *American Journal of Epidemiology*, 111, 194-121.
9. National Center for Health Statistics (2010). International Classification of Diseases and Injuries, Ninth Edition Clinical Modification (ICD-9-CM). Retrieved from ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Publications/ICD-9/2010/ucod.txt.
10. Nefzger, M.D. (1970). Follow-up studies of World War II and Korean War prisoners: I. Study plan and mortality findings. *American Journal of Epidemiology*, 91, 123-138.
11. Nice, D.S., Garland, G.C., Hilton, S.M., Baggett, J.C., and Mitchell, R.E. (1996). Long-term health consequences and medical effects of torture among US Navy prisoners of war in Vietnam. *The Journal of the American Medical Association*, 276, 375-381.
12. Page, W.F. (1992). *The health of former prisoners of war: Results from the medical examination survey of former POWs of World War II and the Korean Conflict*. Retrieved from <http://www.nap.edu/catalog/2036.html>
13. Raza, S.S, Moore, J. L., and Albano, J.P. Injuries and Illnesses of Vietnam War POWs Revisited: I. Navy Risk Factors (2016a). ADA Number: 626171, Defense Technical Information Center, Ft. Belvoir, Virginia.
14. Raza, S.S, Moore, J. L., and Albano, J.P. Injuries and Illnesses of Vietnam War POWs Revisited: II. Army Risk Factors (2016b). ADA Number: 626687, Defense Technical Information Center, Ft. Belvoir, Virginia.
15. Raza, S.S, Moore, J. L., and Albano, J.P. Injuries and Illnesses of Vietnam War POWs Revisited: III. Marine Corps Risk Factors (2016c). ADA Number: 626659, Defense Technical Information Center, Ft. Belvoir, Virginia.

16. Raza, S.S, Moore, J. L., and Albano, J.P. Injuries and Illnesses of Vietnam War POWs Revisited: IV. Air Force Risk Factors (2017a). ADA Number: 1031529, Defense Technical Information Center, Ft. Belvoir, Virginia.
17. Raza, S.S, Moore, J. L., Albano, J.P. and A. F. Wells. Injuries and Illnesses of Vietnam War POWs Revisited: V. Combined Service Group Risk Factors (2017b). Submitted for publication, 9, Defense Technical Information Center, Ft. Belvoir, Virginia.
18. Segovia, F., Moore, J.L., Linnville, S.E., Hoyt, R.E., and Hain, R.E. Optimism Predicts Resilience in Repatriated Prisoners of War: A 37-Year Longitudinal Study. *Journal of Traumatic Stress*, 2012, 25, 330-336.
19. Segovia, F., Moore, J.L., Linnville, S.E., and Hoyt, R.E. Optimism Predicts Positive Health in Repatriated Prisoners of War. *Psychological Trauma: Theory, Research, Practice, and Policy*, 2015, 7, 222-28.
20. Spaulding, R.C., Editor (1976). *Proceedings of the 3rd Annual Joint Medical Meeting Concerning POW/MIA Matters*, San Diego, California, November, 1975.
21. Thirteenth Air Force (1973). *Joint Homecoming Reception Center (JHRC) After Action Report*. Department of the Air Force: San Francisco, California.
22. U.S. Army Health Services Command (1977). *Proceedings of the 4th Annual Joint Medical Meeting Concerning POW/MIA Matters*, San Antonio, Texas, November, 1976.
23. Wetzler, H.P., Editor (1979). *Proceedings of the 5th Annual Joint Medical Meeting Concerning POW/MIA Matters*, San Antonio, Texas, September, 1978.

Table 1
Demographics

	CG	USN/USMC	USAF	USA	O/H
Age_TOC	30.9	29.4	30.7	25.0	29.8
LOC	---	58.6	54.1	34.8	55.0
LOS	---	46.8	28.9	29.5	30.0
Torture	---				30.1
% Officer	100	96	98	34	88
	n = 123	n = 169	n = 251	n = 65	n = 566

Table 2
Survival Rates

Years	CG	USN/USMC	USAF	USA	Non-OH
1973-77	0.98	0.98	0.99	1.00	0.97
1978-82	0.98	0.97	0.99	0.99	0.94
1983-87	0.95	0.95	0.98	0.99	0.93
1988-92	0.93	0.94	0.98	0.97	0.91
1993-97	0.91	0.93	0.94	0.95	0.89
1998-02	0.86	0.91	0.91	0.90	0.83
2003-07	0.80	0.85	0.87	0.87	0.79
2008-12	0.75	0.80	0.80	0.81	0.77
2013-15	0.70	0.71	0.73	0.75	0.71
	n = 138	n = 164	n = 325	n = 77	n = 96

Table 3
Survival Among USN Matched PAIRS

		RPW		
		Deceased	Alive	
CG	Deceased	16	25	41
	Alive	25	72	97
		41	97	138

Table 4**42-Year Mortality Data for OH Repatriates**

Simultaneous Cox Regression (n = 566)

Event	158	0.28
Censored	408	0.72
Total	566	

Overall χ^2 71.716 with df = 4; p < 0.001Change χ^2 67.360 with df = 4; p < 0.001 (from previous block)

Variables in Equation	95% CI for Exp(B)					
	B	Wald	p	Exp(B)	lower	upper
Age_TOC	0.106	55.305	< .001	1.112	1.082	1.144
LOC_mnth	0.004	1.294	0.255	1.004	0.997	1.01
LOS_wks	0.000	0.001	0.981	1.000	0.997	1.003
Torture	0.002	0.082	0.775	1.002	0.988	1.016

Table 5a									
COMPARISON GROUP (n = 123)					USAF RPWs (n = 251)				
USN/USMC RPWs (n = 169)					USA RPWs (n = 65)				
Diagnosis	ICD	%	Diagnosis	ICD	%	Diagnosis	ICD	%	ICD
INF									
1 Dermatomyositis	110	43.1	1 Other Intestinal Helminthiasis	127	24.3	1 Dermatomyositis	110	21.1	110
2 Other diseases due to viruses	78	8.1	2 Dermatomyositis	110	20.1	2 Primary Tuberculous infections	84	4.0	84
3 Herpes Simplex	54	5.7	3 Other diseases due to viruses	78	8.3	3 Plague	20	2.4	20
4 Herpes Zoster	53	4.9	4 Herpes Simplex	54	6.5	4 Tuberculosis of meninges or CNS	13	2.4	13
5 Other Salmonella infections	3	4.9	5 Other Intestinal Infections	8	6.5	5 Tuberculosis of meninges or CNS	13	2.4	13
NEO									
1 Benign Skin Neoplasms	216	28.5	1 Benign Skin Neoplasms	216	21.3	1 Benign Skin Neoplasms	216	14.3	185
2 Other Benign Digestive Neoplasms	211	17.9	2 Benign neoplasm other digestive	211	19.5	2 Skin carcinoma in situ	232	6.2	232
3 Malignant neoplasms of testis	186	15.4	3 Malignant neoplasm of prostate	185	11.8	3 Malignant skin melanoma	172	4.6	172
4 Other malignant skin neoplasms	173	13.0	4 Neoplasm of unspecified nature	239	10.1	4 Other malignant skin neoplasms	173	4.6	173
5 Neoplasms of unspecified nature	239	10.6	5 Lipoma	214	9.5	5 four diagnoses tied at 3.1%	*	3.1	*
END									
1 Disorders of lipid metabolism	272	83.7	1 Disorders of lipid metabolism	272	92.9	1 Disorders of lipid metabolism	272	82.9	272
2 Obesity	278	27.6	2 Thiamine/niacin deficiency states	265	19.5	2 Thiamine & Niacin deficiency	265	16.7	265
3 Unspecified metabolism disorders	277	13.8	3 Unspecified metabolism disorders	277	18.3	3 Diabetes Mellitus	250	14.3	250
4 Acquired Hypothyroidism	244	11.4	4 Obesity	278	14.8	4 Obesity	278	12.4	278
5 Diabetes Mellitus	250	10.6	5 Diabetes Mellitus	250	11.2	5 Gout	274	8.4	274
BLO									
1 Diseases of white blood cells	288	17.1	1 Diseases of white blood cells	288	26.0	1 Diseases of white blood cells	288	8.8	288
2 Other/unspecified anemias	285	9.8	2 Other/unspecified anemias	285	8.9	2 Hereditary hemolytic anemias	285	6.4	285
3 Other deficiency anemias	281	8.1	3 Other deficiency anemias	281	7.7	3 Other/unspecified anemias	285	6.0	285
4 Hereditary hemolytic anemias	282	8.1	4 Hereditary hemolytic anemias	282	5.9	4 Other deficiency anemias	281	5.6	281
5 Purpura/other hemorrhagic	287	5.7	5 Other diseases of the blood	289	3.6	5 Purpura/other hemorrhagic	287	4.4	287
MEN									
1 Alcohol Dependence	303	12.2	1 PTSD	309p	29.0	1 PTSD	309p	31.9	309p
2 Alcohol/tobacco Abuse	305	9.8	2 Anxiety Disorders	300	14.8	2 Adjustment Disorders	309a	11.2	309a
3 Anxiety Disorders	300	9.8	3 Alcohol/Tobacco Abuse	305	13.6	3 Depression, NOS	296	8.8	296
4 Adjustment Disorder	309a	8.9	4 Mood Disorders	296	13.0	4 Mood Disorders	296	7.2	311
5 Mood Disorders	296	8.9	5 Depression, NOS	311	9.5	5 Anxiety Disorders	300	4.4	305
NEU									
1 Sleep Apnea	327	21.1	1 Mononeuritis, upper limb	354	53.8	1 Mononeuritis, upper limb	354	33.5	355
2 Mononeuritis, upper limb	354	11.4	2 Mononeuritis, lower limb	355	20.7	2 Sleep Apnea	327	27.5	356
3 Mononeuritis, lower limb	355	8.1	3 Hereditary Peripher. Neuropathy	356	17.8	3 Hereditary Peripher. Neuropathy	356	12.0	327
4 Nerve root & plexus disorders	353	7.3	4 Sleep Apnea	327	17.8	4 Mononeuritis, lower limb	355	11.6	354
5 Hered Periph Neuropathy, Migraine	356, 346	4.9	5 Nerve root & plexus disorders	353	7.7	5 Other extrapyramidal diseases	333	10.8	346
SEN									
1 Disorders of refraction & accomm.	367	97.6	1 Disorders of refraction & accomm.	367	92.9	1 Hearing Loss	389	91.6	367
2 Hearing Loss	389	95.1	2 Hearing Loss	389	90.5	2 Disorders of refraction & accomm.	367	88.8	389
3 Cataract	366	63.4	3 Cataract	366	67.5	3 Cataract	366	57.8	366
4 Corneal Opacity & other corneal dis.	371	44.7	4 Other disorders of the ear	388	41.4	4 Other disorders of the ear	388	57.8	366
5 Other disorders of the ear	388	39.0	5 Corneal Opacity & other corneal dis	371	32.0	5 Corneal Opacity & other corneal dis.	371	29.9	371
CIR									
1 Essential Hypertension	401	58.5	1 Essential Hypertension	401	54.4	1 Essential Hypertension	401	62.2	401
2 Hemorrhoids	455	53.7	2 Hemorrhoids	455	46.2	2 Cardiac Dysrhythmias	427	33.9	429
3 Cardiac Dysrhythmias	427	38.2	3 Ill-defined Heart Disease	429	30.8	3 Ill-defined Heart Disease	427	30.7	455
4 Conduction Disorders	426	26.8	4 Cardiac Dysrhythmias	427	26.0	4 Hemorrhoids	455	27.5	440
5 Lower Extremity Varicose Veins	454	23.6	5 Conduction Disorders	426	23.7	5 Conduction Disorders	426	18.7	427, 459

Table 6a

Comparison Group Diagnosis	ICD	%	USN/USMC Repatriate Diagnosis	ICD	%
1 Disorders of refraction & accomm.	367	97.6	1 Disorders of lipid metabolism	272	92.9
2 Hearing Loss	389	95.1	2 Disorders of refraction & accomm.	367	92.9
3 Deviated nasal septum	470	86.2	3 Hearing Loss	389	90.5
4 Disorders of lipid metabolism	272	83.7	4 Deviated nasal septum	470	78.1
5 Benign prostate hypertrophy	600	78.0	5 Osteoarthritis	715	77.5
6 Chronic airway obstruction NEC	496	72.4	6 Benign prostate hypertrophy	600	71.6
7 Osteoarthritis	715	69.1	7 Nonspecific findings on blood exam	790	68.0
8 Spondylosis & related disorders	721	67.5	8 Cataract	366	67.5
9 Other dermatoses	702	65.9	9 Spondylosis & related disorders	721	67.5
10 Cataract	366	63.4	10 Other dermatoses	702	65.1
11 Essential Hypertension	401	58.5	11 Chronic airway obstruction NEC	496	62.1
12 Nonspecific findings on blood exam	790	57.7	12 Other/unspecified back disorders	724	62.1
13 Other/unspecified back disorders	724	54.5	13 Essential Hypertension	401	54.4
14 Hemorrhoids	455	53.7	14 Mononeuritis, upper limb	354	53.8
15 Nonspecific results of function tests	794	50.4	15 Peripheral enthesopathies	726	53.3
16 Allergic rhinitis	477	47.2	16 Other/unspecified joint disorders	719	47.9
17 Corneal Opacity & other corneal dis.	371	44.7	17 Diseases of esophagus	530	47.3
18 Dermatophytosis	110	43.1	18 Hemorrhoids	455	46.2
19 Other bone/cartilage disorders	733	43.1	19 Nonspecific results of function tests	794	45.6
20 Other disorders of the ear	388	39.0	20 Allergic rhinitis	477	43.8
21 Cardiac Dysrhythmias	427	38.2	21 Other disorders of the ear	388	41.4
22 Peripheral enthesopathies	726	37.4	22 Corneal Opacity & other corneal dis.	371	32.0
23 Diseases of esophagus	530	35.8	23 Chronic sinusitis	473	32.0
24 Inguinal hernia	550	30.9	24 Ill-defined Heart Disease	429	30.8
25 Symptoms involving cardiac system	785	30.1	25 PTSD	309p	29.0
26 Other, nonspecific abnormal findings	796	30.1	26 Other disorders of urethra/tract	599	28.4
27 Benign Skin Neoplasms	216	28.5	27 Other, nonspecific abnormal findings	796	28.4
28 Obesity	278	27.6	28 Other respiratory diseases	519	27.8
29 Other hernia of abdominal cavity	553	27.6	29 Other hernia of abdominal cavity	553	27.2
30 Conduction Disorders	426	26.8	30 Diseases of white blood cells	288	26.0

Table 6b

USAF Repatriate Diagnosis	ICD	%	ARMY Repatriate Diagnosis	ICD	%
1 Hearing Loss	389	91.6	1 Disorders of refraction & accomm.	367	98.5
2 Disorders of refraction & accomm.	367	88.8	2 Hearing Loss	389	89.2
3 Disorders of lipid metabolism	272	82.9	3 Disorders of lipid metabolism	272	76.9
4 Osteoarthritis	715	73.7	4 PTSD	309p	67.7
5 Benign prostate hypertrophy	600	69.3	5 Essential Hypertension	401	66.2
6 Spondylosis & related disorders	721	64.9	6 Cataract	366	53.8
7 Essential Hypertension	401	62.2	7 Benign prostate hypertrophy	600	52.3
8 Other dermatoses	702	58.2	8 Osteoarthritis	715	50.8
9 Cataract	366	57.8	9 Other/unspecified back disorders	724	47.7
10 Other/unspecified back disorders	724	52.2	10 Nonspecific findings on blood exam	790	47.7
11 Nonspecific findings on blood exam	790	52.2	11 Other dermatoses	702	44.6
12 Chronic airway obstruction NEC	496	45.0	12 Spondylosis & related disorders	721	44.6
13 Other bone/cartilage disorders	733	43.8	13 Chronic airway obstruction NEC	496	36.9
14 Diseases of esophagus	530	41.8	14 Other bone/cartilage disorders	733	36.9
15 Other disorders of the ear	388	39.8	15 Mononeuritis, lower limb	355	33.8
16 Intervertebral disc disorders	722	38.6	16 Other disorders of the ear	388	33.8
17 Allergic rhinitis	477	35.5	17 Corneal Opacity & other corneal dis.	371	30.8
18 Cardiac Dysrhythmias	427	33.9	18 Diseases of esophagus	530	29.2
19 Mononeuritis, upper limb	354	33.5	19 Thiamine & Niacin deficiency	265	26.2
20 Nonspecific results of function tests	794	32.3	20 Allergic rhinitis	477	26.2
21 PTSD	309p	31.9	21 Intervertebral disc disorders	722	24.6
22 Ill-defined Heart Disease	429	30.7	22 Other hernia of abdominal cavity	553	23.1
23 Corneal Opacity & other corneal dis.	371	29.9	23 Diabetes Mellitus	250	21.5
24 Sleep Apnea	327	27.5	24 Obesity	278	20.0
25 Hemorrhoids	455	27.5	25 Hereditary Peripher. Neuropathy	356	20.0
26 Dermatophytosis	110	21.1	26 Dermatophytosis	110	16.9
27 Inguinal hernia	550	21.1	27 Ill-defined Heart Disease	429	16.9
28 Other hernia of abdominal cavity	553	20.3	28 Sleep Apnea	327	16.9
29 Other disorders of urethra/tract	599	20.3	29 General symptoms	780	16.9
30 Conduction Disorders	426	18.7	30 Adjustment Disorders	309a	15.4

Table 7

		ODDS RATIOS				
Category	ICD Diagnostic Group (range)	USN(USMC)/CG	ALL RPW/CG	USA/USAF	USA/USN(USMC)	USAF/USN(USMC)
INF	Infectious and Parasitic Diseases (001 - 139)	0.91	0.52	0.81	0.36	0.45
NEO	Neoplasms (140 - 239)	0.69	0.42	0.42	0.24	0.56
END	Endocrine, Nutritional, Metabolic and Immunity (240- 279)	1.61	0.70	1.12	0.36	0.32
BLO	Blood and Blood Forming Organs (280 - 289)	1.20	0.75	0.84	0.40	0.48
MEN	Mental (290 - 319)	2.26	2.14	3.31	2.39	0.72
NEU	Nervous System (320 - 359)	2.93	1.97	1.17	0.65	0.56
SEN	Sense Organs (360 - 389)	0.27	0.43	2.09	3.93	1.88
CIR	Circulatory System (390 - 459)	0.53	0.50	0.49	0.55	1.10
RES	Respiratory System (460 - 519)	0.48	0.11	0.56	0.09	0.16
DIG	Digestive System (520 - 579)	1.13	0.84	0.61	0.44	0.71
GEN	Genitourinary System (580 - 629)	0.55	0.40	0.45	0.35	0.77
SKN	Skin and Subcutaneous (680 - 709)	1.11	0.67	0.59	0.32	0.54
MUS	Musculoskeletal System and Connective Tissues (710 - 739)	1.15	0.56	0.51	0.23	0.45
CON	Congenital Anomalies (740 - 759)	1.28	0.87	0.46	0.28	0.60
ILL	Symptoms, Signs and Ill-Defined Conditions (780 - 799)	0.82	0.47	0.68	0.34	0.49
INJ	Injury and Poisoning (800 - 999)	2.06	1.18	0.76	0.34	0.45

BOLD = Statistically significant using 95% confidence intervals for each Odds Ratio

		PREVALENCE				
Category	ICD Diagnostic Group (range)	CG	ALL RPW	USN	USAF	USA
INF	Infectious and Parasitic Diseases (001 - 139)	0.61	0.45	0.59	0.39	0.34
NEO	Neoplasms (140 - 239)	0.70	0.50	0.62	0.47	0.28
END	Endocrine, Nutritional, Metabolic and Immunity (240- 279)	0.93	0.91	0.96	0.88	0.89
BLO	Blood and Blood Forming Organs (280 - 289)	0.38	0.32	0.43	0.26	0.23
MEN	Mental (290 - 319)	0.31	0.49	0.50	0.42	0.71
NEU	Nervous System (320 - 359)	0.46	0.62	0.71	0.58	0.62
SEN	Sense Organs (360 - 389)	0.99	0.98	0.97	0.98	0.99
CIR	Circulatory System (390 - 459)	0.93	0.86	0.87	0.88	0.78
RES	Respiratory System (460 - 519)	0.97	0.76	0.93	0.70	0.57
DIG	Digestive System (520 - 579)	0.74	0.71	0.76	0.70	0.58
GEN	Genitourinary System (580 - 629)	0.89	0.77	0.82	0.78	0.62
SKN	Skin and Subcutaneous (680 - 709)	0.76	0.68	0.78	0.65	0.52
MUS	Musculoskeletal System and Connective Tissues (710 - 739)	0.96	0.93	0.96	0.92	0.86
CON	Congenital Anomalies (740 - 759)	0.25	0.23	0.30	0.21	0.11
ILL	Symptoms, Signs and Ill-Defined Conditions (780 - 799)	0.91	0.83	0.89	0.80	0.74
INJ	Injury and Poisoning (800 - 999)	0.41	0.45	0.59	0.39	0.32

Table 8
Vietnam Repatriates: Enlisted versus Officer

Category	ICD Diagnostic Group (range)	Prevalence		Odds Ratio
		Enlisted	Officer	Enl/Off
INF	Infectious and Parasitic Diseases (001 - 139)	0.52	0.66	0.56
NEO	Neoplasms (140 - 239)	0.18	0.54	0.14
END	Endocrine, Nutritional, Metabolic and Immunity (240- 279)	0.93	0.91	1.34
BLO	Blood and Blood Forming Organs (280 - 289)	0.21	0.33	0.56
MEN	Mental (290 - 319)	0.61	0.36	2.76
NEU	Nervous System (320 - 359)	0.55	0.63	0.72
SEN	Sense Organs (360 - 389)	1.00	0.98	2.36
CIR	Circulatory System (390 - 459)	0.80	0.87	0.60
RES	Respiratory System (460 - 519)	0.55	0.79	0.33
DIG	Digestive System (520 - 579)	0.54	0.73	0.43
GEN	Genitourinary System (580 - 629)	0.59	0.80	0.36
SKN	Skin and Subcutaneous (680 - 709)	0.50	0.70	0.43
MUS	Musculoskeletal System and Connective Tissues (710 - 739)	0.88	0.94	0.47
CON	Congenital Anomalies (740 - 759)	0.07	0.25	0.23
ILL	Symptoms, Signs and Ill-Defined Conditions (780 - 799)	0.79	0.83	0.74
INJ	Injury and Poisoning (800 - 999)	0.25	0.47	0.73

BOLD = Statistically significant using 95% confidence intervals for each Odds Ratio

Table 9

ICD	Diagnosis	USA/USAF	USA/USN(USMC)	USA/CG	USAF/USN(USMC)	USAF/CG	USN(USMC)/CG
110	Dermatophytosis	0.76	0.81	0.27	1.06	0.35	0.33
185	Malignant neoplasm of prostate	0.64	0.62	0.46	0.97	0.72	0.74
250	Diabetes Mellitus	1.37	2.17	2.32	1.58	1.70	1.07
278	Obesity	1.77	1.44	0.65	0.81	0.37	0.45
288	Disease of White Blood Cells	0.50	0.14	0.24	0.27	0.46	1.71
303	Alcohol Dependence	4.05	1.23	0.47	0.28	0.12	0.4
309p	PTSD	4.48	5.13	49.45	1.15	11.04	9.64
327	Sleep Apnea	0.54	0.94	0.76	1.76	1.41	0.81
354	Mononeuritis, Upper Limb	0.36	0.16	1.42	0.43	3.92	9.08
355	Mononeuritis, Lower Limb	3.92	1.96	5.78	0.50	1.48	2.95
401	Essential Hypertension	1.19	1.64	1.38	1.37	1.16	0.85
427	Cardiac Dysrhythmias	0.27	0.4	0.23	1.46	0.83	0.57
477	Allergic Rhinitis	0.65	0.46	0.40	0.71	0.62	0.87
550	Inguinal Hernia	0.25	0.21	0.15	0.84	0.60	0.72
562	Diverticula of Intestine	0.36	0.21	0.21	0.58	0.59	1.02
600	Benign Prostate Hypertrophy	0.49	0.44	0.31	0.90	0.64	0.71
709	Other Skin/Subcutaneous Disorders	0.56	0.19	0.45	0.34	0.80	2.33
715	Osteoarthritis	0.37	0.30	0.46	0.81	1.25	1.54
721	Spondylosis & Related Disorders	0.44	0.39	0.39	0.89	0.89	1.00
724	Other /Unspecified Back Disorders	0.84	0.55	0.71	0.67	0.91	1.37
805	Fracture of Vertebral Column	0.59	0.31	0.65	0.52	1.10	2.11

BOLD = Statistically significant using 95% confidence intervals for each Odds Ratio

Table 10

ICD Category	Repatriates (%)	Controls (%)
Infectious Diseases	96 - 99	94 - 100
Malignant Neoplasms	9 - 20	13 - 22
Benign Neoplasms	16 - 19	14 - 26
Diabetes	12 - 15	11 - 19
Other Endocrine Diseases	68 - 86	51 - 67
Blood Diseases	7 - 14	15 - 30
Psychoses	16 - 23	0 - 11
Neuroses	89 - 93	63 - 84
Diseases of the Nervous System	18 - 36	11 - 19
Diseases of the Sense Organs	86 - 88	78 - 91
Heart Disease	51 - 62	54 - 67
Cerebrovascular Disease	5 - 12	0 - 9
Hypertension/Other Circulatory	69 - 80	67 - 69
Acute Respiratory Disease	27 - 36	24 - 33
Chronic Respiratory Disease	61 - 68	56 - 65
Digestive Disease	90 - 94	82 - 87
Urogenital Disease	47 - 60	33 - 67
Skin Disease	70 - 80	63 - 72
Musculoskeletal Disease	87 - 94	82 - 89
Congenital Conditions	6 - 8	4
Symptoms and Ill-Defined Conditions	98 - 99	94 - 100
Injury and Poisoning	85 - 92	67 - 94
Number of Subjects	883	184

Page (1992). The health of former POWs: Results from the medical examination survey of former POWs of World War II and the Korean Conflict