



# HHS Public Access

Author manuscript

*Popul Res Policy Rev.* Author manuscript; available in PMC 2016 December 01.

Published in final edited form as:

*Popul Res Policy Rev.* 2015 December ; 34(6): 785–804. doi:10.1007/s11113-015-9358-9.

## Duty, Honor, Country, Disparity: Race/Ethnic Differences in Health and Disability among Male Veterans

**Connor M. Sheehan<sup>a</sup>,**

Department of Sociology and Population Research Center, University of Texas at Austin

**Robert A. Hummer,**

Department of Sociology and Population Research Center, University of Texas at Austin

**Brenda L. Moore,**

Sociology Department, State University of New York at Buffalo

**Kimberly R. Huyser,** and

Department of Sociology, University of New Mexico

**John Sibley Butler**

Department of Management and Sociology, University of Texas at Austin

### Abstract

Given their unique occupational hazards and sizable population, military veterans are an important population for the study of health. Yet veterans are by no means homogeneous, and there are unanswered questions regarding the extent of, and explanations for, racial and ethnic differences in veterans' health. Using the 2010 National Survey of Veterans, we first documented race/ethnic differences in self-rated health and limitations in Activities of Daily Living among male veterans aged 30–84. Second, we examined potential explanations for the disparities, including socioeconomic and behavioral differences, as well as differences in specific military experiences. We found that Black, Hispanic, and other/multiple race veterans reported much worse health than White veterans. Using progressively adjusted regression models, we uncovered that the poorer self-rated health and higher levels of activity limitations among minority veterans compared to Whites was partially explained by differences in their socioeconomic status and by their military experiences. Minority veterans are a vulnerable population for poor health; future research and policy efforts should attempt to better understand and ameliorate their health disadvantages relative to White veterans.

### Keywords

Veteran Health; Health Disparities; Race/Ethnicity; Military

---

The U.S. military employs more American men than any other single institution (Angrist 1995; Teachman 2011). However, those currently commissioned or enlisted are dwarfed by

---

<sup>a</sup>Corresponding author. Department of Sociology and Population Research Center, University of Texas at Austin. Population Research Center, G1800, University of Texas at Austin, Austin, TX 78712-0544; connor.sheehan@utexas.edu; Telephone (512) 471-5514; Fax: (512) 471-4886.

the over 22 million veterans (Department of Veteran Affairs 2010). Given the substantial number of citizens who currently serve or previously served in the military, the large cohort of Vietnam veterans entering retirement age, the winding down of wars in Iraq and Afghanistan, and the reduced federal budget allocations to the armed forces (U.S. Office of the Budget 2012), it is critically important to understand the health profile of veterans in general and sub-populations of veterans in particular. Indeed, race/ethnicity serves as one important dimension of heterogeneity by which veteran health is likely to vary. Racial and ethnic differences in veterans' health are also critical to understand because, just like the general U.S. population, veterans are becoming increasingly diverse. In 2011, racial and ethnic minorities comprised 21% of all veterans, but by 2040 that number is projected to increase to roughly 34% because non-Hispanic Blacks (henceforth Blacks) and Hispanics each comprise a growing proportion of the veteran population (Department of Veteran Affairs 2013).

In this paper, we document race/ethnic differences in veteran health and explore the extent to which socioeconomic, behavioral, and military experience factors influence the differences. More specifically, we have three major objectives. First, using data from the 2010 National Survey of Veterans (NSV), we document racial/ethnic disparities in self-rated health and disability among male veterans aged 30–84. Second, we investigate if the race/ethnic health and disability differences among veterans are explained by socioeconomic and behavioral covariates. Finally, we assess whether factors specific to military experience explain observed racial/ethnic differences in self-rated health and disability status among veterans. We improve upon past research by: 1) clearly documenting racial/ethnic differences in health using a nationally representative samples of veterans rather than just one specific age cohort of veterans or veterans from a specific hospital or geographic area; 2) testing socioeconomic and behavioral explanations that may be responsible for race/ethnic differences in veteran self-reported health and disability; and 3) examining if specific military experience factors explain the race/ethnic health disparities above and beyond the socioeconomic and behavioral covariates.

## Background

### Race/Ethnic Disparities in Health

In the U.S. as a whole, Blacks live shorter lives characterized by poorer health and higher levels of disability than do Whites (Williams and Sternthal 2010). Specifically, Blacks have elevated risks of mortality at every age until at least 85 (Hummer and Chinn 2011) and spend a longer proportion of their life with some form of disability (Hayward and Heron 1999). While Hispanics have a higher life expectancy than Whites (Arias 2010), the years spent alive are also characterized by poorer health and higher rates of disability than Whites throughout much of the life course (Cho et al. 2004; Hayward et al. 2014). Thus, if veteran health patterns are similar to those of the general population, the portrait will be one of substantial minority disadvantages compared to Whites.

An extensive literature documents race/ethnic health disparities and their causes in the general adult population. Blacks and Hispanics have markedly worse adult health profiles than Whites. One of the key reasons for such disparities is that Blacks, Hispanics, and some

other race/ethnic groups such as American Indians have lower levels of socioeconomic resources than Whites (Huyser, Sakamoto, and Takei 2010; Huyser, Takei, and Sakamoto 2014; Western and Pettit 2005; Williams 2003; Williams 1999). Moreover, the Black-White and Hispanic-White wealth gaps widened considerably between 1984 and 2007 (Shapiro, Meschede, and Sullivan 2010). Because these socioeconomic resources can be used in a flexible fashion to prevent and/or address an array of health problems, inequality in such resources is considered a “fundamental cause” of health and disease (Link and Phelan 1995). Thus, statistical controls for socioeconomic status most often sharply reduce but do not eliminate race/ethnic differences in health (Braveman et al. 2010; Williams and Sternthal 2010). Others have shown that race/ethnic health disparities are in part due to the direct effects of institutional and individual-level discrimination on individual level health, which compound and interact throughout the life course. For example, Blacks and Hispanics often live in segregated neighborhoods that limit their access to quality schools, nutritious food, stable employment, and overall quality of life, factors that negatively influence their health in comparison to whites (Williams 1999; Williams and Sternthal 2010).

Although race/ethnic differences in health and their causes in the general adult population have been well documented, less attention has been paid to race/ethnic health differences within the large and growing veteran population. In one of the few studies to consider race/ethnicity and veterans’ health using a nationally representative sample, Teachman (2011) used the 1979 National Longitudinal Survey of Youth to compare 40 year-old men in 1998–2004 who took the physical examination required to join the military and passed but did not enlist with those who passed and subsequently enlisted in the military, because the two groups had similar levels of baseline physical health. Teachman found that veterans had worse self-reported physical health relative to nonveterans, even after controlling for income, marital status, smoking, alcohol use, and body mass index. However, Teachman found little difference between Blacks and Whites in reaction to military service (i.e., whether they served on active duty or in the reserves). Teachman (2011: 333) concludes: “The results failed to provide any support for the notion that there is a race differential in the link between military service and subsequent health. Blacks and Whites are indistinguishable in their reaction to military service, at least in terms of self-reported health.” However, Teachman’s primary objective was to analyze health differentials between veterans and nonveterans rather than to compare race/ethnic differences within the veteran population. Moreover, the fact that the health of relatively young Blacks and Whites were not differentially influenced by military service does not mean that there are not wide race/ethnic differences in the health of veterans, given the broader structuring of race/ethnic health differences in the United States (Williams and Sternthal 2010). We build on this recent study by specifically focusing on racial/ethnic differences in health and disability among veterans, and by including Hispanics in the analysis rather than just comparing Blacks and Whites. Finally, we assess whether specific military experience factors explain any observed race/ethnic differences in reported veteran health above and beyond other important potential explanations.

## Hypotheses

There are three reasons to think that race/ethnic differences in veteran health will be modest. First, the military was one of the first American institutions to desegregate, and since then has attempted to foster a climate of equal opportunity (Burk and Espinoza 2012). Indeed, prior research highlights favorable marital profiles, occupational satisfaction, and socioeconomic status for minorities who serve in the military compared to their nonveteran peers (Angrist 1995; Lundquist 2004; Lundquist 2008; MacLean and Elder Jr. 2007; Noonan and Mumola 2007; Phillips et al. 1992; Teachman and Tedrow 2007). Second, individuals are selected into the military based upon good health and other positive characteristics (Teachman 2011). Consequently, one might anticipate only modest variation in veteran health between Blacks, Hispanics, and Whites because of this selection process. For example, Black/White disparities in women's birth outcomes are significantly less pronounced among those in the military compared to civilians (Barfield et al. 1996). Indeed, those who enter the military must pass a baseline physical examination and withstand the physical rigors of boot camp, indicating that the health of all individuals at one point of time is reasonably comparable (Teachman 2011). Third, previous research finds that White military recruits who select into the military are relatively less qualified compared to Whites who do not enlist (as measured by high school GPA and mother's education), whereas Black recruits are more qualified relative to Blacks who do not enlist (as measured by high school GPA) (Teachman et al. 1993).

On the other hand, and as discussed in detail above, it is well known that Black and Hispanic men tend to report much worse health and higher levels of disability than their White counterparts in the general U.S. population. Given such extraordinary minority group disadvantages throughout the entire life course, a relatively equitable military context for a brief period in early adulthood is unlikely to eliminate race/ethnic differences in health that may have begun in utero and continue long after individuals exit the military. Overall, then, there are some reasons to think that we will find only modest race/ethnic differences in veteran health. But more likely, due to the substantial life course disadvantages for minority group members outside the military, we expect to find sizable race/ethnic differences in veterans' health and disability. As such, we assert the following hypothesis to structure the beginning of our analysis:

*Hypothesis #1:* Minority veterans will report worse health and higher levels of disability than their White counterparts.

Race/ethnic differences in the socioeconomic resources of military veterans may in part explain the health disparities across groups. As discussed above, in the general U.S. population, Black and Hispanic men have lower levels of schooling, earn less income, and have much less wealth than comparably aged Whites. Despite the research showing that Black and Hispanic veterans have higher incomes than their non-military peers, they still have lower incomes compared to White veterans (Phillips et al. 1992; Teachman and Call 1996). Black veterans also have lower levels of education than White veterans (Teachman and Call 1996). Moreover, educational and financial resources are crucial for health; they can be used flexibly in the face of an array of health challenges (Link and Phelan 1995).

Therefore, controlling for these differences in socioeconomic status should result in narrower health and disability differences across race/ethnic groups:

*Hypothesis #2:* Minority veterans will have lower levels of income and education than White veterans. Controlling for these socioeconomic factors will narrow race/ethnic differences in veterans' reported health.

Behavioral factors may also be associated with race/ethnic differences in veterans' health. Even more so than among nonveterans, smoking has taken a major toll on the health of veterans (Bedard and Deschênes 2006; Conway 1998); moreover, White servicemen are more likely to smoke than Black servicemen (Chisick, Poindexter, and York 1998). Chisick, Poindexter, and York (1998) found that White male recruits are four times more likely to smoke than Black recruits. On active service duty, Whites are twice as likely to smoke compared to Blacks. Because of the well-known negative health consequences of smoking, the substantial gap in smoking behaviors between Whites and other racial/ethnic groups could minimize the health advantages of White veterans:

*Hypothesis #3:* Race/ethnic differences in veterans' reported health and disability will be influenced by the elevated level of smoking among White veterans compared to minority veterans. Given the higher level of smoking among White veterans, controlling for smoking behavior will widen race/ethnic differences in their reported health.

Because the military is such a unique occupational context, it is also critical to assess the extent to which any race/ethnic differences in veteran health are influenced by military experiences. From recruitment to retirement, minorities in the military may have different opportunities and challenges than do Whites. Blacks and Hispanics may also view the military differently than do Whites — and enlist for different reasons (Mare and Winship 1984; Teachman et al. 1993). Indeed, enlistment by branch differs by race/ethnic group, with Blacks disproportionately serving in the Army and more recently Hispanics disproportionately enlisting in the Marines (Burk and Espinoza 2012). Recent research has indicated that post-traumatic stress disorder (PTSD) among Iraq and Afghanistan veterans may vary by branch of service, with those in the Army and Marines having much higher levels compared to those who served in the Navy (Baker et al. 2009). Because Blacks and Hispanics disproportionately serve in the Army and Marines, controlling for branch of service may help to explain health differences.

Previous research has also illustrated that Black and Hispanic Vietnam veterans reported higher levels of PTSD than did Whites (Penk et al. 1989), which may be due in part to their higher levels of combat exposure relative to Whites (Dohrenwend et al. 2008). More recently, Blacks and Hispanics have been disproportionately evacuated from Iraq and Afghanistan for psychiatric reasons compared to all who served (Rundell 2006). However, the extent to which specific aspects of military service influence race/ethnic differences in veteran health remains an open question.

Moreover, the U.S. military context, while promoting equity across race/ethnic groups, is not devoid of biases and institutionalized discrimination. A recent systematic review, in fact, strongly indicates that there are biases and discrimination in several areas of military

practice (Burk and Espinoza 2012). Burk and Espinoza (2012) discuss how minorities in the military are underrepresented among the officer corps, have higher incarceration rates, are at greater risk for PTSD, and may face more barriers to Veteran's Administration (VA) health care than Whites (see also Washington et al. 2002). Previous research has also illustrated increasing mortality disparities between officers and enlisted men, with officers now living 3–4 years longer than enlisted men (Edwards 2008). Thus, the military is not entirely devoid of institutionalized discrimination, nor is it immune from health disparities. Due to the disadvantages faced by minorities in the military context, we offer the following hypothesis:

*Hypothesis #4:* Controlling for differential military experiences (i.e. branch of service, duration of service, age of entry, and exposure to toxins and combat) will narrow the association between race/ethnicity and reported health above and beyond controls for socioeconomic status and smoking.

## Data and Methods

### Data

Data were drawn from the 2010 National Survey of Veterans (henceforth NSV). The 2010 NSV was commissioned by the U.S. Department of Veterans Affairs to better understand the demands of an increasingly diverse veteran population and guide the allocation of resources and services for veterans (Department of Veteran Affairs 2010). Several unique populations were surveyed: veterans, active duty service members, active duty spouses, veteran spouses, and surviving spouses. For the purpose of this analysis, we focused exclusively on the veteran survey. The survey was mailed to a national sample of veterans between fall of 2009 and spring of 2010, netting a response rate of 61%. The NSV had three major strengths. First, when the sampling weights were used, the results are generalizable to all veterans. The second was that, unlike other data sources used to analyze veteran health, it contains detailed variables regarding the military service experiences of each respondent. A third strength was the large sample size (N=8,710).

Starting with the initial sample of 8,710, we excluded those without a valid birth year (n=206). Due to their small numbers in the NSV we also excluded women and the few respondents with missing information on gender (n=597). For an overview of the health of military women, please see Hoiberg and White (1992). We also dropped those in the sample who were under age 30 or age 85 and over (n=726), as well as those who reported serving in periods before World War II (n=3). However, we also ran models with the age extremes in our samples and our substantive results remained the same. Finally, we dropped those who did not report their self-rated health (n=95) or race (n=85). Our final analytic sample included 6,998 male veterans aged 30 through 84.

### Measures

Veterans were asked to indicate each race group that they identified with and then in an additional question were asked if they were Hispanic. We used this information to specify four racial/ethnic groups: non-Hispanic Blacks, Hispanics, Non-Hispanic Whites (referent), and Non-Hispanic others. Veterans who were not Hispanic and who identified as multiple race, Asian American, or Native American were included in the other race category. We

included this heterogeneous group of “others” in the analytic sample to keep all male veterans in the analysis; unfortunately, there were too few Asian or Native American veterans to separately consider in the models we estimate.

Our multivariable analysis included measures of age, socioeconomic status, smoking, and military experience. All of our multivariable models controlled for age measured as a continuous variable. We also tested whether an age-squared term improved the fit of the models; however, it was not significant in the full models so was excluded from the final analysis. To measure socioeconomic status, we included annual household income, with dummy variables for: (1) \$0–\$34,999 (reference), (2) \$35,000–\$74,999, and (3) \$75,000+. We coded education as a categorical variable with: (1) those who did not graduate high school (reference category), (2) high school graduates, (3) some college, (4) college graduates, and (5) professional degree or higher. Marital status at the time of the survey is also measured as a categorical variable: (1) married and civil unions (reference category), (2) divorced or separated, (3) widowed, and (4) never married. We also included a set of smoking dummy variables coded as: (1) never smoker (reference category), (2) former smoker, (3) current someday smoker, (4) and current every day smoker. Former smokers reported smoking over 100 cigarettes in their lifetime but not currently smoking, whereas current smokers are differentiated by whether they reported smoking every day or only on some days. Never smokers were those who reported smoking fewer than 100 cigarettes in their lifetime. Unfortunately the NSV did not have any other health behavior variables (for example, it lacked data on alcohol use and exercise). However, smoking is critically important for veteran health and potentially for understanding race/ethnic differences in veteran health (Chisick, Poindexter, and York 1998).

As discussed above, one of the major strengths of the NSV was the information regarding military service, allowing us to assess whether different military experiences help to explain race/ethnic differences in veteran health. Because those who enter the military at different ages may differ in terms of their career goals for the military and other educational or economic opportunities, we included a set of dummy variables to indicate age at entry: (1) 20 or below (reference category), (2) 21 to 24, and (3) 25+. We ran additional models with age of entry as a continuous variable and the substantive results remained the same. We included military service branch as the following set of dummy variables: (1) Army (reference category), (2) Navy, (3) Marines, (4) Air Force, and (5) other/multiple branches served. To control for length of service, we included a set of dummy variables for years served in the military: (1) 0–4 years (reference category), (2) 5–19 years, and (3) 20+ years. Once again, we estimated models with length of service as a continuous variable and the results were extremely similar. Engaging in combat and serving in a war zone can be particularly deleterious for health and we therefore used dummy variables to control for exposure to violence and war in the military context. The first dummy variable indicates whether or not each person reported serving in a combat or war zone (1 = served in combat, 0 if otherwise); the second indicates whether or not each veteran was ever directly exposed to death, dying, or wounded soldiers (1 = exposed to death, 0 if otherwise). We also included a set of dummy variables to measure self-reported exposure to environmental toxins or hazards such as Agent Orange, chemical warfare agents, ionizing radiation or other substances during service, coded as: (1) definitely or probably exposed (reference group);

(2) probably not exposed; (3) definitely not exposed; and (4) unsure. Finally, we controlled for the most recent period of service as a set of dummy variables: (1) WWII up to Vietnam (reference category), (2) Vietnam, and (3) post-Vietnam.

To operationalize health, we used self-rated health (henceforth SRH) and limitations in Activities of Daily Living (henceforth ADLs). SRH is a five-point scale where low values indicate better self-rated health and higher values indicate poorer health (1 = Excellent, 2 = Very Good, 3 = Good, 4 = Fair, 5 = Poor). SRH has been used to assess global personal health since the late 1950s (Suchman, Phillips, and Streib 1958) due to its remarkable power in predicting mortality (Idler and Benyamini 1997; Jylhä 2009), both for the overall population and for race/ethnic subgroups (McGee et al. 1999). We dichotomized SRH as “1” if the respondent indicated that their health was “Fair” or “Poor”, and “0” if they indicated their health was good or better (below, we justify why we could not use the 5-point scale). Our measure of disability included whether or not each respondent had any difficulties with ADLs. Respondents were asked if they needed assistance due to a health condition with bathing, eating, transferring from a bed or chair, using a toilet, walking around the home, or getting dressed. If the respondent indicated needing assistance or being unable to do any of the listed activities due to a health condition, they were coded “1”; if they reported not needing assistance with any of the activities, they were coded “0.” Generally there was little missing data. For example the variable with the highest amount of missing values, total household income, was missing less than 6% of responses. The values that were missing were handled with multiple imputation. Multiple imputation of missing values on the explanatory variables was conducted using the *-mi-*command suite in *Stata/SE 12*.

### Analytic Strategy

We began the analysis with descriptive statistics for all of our variables, calculated both for all veterans as well as separately for each race/ethnic group. After we documented differences in health, age, socioeconomic status, smoking behavior, and military exposures by race/ethnic group, we turned to the multivariable analysis. The first set of models used logistic regression to predict the odds of fair/poor (henceforth “poor health”) SRH relative to the other categories. We also fit the models using ordered logistic regression that used all categories of SRH (the substantive results were the same), but the parallel lines assumption was violated as indicated by a Brant test, which made logistic regression models the appropriate statistical modeling technique (Hoffman 2004). The second set of models predicted the odds of any/no ADLs using logistic regression models.

To test our hypotheses for SRH and ADLs, we used the same progressive adjustment strategy. Initially, we only controlled for age to estimate a baseline model of race/ethnic differences in SRH and ADLs, respectively. Second, we controlled for socioeconomic status as measured by household income, educational attainment, and marital status to best understand the extent to which race/ethnic differences in veteran health are explained by socioeconomic variables. Third, we controlled for smoking history and current status to assess whether race/ethnic differences in health are explained by smoking. Finally, we controlled for military experience factors: age of entry, branch of service, duration of service, most recent period of service, and whether or not veterans reported having served in



an active war zone, were ever exposed to death, or were exposed to environmental/chemical hazards.

## Results

Table One presents the descriptive statistics for all the variables we use for all of the veterans and also separately by race/ethnic group. In terms of race/ethnic composition of the NSV, Whites form the majority (82.2%), followed by Blacks (9.9%), Hispanics (4.2%), and others (3.5%). Blacks, Hispanics, and the other race/ethnic group have less favorable distributions of income and education than Whites. This is particularly true of Blacks, who have a significantly lower income distribution than Whites. Hispanics have the highest level of never smoking (46.1%), whereas Whites have the highest levels of past smoking (49.0%) and other race/ethnic groups have the highest levels of current everyday smoking (24.9%).

Briefly highlighting key race/ethnic differences in the military experience variables, it is clear that Blacks disproportionately served in the Army (52.8%) and were more likely to enlist at age 20 or younger compared with Whites. Minority veterans generally served longer than White veterans and were significantly more likely to be exposed to active war zones and death than White veterans. Black, Hispanic, and other race veterans also report being more likely to be exposed to environmental hazards than White veterans. Finally, each of the minority group veterans were more likely to have served in the Post-Vietnam era and less likely to have served in the pre-Vietnam era compared with White veterans.

There are also substantial health differences. Overall, 27.7% of veterans report poor health. However, the level of poor health varies significantly by race/ethnicity: 44.1% of Blacks report poor health compared to only 25.4% of Whites. For ADLs, 7.2% of all veterans reported needing assistance with one or more ADLs, and once again Blacks have a significantly higher level (13.3%) than Whites (6.3%). Hispanics are the most similar in terms of health compared to Whites in this descriptive table; however, the average age of Hispanic veterans (56.0) is also far younger than that of Whites (62.8).

Table 2 depicts the odds ratios from four logistic regression models predicting poor SRH among NSV veterans. Model 1 controls for age to establish a baseline estimate of the race/ethnic differences in health. In Model 1, the NSV minority veterans are markedly disadvantaged in terms of health compared to White veterans. Black veterans have 2.53 times higher odds of reporting fair/poor health than their White veteran peers. The difference is smaller for Hispanic veterans, who have 1.58 times higher odds of reporting fair/poor health than Whites. The other race/ethnic group has 1.73 times greater odds of reporting poor health than Whites. Congruent with Hypothesis #1, all of the odds ratios for race/ethnic minority groups depict statistically significantly worse SRH than Whites, net of age.

The second model adds socioeconomic factors. We find that while the race/ethnic disparities are reduced, they are not eliminated. For Blacks, the odds ratio of poor health is reduced, but Blacks still have 2.13 times higher odds of reporting poor health than do Whites. Net of socioeconomic factors and age, Hispanics still have 1.37 times higher odds of poor health

than Whites. The other race/ethnic group still has 1.74 times higher odds of reporting poor health than Whites, net of socioeconomic status. Therefore, we find evidence supportive of Hypothesis #2: that socioeconomic factors partially account for race/ethnic differences in veteran health. In turn, Model 2 also shows that higher levels of income and education are associated with lower odds of poor health.

In addition to age and socioeconomic status, Model 3 controls for smoking. Even net of age, socioeconomic status, and smoking behavior, each of the minority groups exhibits significantly higher odds of poor health than Whites. Blacks and the other race/ethnic groups' odds ratios remain very similar to the previous model. However, controlling for smoking results in Hispanics having even higher odds (1.47) of poor health relative to Whites than in the previous model (1.37). As illustrated in the descriptive statistics, Hispanics have lower levels of lifetime and current smoking than do Whites. Thus, controlling for smoking eliminates one way Hispanics were advantaged compared to Whites, thus making the health disparity between Hispanics and Whites larger. Thus, we find partial support for Hypothesis #3, at least for Hispanics. Predictably, smoking is strongly associated with poor SRH.

In the final model, we additionally control for military service factors. We find that the race/ethnic disparities in health are reduced, but not eliminated, with their inclusion. For Blacks the odds of reporting poor health are reduced to 1.91 times that of Whites when military factors are controlled. Hispanics have 1.33 times higher odds of reporting poor health than Whites and the other race/ethnic group has 1.55 times higher odds of reporting poor health than Whites in the context of Model 4. We also find that men who served in the Army, who served for longer periods, who were exposed to death and environmental hazards while serving, and who served in the Vietnam era are most likely to report poor health than their counterparts. In sum, we find evidence supportive of Hypothesis #4: that military factors partially account for race/ethnic differences in veteran health above and beyond age, socioeconomic, and behavioral factors.

Table 3 shows the results for models predicting race/ethnic differences in the odds of reporting one or more ADLs, using an identical structure of progressively adjusted models as was used above for self-rated health. Model 1 shows that, net of age differences, Black veterans have 2.57 times higher odds, Hispanics have 1.77 times higher odds, and those in the other/race ethnic category have almost twice the odds of White veterans of reporting one or more ADLs. In Model 2, we control for socioeconomic factors and find that the disparity in ADLs between Blacks and Whites is reduced from 2.57 to 2.16 and the Hispanic/White difference in ADLs is reduced to 1.56. This provides further support for Hypothesis #2: socioeconomic differences are in part related to the minority-White veteran health differences. Model 3 controls for smoking behavior and finds little change in the race/ethnic differences in the odds of ADLs. Finally, Model 4 shows that net of age, socioeconomic factors, smoking, and military experience factors, Blacks have 1.78 times higher odds and the other race/ethnic group has 1.49 times higher odds of reporting one or more ADLs than Whites. The Hispanic/White difference becomes insignificant with the inclusion of military variables. At the same time, the race/ethnic differences in ADLs in Model 4 are reduced in comparison to the earlier models, again illustrating support for Hypothesis #4 that

differential military experience factors across groups helps to explain race/ethnic disparities in veteran health.

## Discussion

Veterans are a large and diverse population exposed to unique occupational hazards that warrant special attention—especially in relation to health. Our analysis uncovered significant race/ethnic differences in self-rated health and activities of daily living among male veterans aged 30–84 using a nationally representative data set. Even when we statistically control for differentials in age composition, socioeconomic status, smoking, and military experiences, Black, Hispanic, and other race veterans are still significantly more likely to exhibit poor/fair self-rated health than White veterans. Our results for ADLs largely echoed those for SRH, further bolstering the idea that racial/ethnic minority veterans, and particularly Blacks, are in poorer health compared to their White veteran counterparts. While military participation has been shown to be beneficial in terms of income, marital status, and occupational satisfaction for minorities compared to their peers who do not serve, minority veterans are clearly disadvantaged with regard to self-rated health and disability in comparison to White veterans. This is in spite of the fact that the health of all veterans is relatively comparable across race/ethnic groups as individuals enter the military (Teachman 2011).

What is causing such wide race/ethnic disparities in veteran health and disability status? Congruent with Hypothesis #2, we found that differences in socioeconomic status partially explain race/ethnic disparities in self-rated health and disability. These findings are also compatible with previous research that has documented inequalities in health among veterans based on income (Edwards 2008) and rank (MacLean and Edwards 2010). Thus, it is important to recognize and acknowledge that resource inequalities across subgroups of veterans may need to be addressed before health inequalities are eliminated. Therefore, one way to potentially reduce such differences in veteran health is to minimize socioeconomic inequalities (e.g., occupational status and income) following military service (Edwards 2008; MacLean and Edwards 2010). We also found limited support for Hypothesis #3, that the race/ethnic disparities would be widened with the inclusion of smoking. In particular we found that some of the disparities were widened with the inclusion of smoking, particularly when comparing Hispanics with Whites. This is consistent with recent research that has shown that part of the reason for the Hispanic mortality advantage relative to Whites in the United States is due to Hispanics' lower level of smoking (Lariscy, Hummer, and Hayward 2015).

Perhaps most important, we found support for Hypothesis #4; that is, differences in military experience factors by race/ethnicity accounted for a portion of the veteran health disparities across groups. The disparities were reduced with controls for military factors above and beyond the conventional socioeconomic and behavioral controls. More specifically, race/ethnic disparities were somewhat explained by military experience factors such as age at enlistment, branch of service, duration served, and exposure to war, death, and environmental toxins. The reductions could be due to each minority group having a higher likelihood of reporting exposure to combat and toxins and being more likely to serve in the

Army than Whites. Again, though, the large race/ethnic differences in veterans' health we documented were only partially reduced with controls for military experience factors, indicating that factors outside the military are likely in large part responsible for the veteran health disparities we documented. Nonetheless, our results suggest that one potential way that race/ethnic disparities in veteran health could be reduced is through assurance that racial/ethnic groups are equally represented in branches of service and with regard to hazardous exposures like active combat.

Due to the limitations of our cross-sectional data set, we can only speculate regarding additional mechanisms that may be responsible for the minority veteran health disadvantages. The differences in reported veteran health net of military service experiences and basic socioeconomic and smoking status variables are most likely a result of life course processes of advantage and disadvantage operating in the civilian segment of society. For example, civilian disadvantages from in utero to adolescence affect the health of Blacks, Hispanics, and other minority race/ethnic groups as they progress through the life course (Ben-Shlomo and Kuh 2002). If poorer childhood conditions among race/ethnic minority groups are at least part of the reason for race/ethnic disparities in veteran health, then equitable treatment in the military may occur too late in the life course to prevent health disparities from unfolding. Unfortunately, we had no variables regarding childhood conditions to explore this potential cause. Similarly, life course processes of advantage and disadvantage following military service – such as residential segregation, differential levels of incarceration, and differential access to quality health care – could be responsible for a portion of race/ethnic differences in veteran health that we could not account for. Again, though, our data sets were limited to a narrow set of military, socioeconomic, and smoking status explanatory variables. Additionally, because self-reported health and activities of daily living are subjective measures of health, the race/ethnic differences could be also due to different processes of self-evaluation of health among minority veterans compared to Whites.

There are some other important limitations to this investigation that readers should consider. Most importantly, the data we used were cross sectional, giving us only a snapshot of incredibly complex and lifelong stratification processes. However, we are unaware of any longitudinal surveys of health that have sizable numbers of minority veterans that are generalizable to the entire veteran population and contain such detailed covariates regarding military experience. Second, while we attempted to reduce the impact of differential mortality selection by cutting the sample at 84 years of age, it is still likely causing us to underestimate the true race/ethnic disparities in health, at least between Blacks and Whites. Third, we are also missing important variables that have been associated with veteran health. For example, the NSV did not include data on highest achieved rank. Officers have better health and live longer than their lower ranking non-officer peers (Edwards 2008; MacLean and Edwards 2010). We attempted to minimize this by including time served, educational attainment, and age of enlistment. Next, we did not have any other behavioral variables aside from smoking. Future research should explore if the race/ethnic differences in health can be further explained by additional behavioral variables such as drinking or exercise. We also only analyzed veterans who reported being honorably discharged. Although over 90% of all veterans are honorably discharged, this limitation may be important to consider.

Indeed, minorities face more challenges in the military judicial system than Whites (Burk and Espinoza 2012). However, it remains unclear if minorities are disproportionately dishonorably discharged; therefore we are unsure how excluding those who are dishonorably discharged influences our findings.

Future research should seek to further understand the causes of race/ethnic differences in veteran health. This work should pay specific attention to the early life origins of disparities as well as differences that arise in the transition from military life to civilian life. Indeed, this area of research seems particularly ripe for longitudinal data and analysis and use of retrospective measures regarding childhood conditions. Future research should also explore race/ethnic differences in mental health among Veterans. Physical and mental health are often linked and there is evidence that minorities may face higher burdens of combat related stressors. Additionally, future research should compare race/ethnic differences in health in the veteran population to a comparable nonveteran population. We further recommend that researchers investigate race/ethnic differences in the health of female veterans and soldiers on active duty, groups not covered in this analysis.

Our results strongly suggest that the health status of minority veterans is substantially worse than their White veteran counterparts. It is unfortunate and unjust that minority subgroups of the veteran population suffer from poorer health than their White peers. While the Veteran's Administration has invested considerable resources in minimizing the disparities, just as in the civilian population, there is much more work to be done to achieve health equity across groups. The country must do what it can to minimize race/ethnic health disparities and best ensure that all veterans live the healthiest lives that are possible following their enormous sacrifices on behalf of the rest of us.

## Acknowledgements

We thank three anonymous reviewers, the University of Texas Population Research Center (grant R24 HD42849) for administrative and computing support; the NICHD Ruth L. Kirschstein National Research Service Award (T32 HD007081-35) for training support; the Department of Veterans Affairs for making the data available to the public; and Drs. Pam Paxton and Debra Umberson for their helpful comments. Earlier versions of this paper were presented at the Southern Demographic Association 2012 annual meeting in Williamsburg, Virginia and the Population Association of America 2013 annual meeting in New Orleans. The contents of this manuscript are solely the responsibility of the authors and do not necessarily represent the official views of NICHD, IC2, the Department of Veterans Affairs, or the University of Texas at Austin.

## REFERENCES

- Angrist J. Estimating the labor market impact of voluntary military service using social security data on military applicants (No. w5192). National Bureau of Economic Research. 1995
- Arias, E. United States life tables by Hispanic origin. Washington, DC: National Center for Health Statistics; 2010.
- Baker DG, Heppner P, Afari N, Nunnink S, Kilmer M, Simmons A, Bosse B. Trauma exposure, branch of service, and physical injury in relation to mental health among US veterans returning from Iraq and Afghanistan. *Military Medicine*. 2009; 174(8):733–778.
- Barfield W, Wise P, Rust F, Rust K, Gould J, Gortmaker S. Racial disparities in outcomes of military and civilian births in California. *Archives of Pediatrics & Adolescent Medicine*. 1996; 150(10): 1062–1067. [PubMed: 8859139]
- Bedard K, Deschênes O. The long-term impact of military service on health: Evidence from World War II and Korean War veterans. *The American Economic Review*. 2006; 96(1):176–194.

- Ben-Shlomo Y, Kuh D. A life course approach to chronic disease epidemiology: conceptual models, empirical challenges and interdisciplinary perspectives. *International Journal of Epidemiology*. 2002; 31(2):285–293. [PubMed: 11980781]
- Braveman P, Cubbin C, Egerter S, Williams D, Pamuk E. Socioeconomic disparities in health in the United States: what the patterns tell us. *American Journal of Public Health*. 2010; 100(S1):S186–S196. [PubMed: 20147693]
- Burk J, Espinoza E. Race relations within the US military. *Annual Review of Sociology*. 2012; 38:401–422.
- Chisick M, Poindexter F, York A. Comparing tobacco use among incoming recruits and military personnel on active duty in the United States. *Tobacco Control*. 1998; 7(3):236–240. [PubMed: 9825417]
- Cho Y, Frisbie W, Hummer R, Rogers R. Nativity, duration of residence, and the health of Hispanic adults in the United States. *International Migration Review*. 2004; 38(1):184–211.
- Conway T. Tobacco use and the United States military: a longstanding problem. *Tobacco Control*. 1998; 7(3):219–221. [PubMed: 9825407]
- Department of Veterans Affairs. National Survey of Veterans, Active Duty Service Members, Demobilized National Guard and Reserve Members, Family Members and Surviving Spouses: Final Report. Washington, DC: 2010.
- Department of Veterans Affairs. Minority Veterans: 2011. Prepared by the National Center for Veteran Analysis and Statistics. 2013. <[http://www.va.gov/VETDATA/docs/SpecialReports/Minority\\_Veterans\\_2011.pdf](http://www.va.gov/VETDATA/docs/SpecialReports/Minority_Veterans_2011.pdf)> (Retrieved 12/9/13)
- Dohrenwend B, Turner J, Turse N, Lewis-Fernandez R, Yager T. War-related posttraumatic stress disorder in Black, Hispanic, and majority White Vietnam veterans: The roles of exposure and vulnerability. *Journal of Traumatic Stress*. 2008; 21(2):133–141. [PubMed: 18404630]
- Edwards R. Widening health inequalities among US military retirees since 1974. *Social Science & Medicine*. 2008; 67(11):1657–1668. [PubMed: 18708275]
- Hayward MD, Heron M. Racial inequality in active life among adult Americans. *Demography*. 1999; 36(1):77–91. [PubMed: 10036594]
- Hayward M, Hummer R, Chiu C, Gonzalez-Gonzalez C, Wong R. Does the Hispanic Paradox in Mortality Extend to Disability? *Population Research and Policy Review*. 2014; 33:81–96. [PubMed: 25821283]
- Hoffmann, J. Generalized linear models: An applied approach. Boston: Pearson Education; 2004.
- Hoiberg A, White J. Health status of women in the armed forces. *Armed Forces & Society*. 1992; 18(4):514–533.
- Hummer R, Chinn J. Race/ethnicity and US adult mortality. *Du Bois Review: Social Science Research on Race*. 2011; 8(1):5–24. [PubMed: 21687782]
- Huyser K, Sakamoto A, Takei I. The persistence of racial disadvantage: The socioeconomic attainments of single-race and multi-race Native Americans. *Population Research and Policy Review*. 2010; 29(4):541–568.
- Huyser K, Takei I, Sakamoto A. Demographic Factors Associated with Poverty among American Indians and Alaska Natives. *Race and Social Problems*. 2014; 6(2):120–134.
- Idler E, Benyamini Y. Self-rated health and mortality: a review of twenty-seven community studies. *Journal of Health and Social Behavior*. 1997; 38(1):21–37. [PubMed: 9097506]
- Jylhä M. What is self-rated health and why does it predict mortality? Towards a unified conceptual model. *Social Science & Medicine*. 2009; 69(3):307–316. [PubMed: 19520474]
- Lariscy JT, Hummer RA, Hayward MD. Hispanic Older Adult Mortality in the United States: New Estimates and an Assessment of Factors Shaping the Hispanic Paradox. *Demography*. 2015; 52(1):1–14. [PubMed: 25550142]
- Link B, Phelan J. Social conditions as fundamental causes of disease. *Journal of Health and Social Behavior*. 1995; 35(1):80–94. [PubMed: 7560851]
- Lundquist J. When race makes no difference: Marriage and the military. *Social Forces*. 2004; 83(2):731–757.

- Lundquist J. Ethnic and gender satisfaction in the military: The effect of a meritocratic institution. *American Sociological Review*. 2008; 73(3):477–496.
- MacLean A, Edwards R. The pervasive role of rank in the health of US veterans. *Armed Forces & Society*. 2010; 36(5):765–785. [PubMed: 21113413]
- MacLean A, Elder G Jr. Military service in the life course. *Sociology*. 2007; 33(1):175–196.
- Mare R, Winship C. The paradox of lessening racial inequality and joblessness among black youth: Enrollment, enlistment, and employment, 1964–1981. *American Sociological Review*. 1984; 49(1):39–55.
- McGee D, Liao Y, Cao G, Cooper R. Self-reported health status and mortality in a multiethnic US cohort. *American Journal of Epidemiology*. 1999; 149(1):41–46. [PubMed: 9883792]
- Noonan, M.; Mumola, C. Veterans in state and federal prison. Bureau of Justice Statistics Special Report. 2007. Available at <http://www.bjs.gov/content/pub/pdf/vsfp04.pdf>. Cited 11/17/2014
- Penk W, Robinowitz R, Black J, Dolan M, Bell W, Dorsett D, Noriega L. Ethnicity: Post-Traumatic Stress Disorder (PTSD) differences among black, white, and Hispanic veterans who differ in degrees of exposure to combat in Vietnam. *Journal of Clinical Psychology*. 1989; 45(5):729–735. [PubMed: 2808728]
- Phillips R, Andrisani P, Daymont T, Gilroy C. The Economic Returns to Military Service-Race-Ethnic Differences. *Social Science Quarterly*. 1992; 73(2):340–359.
- Rundell J. Demographics of and diagnoses in Operation Enduring Freedom and Operation Iraqi Freedom personnel who were psychiatrically evacuated from the theater of operations. *General Hospital Psychiatry*. 2006; 28(4):352–356. [PubMed: 16814636]
- Shapiro, T.; Meschede, T.; Sullivan, L. The racial wealth gap increases fourfold. Waltham, MA: Institute on Assets and Social Policy, Brandeis University; 2010.
- Suchman E, Phillips B, Streib G. An analysis of the validity of health questionnaires. *Social Forces*. 1958; 36(3):223–232.
- Teachman J. Are veterans healthier? Military service and health at age 40 in the all-volunteer era. *Social Science Research*. 2011; 40(1):326–335.
- Teachman J, Tedrow L. Joining up: Did military service in the early all volunteer era affect subsequent civilian income? *Social Science Research*. 2007; 36(4):1447–1474.
- Teachman J, Call V. The effect of military service on educational, occupational, and income attainment. *Social Science Research*. 1996; 25(1):1–31.
- Teachman J, Call V, Segal M. The selectivity of military enlistment. *Journal of Political and Military Sociology*. 1993; 21(2):287–309.
- U.S. Office of Management and Budget. “Budget of the U.S. Government.”. 2012. edited by the White House. D.C
- Washington D, Harada N, Villa V, Damron-Rodriguez J, Dhanani S, Shon H, Makinodan T. Racial variations in Department of Veterans Affairs ambulatory care use and unmet health care needs. *Military medicine*. 2002; 167(3):235–241. [PubMed: 11901574]
- Western B, Pettit B. Black-White Wage Inequality, Employment Rates, and Incarceration I. *American Journal of Sociology*. 2005; 111(2):553–578.
- Williams D. The health of men: structured inequalities and opportunities. *American Journal of Public Health*. 2003; 93(5):724–731. [PubMed: 12721133]
- Williams D, Sternthal M. Understanding racial-ethnic disparities in health sociological contributions. *Journal of Health and Social Behavior*. 2010; 51(S1):S15–S27. [PubMed: 20943580]
- Williams D. Race, socioeconomic status, and health the added effects of racism and discrimination. *Annals of the New York Academy of Sciences*. 1999; 896(1):173–188. [PubMed: 10681897]

Table 1  
Descriptive Statistics for Demographic, Socioeconomic, Health Behavior, and Health Variables, Male Veterans, Ages 30–84, 2010

	NYS Veterans 6,998 (100%)	Non-Hispanic Black 434 (9.9%)	Hispanic 281 (4.2%)	Other Race 250 (3.5%)	Non-Hispanic White 6,033 (82.2%)
<b>Age</b>	61.7	56.0 <sup>b</sup>	56.0 <sup>b</sup>	59.2 <sup>b</sup>	62.8
<b>Household Income<sup>c</sup></b>					
\$0 – \$34,999 (Ref)	32.1%	48.4%	38.4%	34.7%	29.7%
\$35,000 – \$74,999	38.9%	33.5%	34.4%	35.2%	39.9%
\$75,000+	29.1%	18.1%	27.2%	30.2%	30.4%
<b>Educational Attainment<sup>c</sup></b>					
Less than High School Degree (Ref)	4.9%	2.0%	6.1%	4.2%	5.2%
High School Degree	26.8%	29.0%	22.0%	21.4%	27.0%
Some College	29.5%	39.6%	36.2%	35.7%	27.7%
College Degree	26.9%	23.8%	27.2%	27.3%	27.2%
Professional Degree	12.0%	5.6%	8.5%	11.5%	12.9%
<b>Marital Status<sup>c</sup></b>					
Married (Ref)	74.5%	59.5%	70.9%	68.8%	76.8%
Divorced	14.4%	25.4%	17.3%	21.0%	12.6%
Widowed	4.7%	3.6%	3.1%	2.8%	4.9%
Never Married	6.4%	11.6%	8.8%	7.5%	5.6%
<b>Smoking<sup>c</sup></b>					
Never Smoker (Ref)	34.0%	34.3%	46.1%	39.4%	33.1%
Past Smoker	46.0%	30.1%	36.2%	31.9%	49.0%
Current Sometday Smoker	5.0%	12.0%	8.1%	3.8%	4.1%
Current Everyday Smoker	15.0%	23.7%	9.6%	24.9%	13.8%
<b>Age of Entry<sup>c</sup></b>					
20 and Below (Ref)	64.2%	68.4%	64.3%	65.3%	63.6%
21 to 24	29.8%	25.3%	25.4%	28.6%	30.6%
25+	6.0%	6.3%	10.4%	6.1%	5.8%
<b>Branch of Service<sup>c</sup></b>					



	NVS Veterans <b>6,998 (100%)</b>	Non-Hispanic Black <b>434 (9.9%)<sup>a</sup></b>	Hispanic <b>281 (4.2%)<sup>a</sup></b>	Other Race <b>250 (3.5%)<sup>a</sup></b>	Non-Hispanic White <b>6,033 (82.2%)<sup>a</sup></b>
Army (Ref)	46.1%	52.8%	51.1%	35.9%	45.4%
Navy	21.7%	11.8%	15.4%	26.2%	23.0%
Marines	9.6%	12.6%	16.8%	10.8%	8.8%
Air Force	18.8%	17.3%	13.5%	18.7%	19.3%
Other/Multiple Branches	3.9%	5.6%	3.2%	8.3%	3.5%
<b>Duration of Service<sup>c</sup></b>					
0 to 4 (Ref)	70.8%	54.1%	64.5%	63.1%	73.5%
5 to 19 years	20.0%	30.3%	24.3%	22.4%	18.4%
20+ years	9.2%	15.6%	11.1%	14.5%	8.1%
<b>Combat Experiences</b>					
Served in combat/war zone (yes)	32.1%	36.0% <sup>b</sup>	38.8% <sup>b</sup>	42.0% <sup>b</sup>	30.9%
Exposed to death/trauma (yes)	32.4%	37.5% <sup>b</sup>	41.5% <sup>b</sup>	39.3% <sup>b</sup>	31.0%
<b>Environmental Hazards<sup>c</sup></b>					
Definitely/probably exposed (Ref)	25.3%	32.5%	32.2%	38.7%	23.5%
Probably not exposed	26.4%	21.2%	21.4%	22.6%	27.5%
Definitely not exposed	28.7%	24.1%	25.0%	16.8%	30.0%
Unsure	19.6%	22.1%	21.4%	21.9%	19.1%
<b>Most Recent Period of Service<sup>c</sup></b>					
WWII-Vietnam (Ref)	29.2%	13.8%	15.9%	20.5%	32.1%
Vietnam	32.6%	24.4%	31.0%	30.1%	33.8%
Post-Vietnam	38.1%	61.8%	53.1%	49.4%	34.0%
<b>Reported Health</b>					
Fair/Poor	27.7%	44.1% <sup>b</sup>	30.6% <sup>b</sup>	33.1% <sup>b</sup>	25.4%
Limitation in One or More Activities of Daily Living	7.2%	13.3% <sup>b</sup>	8.2% <sup>b</sup>	10.7% <sup>b</sup>	6.3%

Source: *National Survey of Veterans, 2010*

<sup>a</sup> Weighted Percentage

<sup>b</sup> significantly (p < .05) different from Whites as measured by a t-test

<sup>c</sup> significant (p < .05) chi-squared between noted variable and race/ethnicity

Note: Missing data were handled by STATA's multiple imputation suite.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

**Table 2**

Odds Ratios From Logistic Regression Models Predicting "Fair" or "Poor" Self-Rated Health Among Males Veterans Ages 30–84 (N=6,998), 2010

	<u>Model 1</u>	<u>Model 2</u>	<u>Model 3</u>	<u>Model 4</u>
<b>Race/Ethnicity</b>				
White (Ref)				
Black	2.53 ***	2.13 ***	2.12 ***	1.91 ***
Hispanic	1.58 **	1.37 *	1.47 **	1.33 *
Other Race	1.73 ***	1.74 ***	1.71 ***	1.55 **
<b>Age</b>	1.02 ***	1.01 ***	1.02 ***	1.03 ***
<b>Household Income</b>				
\$0 – \$34,999 (Ref)				
\$35,000 – \$74,999		0.62 ***	0.64 ***	0.62 ***
\$75,000+		0.30 ***	0.32 ***	0.31 ***
<b>Educational Attainment</b>				
Less than High School Degree (Ref)				
High School Degree		0.54 ***	0.56 ***	0.58 ***
Some College		0.46 ***	0.48 ***	0.48 ***
College Degree		0.31 ***	0.35 ***	0.34 ***
Professional Degree		0.25 ***	0.30 ***	0.31 ***
<b>Marital Status</b>				
Married (Ref)				
Divorced		1.20 *	1.11	1.06
Widowed		0.92	0.88	0.93
Never Married		0.99	0.97	1.11
<b>Smoking</b>				
Never Smoker (Ref)				
Past Smoker			1.37 ***	1.27 **
Current Someday Smoker			2.13 ***	1.87 ***
Current Everyday Smoker			2.40 ***	2.18 ***
<b>Age of Entry</b>				
20 and Below (Ref)				
21 to 24				0.78 ***
25+				1.08
<b>Branch of Service</b>				
Army (Ref)				
Navy				0.73 ***
Marines				0.96
Air Force				0.88

	<u>Model 1</u>	<u>Model 2</u>	<u>Model 3</u>	<u>Model 4</u>
Other/Multiple Branches				0.85
<b>Duration of Service</b>				
0 to 4 (Ref)				
5 to 19 years				1.16 †
20+ years				1.29 *
<b>Combat Experiences</b>				
Served in combat/war zone				0.89
Exposed to death				1.39 ***
<b>Environmental Hazards</b>				
Definitely/probably exposed (Ref)				
Probably not exposed				0.51 ***
Definitely not exposed				0.42 ***
Unsure				0.68 ***
<b>Most Recent Period of Service</b>				
WWII-Vietnam (Ref)				
Vietnam				1.19 †
Post-Vietnam				0.93

† p < 0.1

\* p < 0.05

\*\* p < 0.01

\*\*\* p < 0.001

Source: *National Survey of Veterans, 2010*

Model 1 controls only for Age. Model 2 controls for Age and SES. Model 3 controls for Age, SES, and Smoking.

Model 4 controls for Age, SES, Smoking, and Military Factors.

Note: Missing data were handled by STATA's multiple imputation suite.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

**Table 3**

Odds Ratios From Logistic Regression Models Predicting One or More ADLs Among Males Veterans Age 30–84 (N=6,538), 2010

	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>	<b>Model 4</b>
<b>Race/Ethnicity</b>				
White (Ref)				
Black	2.57 ***	2.16 ***	2.08 ***	1.78 **
Hispanic	1.77 *	1.56 *	1.57 *	1.42
Other Race	1.85 **	1.79 **	1.77 *	1.49 †
<b>Age</b>	1.02 ***	1.01 *	1.01 **	1.01
<b>Household Income</b>				
\$0 – \$34,999 (Ref)				
\$35,000 – \$74,999		0.60 ***	0.62 ***	0.61 ***
\$75,000+		0.28 ***	0.29 ***	0.29 ***
<b>Educational Attainment</b>				
Less than High School Degree (Ref)				
High School Degree		0.58 **	0.58 **	0.62 **
Some College		0.58 **	0.59 **	0.59 **
College Degree		0.47 ***	0.48 ***	0.48 ***
Professional Degree		0.37 ***	0.38 ***	0.38 ***
<b>Marital Status</b>				
Married (Ref)				
Divorced		1.05	1.02	0.99
Widowed		0.62 *	0.61 *	0.61 *
Never Married		0.72	0.70	0.77
<b>Smoking</b>				
Never Smoker (Ref)				
Past Smoker			1.03	0.95
Current Someday Smoker			2.32 ***	2.06 ***
Current Everyday Smoker			1.32 †	1.23
<b>Age of Entry</b>				
20 and Below (Ref)				
21 to 24				0.89
25+				1.10
<b>Branch of Service</b>				
Army (Ref)				
Navy				0.72 *
Marines				0.83
Air Force				0.82
Other/Multiple Branches				1.15

	<u>Model 1</u>	<u>Model 2</u>	<u>Model 3</u>	<u>Model 4</u>
<b>Duration of Service</b>				
0 to 4 (Ref)				
5 to 19 years				1.29 †
20+ years				1.94 **
<b>Combat Experiences</b>				
Served in combat/war zone				0.75 *
Exposed to death				1.75 ***
<b>Environmental Hazards</b>				
Definitely/probably exposed (Ref)				
Probably not exposed				0.52 ***
Definitely not exposed				0.44 ***
Unsure				0.66 **
<b>Most Recent Period of Service</b>				
WWII-Vietnam (Ref)				
Vietnam				0.68 *
Post-Vietnam				0.65

† p < 0.1

\* p < 0.05

\*\* p < 0.01

\*\*\* p < 0.001

Source: *National Survey of Veterans, 2010*

Model 1 controls only for age. Model 2 controls for age and SES. Model 3 controls for age, SES, and Smoking.

Model 4 controls for age, SES, Smoking, and military factors.

Note: Missing data were handled by STATA's multiple imputation suite.

Note: Sample differs compared to Self-Rated Health models due to higher level of missing data for ADLs.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript