THE HEALTH EFFECTS OF MILITARY SERVICE: EVIDENCE FROM THE VIETNAM DRAFT

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There is a strong cross-sectional association between military service and adverse health. However, veterans differ very significantly in their observable characteristics from nonveterans, suggesting that some of the association between military service and adverse health may be due to omitted variables bias. To address this problem, we use draft eligibility as an instrument for military service. Despite a very strong first-stage relationship between draft eligibility and military service, the two-stage least squares estimates of the difference in health between veterans and nonveterans are statistically insignificant and too imprecise to preclude the differences in health found in the cross-sectional regressions. (*JEL* H56, I12, I18)

I. INTRODUCTION

The impact of military service on long-term health is reemerging as a vital policy question as the United States conducts major military operations in Iraq and Afghanistan. Health professionals have raised concerns that significant numbers of the veterans of these conflicts are experiencing psychological and physical health problems. The Department of Veterans Affairs estimates that anywhere from 12 to 20% of servicemen returning from Iraq suffer from posttraumatic stress disorder, which the medical literature suggests can have a long-term adverse effect on an individual's health. In the 2005 fiscal year, the Department of Veterans Affairs spent about 32 billion dollars on medical care for veterans: a substantial liability for the American taxpayer. Thus, understanding the long-term health impacts of military service is important both for allocating treatment resources and for correctly estimating the cost of waging these two wars.

Comparing the health of veterans with that of nonveterans may not give us credible estimates of the effect of military service. People voluntarily enlisting in the military differ in their observable characteristics from those who do not. These observable differences between veterans and nonveterans leave us concerned that cross-sectional estimates of the long-term health consequences of military service will be biased by systematic differences in the unobservable characteristics of the two groups. For this reason, we use the draft lottery implemented during the Vietnam War as an instrument for military service. The draft lottery required randomly selected men born between 1944 and 1952 to report for possible induction into the military.

We use confidential versions of the 1974–2004 National Health Interview Surveys (NHIS)[1] to examine the impact of military service on veterans' health. We focus on the

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1. U.S. Department of Health and Human Services, National Center for Health Statistics. NATIONAL HEALTH INTERVIEW SURVEY, 1971–2004 [Computer file]. ICPSR version. Hyattsville, MD: U.S. Dept. of Health and Human Services, National Center for Health Statistics [producer]. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor].

ABBREVIATIONS

IV: Instrumental Variable
NHIS: National Health Interview Survey
OLS: Ordinary Least Squares
2SLS: Two-Stage Least Squares

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67,608 men who were born between 1950 and 1952 because, as we document, this is the cohort most affected by the Vietnam draft lottery. We begin with a cross-sectional comparison of veterans and nonveterans, which reveals that veterans are in systematically worse health than nonveterans and that these health disparities increase with age. These estimates probably overstate the causal effect of military service because veterans differ systematically from nonveterans on dimensions such as education that are strongly associated with adverse health. When we correct for this problem using draft status to instrument for military service, we find that despite a very strong first-stage relationship between draft eligibility and military service, the 2-stage least squares (2SLS) estimates of the impact of military service on health are fairly imprecise. For most of the outcomes, we examine the confidence intervals from the 2SLS regressions containing both zero and the point estimate from the cross-sectional regression.

This paper makes two contributions to the literature. First, unlike the cross-sectional literature on the impact of military service on health, the instrumental variables approach used in this paper provides unbiased estimates. Second, this paper documents that though the Vietnam lottery very significantly increased military service, it led to only a modest increase in combat exposure.[2] In the following section, we discuss the existing literature on veterans' health and on the impact of the Vietnam Era Draft. In Section III, we describe our primary data source, the NHIS. In Section IV, we discuss the research methodology and some of the issues that complicate the use of draft eligibility as an instrument. Section V discusses our results, and Section VI concludes.

II. PREVIOUS LITERATURE

There is a significant literature documenting the disproportionate prevalence of health problems among military veterans. Hoge et al. (2004) find that mental health problems are common in veterans who served in Iraq and Afghanistan. Kang and Bullman (2001) document an increase in mortality caused by motor vehicle accidents in a 7-yr follow-up study of Gulf War veterans. McKinney et al. (1997) show that veterans are more likely to smoke than nonveterans. In one of the early papers in this literature, Card (1987) finds that Vietnam veterans are much more likely to report problems associated with posttraumatic stress disorder including "nightmares, loss of control of behavior, emotional numbing, withdrawal from the external environment, hyperalertness, anxiety, and depression." Jordan et al. (1991) document that exposure to combat in Vietnam is associated with higher prevalence of specific psychiatric disorders, including posttraumatic stress disorder. McFall, Mackay, and Donovan. (1992) and Price et al. (2004) present evidence of a strong link between posttraumatic stress disorder and substance abuse.

The papers described above share a common limitation: given the very significant differences in the characteristics of veterans and nonveterans, it is likely that some of the differences they document are due to omitted variables bias rather than the adverse effects of military service.[3] The first paper to deal convincingly with the omitted variables problem was by Hearst, Newman, and Hulley (1986). They used draft eligibility as an exogenous source of variation in the probability of military service. The authors found that men born on days that made them eligible for the draft had a 4% higher mortality rate and were 13% more likely to commit suicide and 8% more likely to die in a motor vehicle accident. A second paper that tackles the omitted variables problem convincingly is Bedard and Deschenes (2006). The authors use an instrumental variables strategy to credibly document that World War II and Korean War veterans suffer from substantially increased rates of premature mortality. One major contribution of their paper is that it documents that military-induced smoking is a major causal pathway through which military service causes premature mortality.

This paper contributes to this literature using the Vietnam draft as an instrument to get unbiased estimates of the long-term impact of military service on health behaviors and

2. This is important because if the mechanism via which military service adversely affects an individual is combat exposure, then this widely used instrument has very low power.

3. Even when the comparison is between veterans with and without combat exposure, there is the possibility that people who choose military occupations with a high probability of combat exposure are systematically different from other soldiers.

morbidity. An additional advantage of this paper is that it examines the broad set of outcomes that the literature suggests are likely to be affected by either posttraumatic stress disorder or cigarette smoking rather than focusing on a few outcomes as is common in most of the papers in the cross-sectional literature. Finally, the fact that we use 31 yr of the NHIS, which is the largest annual survey of U.S. residents' health, makes this the most powerful examination of this question that is possible to conduct with existing data sources.

III. DATA

Our primary data source is the NHIS from the years 1974–2004. The NHIS is a nationally representative survey of the noninstitutionalized population of the 50 states and the District of Columbia. It includes comprehensive questions on demographic characteristics, general health status, and the prevalence of a variety of health conditions. For reasons we discuss in the following section, we restrict our analysis to the 67,608 males born between 1950 and 1952 who are surveyed between 1974 and 2004. Due to the significant changes in the questions included in the survey, we separately analyze the following periods: 1974–1981, 1982–1996, and 1997–2004. Separating the analysis in this fashion also makes it possible to see how the health differences between veterans and nonveterans evolve over time. We created an indicator for military service based on reported veteran status. It is worth noting that veteran status indicates that an individual served in the military, not that they were deployed to a war zone such as Vietnam. We had a confidential version of the survey made available to us that includes each respondent's date of birth in addition to the variables available on the public use data set.

We use date of birth to determine each survey respondent's eligibility for the Vietnam Era Draft Lottery. There were four rounds of the Vietnam Draft conducted in December 1969, July 1970, August 1971, and February 1972. In each round, balls marked with a specified date between January 1 and December 31 were randomly drawn out of a container. The first date drawn in December 1969 was September 14. Therefore, September 14 was assigned the lottery number 1. The process continued until every day of the year was assigned a number from 1 to 365 (366 for leap years).[4] The Selective Service then called people for induction based on the number assigned to their birthday. The final number called for the December 1969 round (affecting those born between 1944 and 1950) was 195. This would require any male registered with the Selective Service whose day of birth had an assigned lottery number less than or equal to 195 to report for induction into the U.S. Military. The cut off numbers assigned by the Selective Service for the July 1970 round (affecting those born in 1951) and the August 1971 round (affecting those born in 1952) were 125 and 95, respectively. There were no draftees called for service using the February 1972 round.

IV. RESEARCH METHODS

We are interested in estimating the effect of military service on health. Specifically, we want to estimate the parameters from the following equation:

$$(1) \qquad y_i = \beta \text{Veteran}_i + \boldsymbol{X}_i\alpha + u_i,$$

where y_i is a measure of individual i's health, Veteran_i is a dummy variable equal to 1 if individual i is a veteran, and $\boldsymbol{X}_i$ is a vector containing a constant and observed characteristics of the individual. The parameter of interest, β, is the estimate of the difference in health between veterans and nonveterans. If veteran status is correlated with unobserved determinants of health, estimates of β from the equation above will be biased.

Veterans are likely to be systematically different from nonveterans for two primary reasons. First, to enlist in the military, one must pass a physical exam. Second, individuals from higher socioeconomic backgrounds have more employment and educational opportunities that may make them less likely to enlist in the military. In the first three columns of Table 1, we compare some of the observable characteristics of male veterans and nonveterans for the 1950–1952 birth cohorts. The table reveals that veterans differ substantially from nonveterans on all the dimensions we examine. Many of these variables,

4. The results of the draft lotteries were downloaded from the Web site of the Selective Service, available at http://www.sss.gov/lotter1.htm.

TABLE 1
Characteristics of Survey Respondents in the NHIS

Characteristics	Veteran	Nonveteran	*t* Statistic	Draft Eligible	Not Draft Eligible	*t* Statistic
White	0.821	0.776	11.68**	0.786	0.787	0.20
Hispanic	0.051	0.083	14.28**	0.076	0.075	0.30
Black	0.107	0.101	2.01*	0.103	0.102	0.41
Height	68.57	67.97	4.58**	68.12	68.11	0.05
Married	0.749	0.729	4.75**	0.734	0.733	0.27
Divorced	0.108	0.071	12.17**	0.080	0.079	0.58
Never married	0.109	0.168	19.22**	0.155	0.154	0.35
Education						
Less than high school	0.086	0.138	18.26**	0.127	0.126	0.34
High school diploma	0.445	0.309	28.53**	0.335	0.344	2.16*
Some college or more	0.464	0.543	16.11**	0.531	0.522	1.90

Notes: The sample comprises all men born between 1950 and 1952 who were surveyed in the NHIS between 1974 and 2004. There are 67,608 observations for all the variables other than white, Hispanic, and height. It is not possible to distinguish whites and Hispanics in survey years 1974 and 1975.

*Significant at 5% level; **significant at 1% level.

including race, ethnicity, and educational attainment, are well known to be strongly correlated with health outcomes. This suggests that cross-sectional estimates of the parameter β from Equation (1) will suffer from substantial omitted variables bias.

One solution to this omitted variables problem is to leverage the variation in the probability that an individual is a veteran caused by the Vietnam Era Draft Lottery. We start by estimating the first-stage relationship between veteran status and draft eligibility:

$$(2) \quad \text{Veteran}_i = \delta_1 \text{Draft}_i + \boldsymbol{X}_i\gamma_1 + v_{1i},$$

where Draft_i is an indicator variable for being born on a day that was called to report for possible induction. We then estimate the reduced form relationship between draft eligibility and the health outcome:

$$(3) \quad y_i = \delta_2 \text{Draft}_i + \boldsymbol{X}_i\gamma_2 + v_{2i}.$$

If draft eligibility is randomly assigned and veteran status is the only causal channel through which draft eligibility affects the health outcome, then we can interpret the ratio of δ_2:δ_1 as the causal effect of military service on health for the type of person who complies with the draft.[5]

5. This estimate is the local average treatment effect for the approximately 15% of the population that are "Compliers." See Angrist, Imbens, and Rubin (1996) for a detailed discussion of the interpretation of this estimate.

A. Determining the Correct Cohort to Analyze

The draft lottery applied to those born between 1944 and 1952. However, due to the timing of its implementation, it had little or no effect on the older birth cohorts. Picking the correct cohorts to focus on is a necessary step in maximizing the power of this study. In Figure 1, we plot the proportion of men who are veterans by month of birth. The figure reveals that though the draft had an effect on the probability that draft-eligible men born in 1948 and 1949 would serve in the military, it had its largest effect on men born between 1950 and 1952.[6] Table 2 confirms this impression. Men born between 1950 and 1952 on draft-eligible days are 14.8 percentage points more likely to be veterans. This is a considerably larger increase than for men born in 1948 or 1949. For this reason, and another that we discuss shortly, we focus on men born between 1950 and 1952.[7]

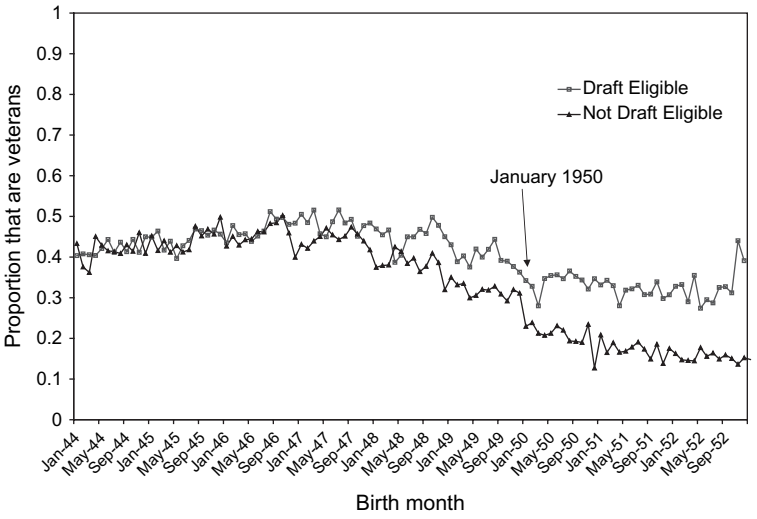
B. The Draft as an Instrument for Veteran Status

There are several problems with using draft eligibility as an instrument for military service,

6. This is due to the fact that men born in 1948 and 1949 were older when the lottery was run, and most of them had either already entered the military or obtained a deferment.

7. We also experimented with restricting the regressions to men born in 1948–1952 and also to men born in 1950 and got very similar results to the ones presented in the paper. The results for these other samples are available on request.

FIGURE 1
Proportion of Males who are Veterans by Birth Month and Draft Eligibility



Note: Estimated from the NHIS (1974–2004).

the first of which is the nonrandom assignment of lottery numbers to individual birthdays. As noted at the time, a mechanical failure in the implementation of the first round of the lottery resulted in a disproportionately high probability of being drafted for those born in the past few months of the year.[8] This has the potential to bias our instrumental variables estimates if those born in the later months of the year differ in important ways from those born at other times throughout the year.[9] We deal with this problem by including a dummy variable in our regressions for each month of birth.[10] As the last three columns of Table 1 illustrate, differences in the observed characteristics of men who were draft eligible and those who were not are mostly small in magnitude and statistically insignificant.

An additional problem is that the effects of draft eligibility might depend on how low the individual's number is. In Figure 2, we present the proportion of men born between 1950 and 1952 who are veterans by lottery number. This confirms the strong first-stage effect of the lottery on military participation, which is shown in Figure 1. It is also worth noting that there is a significant negative slope in the probability of veteran status.[11] This may be due to men with low lottery numbers that are fairly certain that they will be drafted voluntarily enlisting in branches of the armed services that are unlikely to result in deployment to Vietnam.[12] This gradient suggests that it may be worth interacting the lottery number with the dummy variable for draft eligibility to increase

8. The failure of the randomization in the first implementation of the draft lottery was due to the fact that the balls with the days of the year were not mixed sufficiently. Though the months were added in order the balls for each month were added at one time, so there is no within-month gradient in the probability of being drafted.

9. That health varies with season of birth is well documented in the public health literature.

10. For example, in our sample of men born between 1950 and 1952, we include 35 mo of birth dummies.

11. It is also well documented that compliance with the draft and its effects vary by race (Angrist 1990 and Rohlfs 2005b). We tried restricting our sample by race and found that the results are not significantly different when we focus on just whites and that restricting the analysis group to blacks or Hispanics results in very noisy estimates due to the small sample size. These results are available on request.

12. That this pattern is particularly pronounced in 1952 when there was no longer an educational deferment and that it occurs only for men with lottery numbers well below the induction cut offs suggest that many people avoided deployment to Vietnam by volunteering for branches of the military that were unlikely to deploy there.

TABLE 2
Relationship between Draft Eligibility and Veteran Status

	Born in 1946	Born in 1947	Born in 1948	Born in 1949	Born in 1950	Born in 1951	Born in 1952	Born in 1950–1952
Draft eligibility	0.015 (0.0079)	0.037 (0.0074)**	0.067 (0.0075)**	0.084 (0.0073)**	0.13 (0.0065)**	0.143 (0.0066)**	0.173 (0.0074)**	0.148 (0.0039)**
Constant	0.423 (0.0275)**	0.451 (0.0235)**	0.335 (0.0238)**	0.288 (0.0227)**	0.204 (0.0223)**	0.178 (0.0207)**	0.152 (0.0148)**	0.168 (0.0113)**
Observations	20,228	22,500	21,467	21,532	22,057	22,411	23,140	67,608
R^2	.01	.00	.01	.01	.02	.03	.04	.04

Notes: Estimated from NHIS (1974–2004) surveys. All the regressions include dummies for month of birth and survey year. Standard errors are given in parentheses.
*Significant at 5% level; **significant at 1% level.

the power of the instrument. We tried this, and though this increases the power of the instrument slightly, it does not substantively affect the results.[13]

A third problem is that the draft has the potential to affect health through multiple causal channels. Numerous authors have documented that the draft, in addition to increasing probability of military service, also affects educational attainment and adult earnings.[14] Given the relatively weak impact of the draft on these outcomes, they are unlikely to affect health in a substantial manner.

The literature suggests two primary mechanisms via which military service might adversely affect health. The first, as documented in Bedard and Deschenes (2006), is that military service can result in an increase in smoking. If this is the primary mechanism, then the correct first stage to examine is the increase in military service that resulted from draft eligibility. A second mechanism mentioned in the literature is combat exposure, which can result in long-term physical disabilities and psychological problems such as posttraumatic stress disorder.

We do not have a direct measure of combat exposure, so we use casualties in Vietnam as a proxy.[15] In Figure 3, we present the number of deaths per birth date by draft-eligibility status. This figure stands in stark contrast to Figure 2; it appears that draft eligibility only very modestly increased an individual's chance of being killed in Vietnam. This suggests that draft eligibility only modestly increased combat exposure.[16] This may be because men compelled to enter the military by the draft were able to secure noncombat roles either by voluntarily enlisting in a branch of the military unlikely to deploy to Vietnam or by securing a military occupation in which they were unlikely to see combat.[17] In Table 3, we present the regression estimates corresponding to Figure 3. The final column of the table reveals

13. Results available from authors.

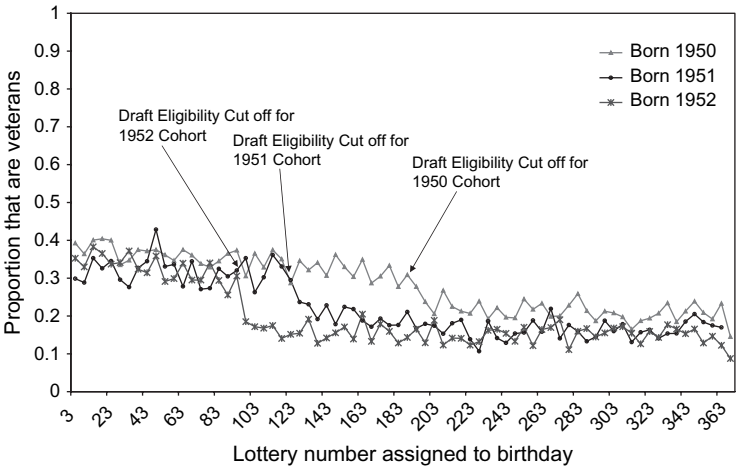
14. See Angrist (1990), Angrist and Krueger (1992), and Card and Lemieux (2001).

15. The casualty data is from the national archives and was downloaded from http://www.no-quarter.org/.

16. Rohlf's (2005a) estimates that for each American combat death in Vietnam, about 30 American soldiers came under enemy fire and survived.

17. There is significant anecdotal evidence that this was common.

FIGURE 2
Proportion of Males who are Veterans by Lottery Number



Notes: Data are from the NHIS (1974–2004). The proportions are computed for 5-d cells. The final cut offs for the 1950, 1951, and 1952 lotteries were 195, 125, and 95, respectively.

that for a typical nondraft eligible birthday, an average of 3.5 men died in the Vietnam theatre of operations. Draft eligibility increased the number of deaths by 0.751. This is an approximately 21% increase in combat deaths compared to the 60% increase in the probability of military service. It was volunteers and those drafted before the lottery was implemented that account for most of the American casualties in Vietnam; therefore, it is probably this group that accounts for the majority of the combat exposure. Additionally, Table 3 substantiates our earlier decision to focus on men born between 1950 and 1952 as this cohort demonstrates a significant increase in combat exposure as a result of draft eligibility.[18]

V. RESULTS

In this section, we present our estimates of the impact of military service on long-term health. We focus on the outcomes that the literature suggests military service is most likely to affect.[19] We then estimate the relationship between veteran status and adverse health using the draft as an instrument and compare these estimates with the cross-sectional estimates.

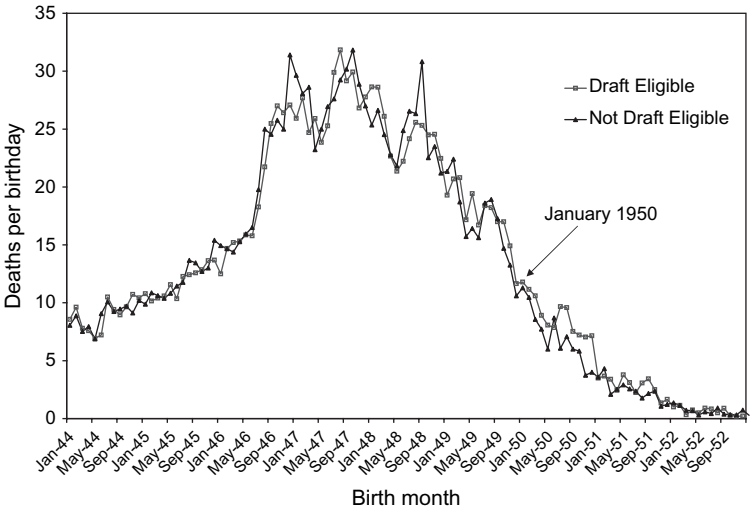
The literature suggests two primary ways in which military service is likely to affect health. The first is that military service can result in an increase in smoking. This suggests that we examine smoking rates and the cardiovascular problems that are most commonly caused by smoking. The second way in which military service affects health is it can lead to combat exposure, which can result in physical disabilities and posttraumatic stress disorder. Since there are only limited questions on physical disabilities in the NHIS, we focus on self-reported health and on limitations in people's ability to engage in day-to-day activities and to work. We also examine evidence of the long-term effects of posttraumatic stress disorder by focusing on psychological problems and substance abuse.[20]

18. The 1950 cohort has the strongest first-stage increase in combat exposure. We found that restricting the analysis to this cohort did not change our estimates significantly.

19. We also estimate the effect of veteran status on numerous outcomes that the literature does not characterize as likely to be affected by military service. These results are available from the authors.

20. The medical literature suggests that psychological stress can result in substance abuse.

FIGURE 3
Casualties in Vietnam per Birth Date by Draft-Eligibility Status



Notes: The casualty data are from the national archives and were downloaded on April 4, 2006, from http://www.no-quarter.org/.

In Table 4, we examine self-reported health and various measures of people's activity limitations. The table presents results for men born between 1950 and 1952. The regressions include dummies for month of birth, survey year, and race and are weighted to adjust for the complex sampling structure of the NHIS.[21] To save space, only the estimate of the difference between veterans and nonveterans, followed by the standard error and the mean of the outcome, are included in the table.[22] In each pair of columns, the first column presents the ordinary least squares (OLS) results and the second column presents the estimates from regressions using draft eligibility as an instrument. To facilitate the comparison of the differences between veterans and nonveterans, each row tracks how the disparity in a single outcome evolves as the cohort ages. The first two columns present the results for men surveyed between 1974 and 1981, the next pair of columns presents results for men surveyed between 1982 and 1996, and the final pair of columns presents the results for men surveyed between 1997 and 2004. In the first row of the table, we present the results for self-reported health where a 1 represents excellent health. The OLS results in the first column of each pair of columns reveal that though the differences in self-reported health are small and statistically insignificant when men are interviewed between 1974 and 1981 (when they are between the ages 22 and 31) as they age, veterans' health deteriorates far faster than the health of nonveterans. We observe similar pattern when we examine limitations to an individual's ability to engage in activities or to work. Though the initial differences between the two groups are small, they increase rapidly with age.[23] By the time the cohort is in its late forties and early fifties, the veterans have much higher rates of activity and work limitations. In the second column of each pair, we present the instrumental variables estimates. Unfortunately, for most of the outcomes, the confidence intervals on the instrumental variable (IV) estimates include both zero and the point estimate from the cross-sectional regression.

In Table 5, we examine the differences between veterans and nonveterans for various

21. In addition, the regressions are clustered on primary sampling unit to adjust for correlation in the error term that results from the sampling structure.

22. The point estimates and standard error for the other variables in the regression are available on request.

23. That the disparities are initially very small suggests that they are not due to combat injuries.

TABLE 3
Relationship between Draft Eligibility and Combat Mortality

	Born in 1946	Born in 1947	Born in 1948	Born in 1949	Born in 1950	Born in 1951	Born in 1952	Born in 1950–1952
Draft eligibility	−0.573 (0.507)	−0.644 (0.560)	−0.111 (0.578)	0.612 (0.459)	1.678 (0.326)**	0.426 (0.186)*	−0.005 (0.093)	0.751 (0.134)**
Constant	20.147 (0.363)**	28.141 (0.402)**	24.685 (0.414)**	16.933 (0.329)**	7.254 (0.234)**	2.399 (0.108)**	0.662 (0.047)**	3.499 (0.080)**
Mean	19.841	27.797	24.626	17.26	8.151	2.545	0.661	3.783
R^2	.00	.00	.00	.01	.07	.01	.00	.00

Notes: The regressions include dummies for month of birth. The dependant variable in the regressions is the number of deaths occurring among people born on a given day. Standard errors are given in parentheses.

*Significant at 5% level; **significant at 1% level.

health conditions that are likely to be affected by posttraumatic stress disorder such as depression and substance abuse. We also compare the rates of hypertension and other heart conditions because these are likely to be affected by differences in smoking rates. This table has the same layout as Table 4. The OLS estimates reveal that veterans are suffering from substantially higher rates of anxiety and depression than nonveterans and that these disparities increase as they age. The IV estimates of the difference in the rates of depression or anxiety are smaller than the OLS estimates but imprecisely estimated. We find no evidence of differences in the rates of substance abuse, hypertension, or heart conditions in either the OLS or the IV regressions. This may be partially due to the fact that the reported rates of these conditions are very low.[24]

In Table 6, we focus on a subsample of men surveyed between 1997 and 2004 who were asked additional detailed questions about smoking, alcohol consumption, and their health problems. Unlike the general survey in the sample adult survey, there are questions about specific medical conditions, which is why the rate of heart conditions reported in this table is more than twice the rate reported in Table 5. The interviews were conducted when these men were between the ages 45 and 54, which is the age range for which we observed the largest disparities in physical limitations in Table 4. We focus on a subset of behaviors and outcomes that are likely to be influenced by military service. The two behaviors we examine are smoking and alcohol consumption. We find that veterans are more likely to have tried cigarettes and alcohol than nonveterans and are more likely to currently smoke and drink. The IV estimates are too imprecise to be informative. We find that veterans are more likely to report having their feelings interfere with their life, though only the difference in one measure of this outcome is statistically significant. The instrumental variables estimates of the effect of military service on this measure of psychological

24. The reported rates for these conditions are often significantly lower than estimates of prevalence among the population. This is because some respondents are asked whether or not they suffer from the specific conditions while others are prompted to describe any physical or psychological limitations and the conditions responsible for these limitations.

TABLE 4
OLS and 2SLS Estimates of Impact of Veteran Status on Physical Limitations

	1974–1981		1982–1996		1997–2004	
Dependant Variable	**OLS**	**2SLS**	**OLS**	**2SLS**	**OLS**	**2SLS**
Health on 5-point scale	0.00631	0.03567	0.04216	0.03183	0.11448	−0.23967
SE	0.01140	0.06126	0.01394**	0.08160	0.02503**	0.16524
Mean	1.49093	1.49093	1.92516	1.92516	2.19675	2.19675
Activity limited	−0.00248	0.05337	0.01446	0.06231	0.044	−0.03349
SE	0.00498	0.02645*	0.00467**	0.02681*	0.00859**	0.05494
Mean	0.08314	0.08314	0.1187	0.1187	0.14165	0.14165
Activity unable	−0.00073	−0.0044	0.00513	0.01449	N/A	N/A
SE	0.00218	0.01209	0.00278	0.01699	N/A	N/A
Mean	0.01433	0.01433	0.0406	0.0406	N/A	N/A
Work limited	N/A	N/A	0.01223	0.03817	0.03648	−0.07251
SE	N/A	N/A	0.00401**	0.02373	0.00801**	0.05027
Mean	N/A	N/A	0.08653	0.08653	0.11475	0.11475
Work unable	N/A	N/A	0.00489	0.00931	0.02024	−0.10289
SE	N/A	N/A	0.00279	0.01713	0.00650**	0.04050*
Mean	N/A	N/A	0.04156	0.04156	0.07398	0.07398

Notes: Estimated for men born in 1950–1952. Regressions include dummies for race, birth month, and survey year. Regressions are weighted to reflect sampling probabilities and are clustered on primary sampling unit. For 1974–1981, health is measured on a 4-point scale, with 1 being excellent health; in the other survey years, it is on a 5-point scale. For the regressions using 1974–1981 surveys, there are 20,133 observations. For the regressions using 1982–1996 surveys, there are 34,068 observations. For the regressions using the 1997–2004 surveys, there are 11,261 observations. N/A, not applicable.

health are smaller than the OLS estimates but imprecisely estimated. Finally, we find no differences in the rates at which the two groups report cardiovascular problems. Even the OLS estimates for these outcomes are fairly imprecise due to the modest sample size of the sample adult survey.

VI. CONCLUSIONS

In this paper, we document that Vietnam era veterans are in significantly worse health than nonveterans and that these health disparities are increasing as these populations age. However, given the significant differences

TABLE 5
OLS and 2SLS Estimates of Impact of Veteran Status on Specific Conditions

	1974–1981		1982–1996		1997–2004	
Dependant Variable	**OLS**	**2SLS**	**OLS**	**2SLS**	**OLS**	**2SLS**
Depression or anxiety	0.00283	0.01189	0.00473	0.00384	0.01279	−0.01723
SE	0.00119*	0.00553*	0.00168**	0.00975	0.00347**	0.02004
Mean	0.00331	0.00331	0.01178	0.01178	0.01857	0.01857
Alcohol or drug abuse	0.00034	0.0023	0.00102	0.00036	0.00051	−0.00252
SE	0.00062	0.00299	0.00067	0.00370	0.00082	0.00481
Mean	0.00092	0.00092	0.00204	0.00204	0.00099	0.00099
Hypertension	0.00069	−0.00619	0.00524	0.00568	0.00478	0.00527
SE	0.00162	0.00840	0.00219*	0.01279	0.00286	0.01747
Mean	0.00735	0.00735	0.02377	0.02377	0.01352	0.01352
Heart conditions or disease	−0.00105	0.00059	−0.00005	0.00934	0.00183	−0.00409
SE	0.00093	0.00553	0.00141	0.00890	0.00291	0.01952
Mean	0.00351	0.00351	0.01036	0.01036	0.01639	0.01639

Notes: See notes from Table 4.

TABLE 6
OLS and 2SLS Estimates of Impact of Veteran Status on Health (1997–2004)

	OLS	2SLS	OLS	2SLS	OLS	2SLS
	Never smoker		Current smoker		Cigarettes per day	
Veteran	−0.1678	0.06772	0.1112	−0.05253	0.74187	0.04896
SE	0.01753**	0.13559	0.01743**	0.12446	0.69160	5.73404
Mean	0.40821	0.40821	0.29132	0.29132	20.59093	20.59093
	Never drinker		Current drinker		Days drank past month	
Veteran	−0.05322	−0.05619	0.03472	0.1033	0.34199	0.34528
SE	0.01022**	0.08316	0.01651*	0.12308	0.41848	3.06286
Mean	0.1077	0.1077	0.70219	0.70219	7.23285	7.23285
	Feelings interfere life		Feelings interfere life (some)		Feelings interfere life (lots)	
Veteran	0.01792	0.0015	0.02905	−0.06102	0.00857	0.00168
SE	0.01380	0.09912	0.01091**	0.07559	0.00679	0.05069
Mean	0.16844	0.16844	0.09036	0.09036	0.03418	0.03418
	Angina pectoris		Heart conditions or disease		Heart attack	
Veteran	0.00701	0.0454	0.0017	0.10549	0.0092	0.02758
SE	0.00612	0.04349	0.00899	0.06712	0.00738	0.05161
Mean	0.02613	0.02613	0.06502	0.06502	0.03695	0.03695

Notes: See notes from Table 4. These regressions are for men born in 1950–1952 and captured in the NHIS Sample Adult Survey between 1997 and 2004. The sample size is 5,100, except for the following questions: days drank in the past 30-d observation = 3,632, and cigarettes per day observation = 1,589.

*Significant at 5% level; **significant at 1% level.

between the two groups in their observable characteristics, it is not clear that these health disparities are entirely due to military service. Unfortunately, the 2SLS estimates that use the Vietnam draft lottery as an instrument for military give us estimates too imprecise to be informative.

One possibility is that the differences observed in the cross-section are primarily due to exposure to the stress of combat. If this is the case, then the first-stage estimates in Table 2 greatly overstate the strength of the draft as an instrument. As shown in Table 3, the draft lottery resulted in only a modest increase in combat exposure for draft-eligible men. This suggests that the Vietnam draft lottery is a poor instrument if the outcome being examined is one that military service affects through the causal channel of combat exposure. Given that the NHIS is the largest survey of the health of the U.S. population and examines a broader set of health outcomes than most other surveys, it is unlikely that this instrument can be applied to another data set to get estimates of the impact of combat exposure on health sufficiently precise to be useful.

REFERENCES

Angrist, J. D. "Lifetime Earning and the Vietnam Era Draft Lottery: Evidence from Social Security Administrative Records." *American Economic Review*, 80, 1990, 313–36.

Angrist, J. D., G. W. Imbens, and D. B. Rubin. "Identification of Causal Effects Using Instrumental Variables." *Journal of the American Statistical Association*, 91, 1996, 444–55.

Angrist, J. D., and A. B. Krueger. "Estimating the Payoff to Schooling Using the Vietnam-Era Draft Lottery." National Bureau of Economic Research Working Paper No. W4067, 1992.

Bedard, K., and O. Deschenes. "The Long-Term Impact of Military Service on Health: Evidence from World War II and the Korean War." *American Economic Review*, 96, 2006, 176–94.

Card, D., and T. Lemieux. "Going to College to Avoid the Draft: The Unintended Legacy of the Vietnam War." *American Economic Review Papers and Proceedings*, 91, 2001, 97–102.

Card, J. "Epidemiology of PTSD in a National Cohort of Vietnam Veterans." *Journal of Clinical Psychology*, 43, 1987, 6–17.

Hearst, N., T. B. Newman, and S. B. Hulley. "Delayed Effects of the Military Draft on Mortality: A Randomized Natural Experiment." *New England Journal of Medicine*, 314, 1986, 620–24.

Hoge, C. W., C. A. Castro, S. C. Messer, D. McGurk, D. I. Cotting, and R. L. Koffman. "Combat Duty in Iraq and Afghanistan, Mental Health Problems,

and Barriers to Care." *New England Journal of Medicine*, 351, 2004, 13–22.

Jordan, B. K., W. E. Schlenger, R. Hough, R. A. Kulka, D. Weiss, J. A. Fairbank, and C. R. Marmar. "Lifetime and Current Prevalence of Specific Psychiatric Disorders among Vietnam Veterans and Controls." *Archives of General Psychiatry*, 48, 1991, 916–26.

Kang, H. K., and T. A. Bullman. "Mortality among US Veterans of the Persian Gulf War: 7-Year Follow-up." *American Journal of Epidemiology*, 154(5), 2001, 399–405.

McFall, M. E., P. W. Mackay, and D. M. Donovan. "Combat-Related Posttraumatic Stress Disorder and Severity of Substance Abuse in Vietnam Veterans." *Journal of Studies on Alcohol*, 53, 1992, 357–63.

McKinney, W. P., D. D. Mclntire, T. J. Carmody, and A. Joseph. "Comparing the Smoking Behavior of Veterans and Non-Veterans." *Public Health Report*, 112, 1997, 212–17.

Price, R. K., N. K. Risk, A. H. Haden, C. E. Lewis, and E. L. Spitznagel. "Post-Traumatic Stress Disorder, Drug Dependence, and Suicidality among Male Vietnam Veterans with a History of Heavy Drug Use." *Drug and Alcohol Dependence*, 76S, 2004, S31–43.

Rohlfs, C. "Estimates of the Willingness-to-Pay to Avoid Military Service and Fatality Risk: Evidence from the Vietnam Draft." Unpublished Working Paper, University of Chicago, Economics Department, 2005a.

Rohlfs, C. "Does Military Service Make You a More Violent Person? Evidence from the Vietnam Draft Lottery." Unpublished Working Paper, University of Chicago, Economics Department, 2005b.