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THE LONG-TERM EFFECTS OF MILITARY CONSCRIPTION ON MORTALITY: ESTIMATES FROM THE VIETNAM-ERA DRAFT LOTTERY

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ABSTRACT

Research on the effects of Vietnam military service suggests that Vietnam veterans experienced significantly higher mortality than both non-Vietnam veterans and the civilian population at large. These results, however, may be biased by non-random selection into the military if unobserved background differences between veterans and non-veterans affect mortality directly. The present study generates unbiased estimates of the causal impact of Vietnam era draft eligibility on male mortality. Using records from the Vietnam draft lottery to assign decedents born 1950-1952 draft lottery numbers, the study estimates excess mortality among observed draft eligible male decedents as compared to the (1) expected proportion of draft eligible decedents given Vietnam draft eligibility cutoffs and (2) observed proportion of draft eligible female decedents. The results demonstrate that there appears to be no effect of draft exposure on mortality (even cause-specific death rates). When we examine population subgroups—including splits by race, educational attainment, nativity and marital status—we find weak evidence for an interaction between education and draft eligibility. On the whole, these results suggest that previous research, which has shown that Vietnam-era veterans experienced significantly higher mortality than non-veterans, may be biased by non-random selection into the military and may thus overstate the need for compensatory government pensions.

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Introduction

Over eight million men and women served in the military during the years of America's formal involvement in the Vietnam War with well over three million deployed to the theater of combat in Southeast Asia (US Department of Veteran Affairs 2008a). The war claimed more than fifty-seven thousand American lives and left many thousands more service men and women wounded. In 2008, Vietnam veterans constituted over thirty percent of the United States' veteran population, the largest period of service cohort by far, and received a greater proportion of service-related disability benefits than veterans of World War II, the Korean Conflict, and the Gulf War combined (US Department of Veteran Affairs 2008b).

Although not as severe in terms as casualties as World War II, the Vietnam War remains one of the most controversial military engagements in American history and, according to a wealth of previous research, one of the most taxing to its veterans as well. While World War II era veterans were granted generous state-financed educational benefits through the GI Bill (Teachman 2005) and by some measures experienced a significant earnings premium compared to nonveteran peers (Berger and Hirsch 1983), studies of Vietnam veterans have documented a sizable wage penalty as well as a host of mental and physical health problems. The National Vietnam Veterans Readjustment Study in the 1980s, for instance, found that the lifetime incidence rate for post-traumatic stress disorder (PTSD), a disorder whose symptoms may persist up to forty years after service (MacLean and Elder 2007), was over thirty percent in male Vietnam veterans (Kulka et al. 1990).

The consequences of service for the health and happiness of Vietnam-era veterans has thus been a subject of considerable research (see, e.g., Call & Teachman 1996; Davison et al. 2006; Gamache, Rosenheck & Tessler, 2001; Hearst, Newman & Hulley 1986; Hearst et al. 1991; Liu et al. 2005; London & Wilmoth 2006; Settersten 2006). Military combat has been associated with increased incidence of physical and mental illness and has important consequences for lifetime health and mortality rates among veterans beyond the immediate risks due to exposure to war (Cook et al. 2004; Davison et al. 2006; Gamache et al., 2001; Hearst et al. 1986; Liu at al. 2005; Ruger et al. 2002). In addition to the trauma of combat, some Vietnam-era combatants faced exposure to the environmental toxin, Agent Orange (2,3,7,8-tetrachlorodibenzo-p-dioxin), which has been associated with Hodgkin's disease, non-Hodgkin's lymphoma, soft-tissue sarcoma, and chloracne (Institute of Medicine 1994). Vietnam veterans also report high rates of recreational drug use, including "hard" drugs like heroin—both in the field and upon return to the U.S. (Wright, Carter & Cullen 2005). Vietnam veterans typically also came home to a hostile and certainly less supportive social and political environment than did previous generations of veterans, perhaps increasing their stress levels (Angrist & Krueger 1994; Sampson & Laub 1996).

Selection Bias in Estimates of Military Service Effects

While past empirical and theoretical work suggests that the effects of military service may be both a fruitful and policy-relevant line of inquiry, nearly all studies of veterans, regardless of war-time period, have been plagued by the problem of selection bias. Since entry into the military is typically far from random, the men in the ranks of the armed forces may not be representative of the male population as a whole, making identification of a treatment effect of military service difficult at best.[i] Specifically, unobserved differences between veterans and non-veterans may influence substantive outcomes directly and may therefore contaminate efforts to estimate a treatment effect of military service or even an intent-to-treat effect of exposure to conscription.

To illustrate, an early investigation by Seltzer and Jablon (1974) found that, even more than twenty years after military service, white male World War II veterans had drastically lower mortality rates compared to the overall white male population. Reduced mortality rates for tuberculosis, cardiovascular disease, and ulcers were particularly pronounced and underscored the potential long-term impact of selection bias on health outcomes. Specifically, if military pre-induction screenings weeded out males who appeared unhealthy or otherwise unfit to serve, reduced mortality rates may have reflected not the ameliorative effects of military service but instead a lasting health selection gradient.

Selection effects may work in the opposite direction, as well. For example, Boehmer et al. (2004) find significantly elevated all-cause mortality for Vietnam era veterans in the first five years after the end of the conflict and elevated cardiovascular related death rates for men discharged from service after 1970 during the second half of a 30-year follow-up frame (also see Settersten 2006 with respect to mental health outcomes). However, just as pre-induction health screenings may select only the most physically fit for actual service, those who are initially motivated to apply for military service (or who fail to evade conscription) may differ in important ways from the population at large making the net effect of selection bias on health outcomes largely indeterminate.

Causal Estimation Strategies

Between December 1969 and February 1972, the United States Selective Service held four Vietnam draft lotteries. Each of these draft lotteries randomly assigned men in the 1950, 1951, 1952, and 1953 birth cohorts[ii] order of induction numbers through a hand drawing of three hundred sixty-five birth dates (and three hundred sixty-six for the leap year lottery of the 1952 birth cohort). Following the lotteries, men in a particular birth year classified as either 1-A or 1-A-O[iii] were called to report in order for possible induction up to a yearly draft eligibility cutoff (see Table 1). Draft lottery numbers, then, are highly correlated with Vietnam military service but likely uncorrelated with unobservables that directly influence mortality outcomes (see Angrist [1990]). The draft lottery thus provides a unique opportunity to utilize a random assignment method as a 'natural experiment' and cleanly estimate the causal impact of exposure to military conscription on important outcomes net of selection bias.

This "randomized natural experiment" of the Vietnam draft lottery has been used by several existing studies to sort out the unique experience of the Vietnam-era cohort. As the first to deploy this novel estimation strategy, Hearst et al. (1986) documented the short-term consequences of Vietnam military service on subsequent mortality risk. Between 1974 and 1983, Hearst et al. found that draft eligible Vietnam era men living in California and Pennsylvania experienced significantly higher mortality rates than draft ineligible men—particularly from suicide and motor vehicle accidents. Later work by Angrist (1990) utilized draft eligibility as an instrument variable (IV) for military service to study income and earnings for male veterans. Angrist's study showed that white veterans experienced a 15 percent drop in lifetime earnings compared to similar white non-veterans while non-whites faced no wage penalty as a result of military service. (It should be noted, however, that since there were other behavioral responses to draft lottery number on the part of both the individuals and employers, the effect should rather be interpreted as an estimate of "intent-to-treat.") Caveats aside, these findings jointly suggest that the effect of military service on the lives of these veterans may be causal instead of simply a remnant of differential selection into the military. Moreover, the work of Angrist (1990) suggests, in line with a significant sociological literature on the ameliorative effects of service for minorities (Lundquist 2004; Lundquist 2008; Sampson & Laub 1996), that the effects of military service may vary by subpopulation.

Nonetheless, the more recent research using IV estimation by Angrist and Chen (2008) suggests that, despite early evidence to indicate that the negative effects of military service may indeed have been causal, such putative deleterious effects may have faded over time. Using the 2000 Decennial Census, Angrist and Chen (2008) find that the wage penalty for white veterans has dissipated along with the elevated mortality rates previously documented by Hearst et al. (1986) for whites and non-whites alike.

Important questions remain, however, about the potential causal impact of military service on health outcomes. While Angrist and Chen (2008) find little evidence for a long-term effect of Vietnam military service on mortality, their study may mask important variation in the effects of Vietnam military service on specific causes of death—as Hearst et al.'s early study implies—as well as important subgroup variation in mortality rates. Using a different, complementary data source, the present study attempts to flesh out the long-term effects of Vietnam draft eligibility on mortality outcomes using a variation of the Vietnam draft lottery technique adapted from Hearst et al. (1986).[iv]

Data and Methods

Our data come from the National Center for Health Statistics multiple cause of death file, 1989-2002. This file contains all deaths processed by the NCHS for each calendar year. For the time period 1989-2002, all deaths in the United States were processed by the NCHS. Each record in the multiple cause file contains background information on the decedent taken from the decedent's U.S. Standard Certificate of Death including race, sex, and level of education as well as the decedent's day, month, and year of birth. The file also contains information on underlying cause of death.[v]

Due to problems with the assignments of lottery numbers prior to 1970[vi], we restrict our analyses to those decedents born between 1950 and 1952. To further ensure comparability of our analyses across birth cohorts, we use only the data years for each birth cohort corresponding to ages 39-49 (e.g. data years 1989-1999 for the 1950 birth cohort). Thus, our sample includes a total of 372,128 decedents including 246,504 males and 125,624 females. Of these decedents, 245,088 are non-Hispanic whites, 89,589 are non-Hispanic blacks, and 27,947 are Hispanic with a remaining 9,504 classified as non-Hispanic "other" on the U.S. Standard Death Certificate.

Using publicly available records of the Vietnam-era lottery results[vii], we begin by assigning each decedent, females included, the random sequence number or draft lottery number corresponding to his or her date of birth. We then calculate the observed proportion of draft eligible and draft ineligible male and female decedents based on the highest draft lottery number called to report for a given draft year. In 1950, for instance, the highest draft lottery number called to report was 195. Thus, all decedents with a lottery number below or equal to the eligibility cutoff are coded one for draft eligible, and all of those decedents above the 195 cutoff are coded zero as draft ineligible. Expected proportions for each draft eligible birth cohort are given in Table 1.

We next calculate the frequencies of draft eligible and ineligible males and females as a proportion of all male and female decedents. For example, for draft eligible men we compute

$$p_{EM} = \frac{f_{EM}}{f_M} \tag{1}$$

where p_{EM} is the observed proportions of draft eligible male decedents out of the total number of male decedents in our "sample". Again, we proceed by calculating these relative frequencies for each of the four groups--draft eligible and ineligible men and women--using the equation (1) specified above.

After each relative frequency has been calculated for draft eligible and ineligible men and women for a variety of subgroups, we utilize an estimation strategy that deploys two counterfactuals to assess excess mortality among draft eligible men. First, we compare the observed proportion of draft eligible males to the observed proportion of draft eligible females. Women, logically, should not demonstrate a "draft effect". That is, there is no reason to expect that any fertility difference by birth date differed significantly by sex and thus any significant difference between the proportions of draft eligible males and draft eligible females may thus indicate a "draft exposure" effect.

Our second comparison utilizes information on the proportion of draft eligible birth dates in each draft lottery calendar year to detect excess mortality among draft eligible men. We do this by comparing the observed proportion of draft eligible males (p_{DEM}) to the expected or theoretical proportion of draft eligible males given the proportion of males draft eligible for each birth cohort[viii]. Thus, we compute the proportion of expected draft eligible men as

(2) $$\hat{p}_{DEM} = \frac{\max_{1950}}{days_{1950}}$$

where $\max_{1950}$ represents the highest lottery number called to serve for the 1950 birth cohort and $days_{1950}$ represents the number of days in the 1950 calendar year. The difference between the observed proportion of draft eligible males minus the expected proportion of draft eligible males (p_{DEM} - $\hat{p}_{DEM}$) yields our estimate of excess mortality. Again, we may test the difference of proportions to assess the significance of the draft exposure effect.

Since previous research has turned up evidence to suggest that a draft exposure effect may be most pronounced for certain causes of death, we repeat both of the above counterfactual analyses by a variety of causes that have been linked to military combat. These causes include malignant neoplasms (cancer), ischemic heart disease, chronic liver disease and cirrhosis, motor vehicle accidents, and suicide. (See Appendix A for coding decisions.)

As a final specification check, we run several regression discontinuity (RD) models that regress the frequency of deaths by draft number on draft number in both linear and quadratic form for each birth cohort. Thus we estimate:

$$(3)\quad \hat{y} = \beta_0 + \beta_1\mathrm{DRAFTNUM} + \beta_2\mathrm{DRAFTNUM}^2 + \beta_3\mathrm{ELIGIBLE} + \beta_4\mathrm{MONTH}$$

where the right-hand side variables are draft number in both linear and quadratic form, a dummy variable indicator for eligibility status (ELIGIBLE) and, as a robustness check, a vector of dummy variables for month of birth (MONTH).

Results

We begin with results for our first counterfactual, which compares the observed proportion of draft eligible men to the proportion of draft eligible women for our sample overall and for a variety of subgroups. As shown in Table 2, our first comparison turns up only slight evidence for a draft exposure effect. The results for the combined sample are largely insignificant with one exception--decedents with thirteen or more years of education. In this case, the proportion of draft eligible male decedents is larger than the proportion of draft eligible female decedents indicating a slight draft exposure effect. Highly educated draft eligible male decedents thus exhibit excess mortality of about 1.17% compared to draft eligible females.

<<Table 2 Here>>

We next present results for our second counterfactual. Again, for this comparison we calculate the observed proportion of draft eligible male decedents, as above, and the theoretical proportion of draft eligible males based on the highest called draft lottery number for each birth cohort. Table 3 presents the results for the sample overall as well as for a variety of subgroups. Here, too, we find little evidence of a draft exposure effect in the form of excess (or reduced) mortality amongst draft eligible male decedents. The one exception is a slight but statistically significant mortality reduction for male decedents with twelve years of schooling or less.

<<Table 3 Here>>

Finally, we conclude our counterfactual analysis with results by particular causes of death. Even though our previous analyses turned up little evidence to indicate a draft exposure effect, it could be the case that exposure to the draft elevated (or reduced) the probability of mortality due to certain conditions as research by Hearst et al. (1986) suggests.

Table 4 presents results for each unique cause of death for the first comparison, males versus females. We here find no evidence of elevated (or reduced) mortality for draft eligible men for any of the particular causes of death that have previously been linked to Vietnam combat. The differences between draft eligible males and draft eligible females for each cause are small and statistically insignificant.

Lastly, Table 5 displays the cause of death results for the second counterfactual, which compares the observed proportion of draft eligible male decedents in our sample to a theoretical or expected proportion of draft eligible decedents based upon the highest lottery number called to report for service. Here, too, we find no evidence of a draft exposure effect on eligible male decedents. All of the calculated differences are small and statistically insignificant.

<<Tables 4 & 5 Here>>

Finally, estimation of several regression discontinuity models corroborates the results of our counterfactual analyses.[ix] There appears to be no draft exposure effect for any of the 1950-1952 birth cohorts even after controlling for month of birth and adding an interaction term for draft eligibility and birth year.

Discussion and Conclusion

Given the considerable difficulties involved in identifying a true treatment effect of military conscription, our study contributes to a growing body of knowledge about the long-term health consequences of service in general and service during the Vietnam era in particular. Using a novel estimation strategy, we have assessed--and detected very little--excess mortality for the 1950-1952 draft lottery cohorts.

In contrast to the work by Hearst et al (1986), we find little convincing evidence of a lasting draft eligibility effect on the Vietnam era birth cohorts. Our analysis indicates that, even after controlling for a variety of potential confounders such as education and nativity status, mortality for the draft eligible population appears unaffected compared to both the expected proportion of eligible males by birth date and the female population. Similarly, analyses by underlying cause of death turned up little evidence that exposure to the draft may have elevated mortality due to, for example, suicide or motor vehicle accidents.

Coupled with recent null findings by Angrist and Chen (2008) on the long-term consequences of Vietnam service, our analysis suggests that the short-term elevation in mortality rates following combat may have dissipated over time or, alternately, may have been remnants of sampling (in the case of Hearst et al [1986]) or study design (in the case of Boehmer et al [2004]). More importantly, however, the absence of a long-term effect of conscription on mortality for the Vietnam cohorts may imply that the deleterious effects of military service on health have been greatly overstated.

Since such labor market losses and deleterious health effects of military service in general and combat in particular have long justified the state's role in compensating veterans for their sacrifices in the line of duty, these null findings are of significant theoretical and policy importance. As Skocpol (1992; 1993) and others have argued, the introduction of generous pensions to both Union Army veterans and their families may have actually preceded benefits granted to industrial wage-earners, long considered the primary beneficiaries of modern welfare state. Beyond pensions, however, other scholars have recognized military service as one of the most important pathways to claims based on citizenship. As Gifford notes, "as a service to the state itself, and typically imbued with notions of patriotism, valor, and self-sacrifice, military service is an unambiguous citizenship-defining experience" (2003: 25-6). In the language of T.H. Marshall (1950), military service has historically guaranteed veterans not only civil and political rights but social rights as well. It is in this context that sorting out the causal impact of service, particularly during a conflict as controversial and consequential as the Vietnam War and particularly on an outcome as important as mortality, becomes especially important in order to weigh political and economic claims made by veterans and their representatives.

ENDNOTES

i For the purposes of this study, we restrict our analysis of the effects of military service to male veterans simply because during the Vietnam-era an overwhelming majority of military personnel were men (Kulka et al. 1990).

ii The first draft lottery held on December 1, 1969 actually assigned all men born between 1944-1950 order of induction numbers. However, for reasons explained below, we deal only with the 1950-1953 cohorts.

iii Men available for immediate military service were classified as 1-A and conscientious objectors to military training and combat were classified as 1-A-O or "conscientious objector."

iv It is complementary in that the Census measures men still alive and residing in the United States while the death records we use those who died in the U.S. The Census-approach might overstate the effect of military conscription since it would count those who fled to Canada and did not return as dead, while our approach would underestimate an effect since those who fled to Canada would appear to still be living since they would not appear in U.S. death records. This is not so much of a concern in the end since we arrive at similar results, at least with respect to the overall impact.

v For data years 1989-1998, underlying cause of death is coded using the International Classification of Diseases (ICD) 9th Revision. In 1999, the NCHS began implementation of the updated ICD 10th Revision. Thus to ensure comparability across data years, we code the underlying cause of death for all years based on the 34-category classification of the ICD-9.

vi The 1970 draft lottery also applied to men born between 1944 and 1949, but most of these veterans had already entered the service prior to the lottery drawing. Thus, the remaining men eligible for induction under the 1970 lottery may not constitute a representative sample as Angrist (1990) indicates.

vii See http://www.sss.gov/lotter1.htm.

[viii]viii This comparison assumes that birth dates are uniformly distributed across the calendar year and thus any differences by lottery number are due to an eligibility effect rather than variation in fertility rates. Hence we also use an alternate “check” using the male-female comparison, which should implicitly correct for the possibility of varying fertility rates.

ix Results available upon request.

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Table 1: Expected proportion of draft eligible birth dates by birth year

Birth Year	Eligibility Ceiling	Days in Year	Expected Proportion Eligible
1950	195	365	0.5342
1951	125	365	0.3425
1952	95	366	0.2596
1953	95	365	0.2603

Table 2: Difference of Proportions Test for Draft Eligible Males versus Draft Eligible Females, 1950-1952

	p_m	p_f	p_m-p_f
Overall	0.3755	0.3736	0.0019 (0.0027)
Hispanic	0.3754	0.372	0.0034 (0.0105)
Non-Hispanic White	0.3739	0.375	-0.0011 (0.0034)
Non-Hispanic Black	0.3812	0.371	0.0102 (0.0055)
Non-Hispanic Other	0.366	0.3681	-0.021 (0.0168)
00-12 Years of Education	0.3703	0.3742	-0.0039 (0.0037)
13+ Years of Education	0.3811	0.3694	0.0117* (0.0047)
U.S. Natives	0.376	0.3735	0.0025 (0.0029)
Non-Natives	0.37	0.3758	-0.0058 (0.0100)
Never Married	0.3721	0.371	0.0011 (0.0060)
Have Been Married	0.3774	0.3742	0.0032 (0.0031)

*p<0.05, standard errors in parentheses

Table 3: Difference of Proportions Test for Observed versus Expected Draft Eligible Males, 1950-1952

	p_{EM}	$\hat{p}_{EM}$	$p_{EM} - \hat{p}_{EM}$
Overall	0.3755	0.3788	-0.0033 (0.0022)
Hispanic	0.3754	0.3788	-0.0034 (0.0079)
Non-Hispanic White	0.3739	0.3788	-0.0049 (0.0028)
Non-Hispanic Black	0.3812	0.3788	0.0024 (0.0047)
Non-Hispanic Other	0.3660	0.3788	-0.0128 (0.0146)
00-12 Years of Education	0.3703	0.3788	-0.0085* (0.0030)
13+ Years of Education	0.3811	0.3788	0.0023 (0.0040)
U.S. Natives	0.3760	0.3788	-0.0028 (0.0024)
Non-Natives	0.3700	0.3788	-0.0088 (0.0082)
Never Married	0.3721	0.3788	-0.0067 (0.0042)
Have Been Married	0.3774	0.3788	-0.0014 (0.0027)

* p<0.01, standard errors in parentheses

Table 4: Difference of Proportions Test by Cause of Death for Draft Eligible Males versus Draft Eligible Females,1950-1952

Cause of Death	p_m	p_f	p_m-p_f
Malignant Neoplasms	0.3703	0.3761	-.0058 (0.0064)
Ischemic Heart Disease	0.3780	0.3808	-0.00228 (0.0097)
Chronic Liver Disease and Cirrhosis	0.3776	0.3821	-0.0045 (0.0140)
M.V. Accidents	0.3809	0.3763	0.0046 (0.0126)
Suicide	0.3665	0.3753	-0.0088 (0.0136)

standard errors in parentheses

Table 5: Difference of Proportions Test by Cause of Death for Observed Proportion of Draft Eligible Males versus Expected Proportion of Draft Eligible Males, 1950-1952

Cause of Death	p_{EM}	$\hat{p}_{EM}$	$p_{EM} - \hat{p}_{EM}$
Malignant Neoplasms	0.3703	0.3788	-.0085 (0.0056)
Ischemic Heart Disease	0.3780	0.3788	-0.0008 (0.0063)
Chronic Liver Disease and Cirrhosis	0.3776	0.3788	-0.0012 (0.0098)
M.V. Accidents	0.3809	0.3788	0.0021 (0.0097)
Suicide	0.3665	0.3788	-0.0123 (0.0092)

standard errors in parentheses

Appendix A: Coding Classifications for Underlying Cause of Death

Cause of Death	ICD-9[a]	ICD-10[b]
Ischemic Heart Disease	410-414	I20-I25
Chronic Liver Disease and Cirrhosis	571	K70, K73-K74
Motor Vehicle Accidents	E810-E825	V02-V04, V09.0, V12-V14,V19.0-V19.2, V19.4-V19.6,V20-V79,V80.3-V80.5,V81.0-V81.1,V82.0-V82.1,V83-V86, V87.0-V87.8,V88.0-V88.8,V89.0, and V89.2
Suicide	E950-E959	U03,X60-X84, and Y87.0
Malignant Neoplasms[c]	150-159, 160-165, 188-189, 204-208, 140-149, 170-173, 190-203	C16, C18-C21, C25, C33-C34, C64-C68, C82-C85, C91-C95, C00-C15, C17, C22-C24, C26-C32, C37-C49, C51-C52, C57-C60, C62-C63, C69-C81, C88, C90, C96-C97

[a] Years 1989-1998
[b] Years 1999-2002
[c] Malignant neoplasms excludes neoplasms of the breast and genital organs for both men and women decedents