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Military Combat and Risk of Coronary Heart Disease and Ischemic Stroke in Aging Men: the Atherosclerosis Risk in Communities (ARIC) Study

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Abstract

Purpose: To assess the long-term association of military combat stress with coronary heart disease (CHD) and ischemic stroke (IS).

Methods: The association between exposure to military combat and the occurrence of CHD and IS was assessed among 5,347 men in the Atherosclerosis Risk in Communities (ARIC) study. Outcomes were assessed an average of 36 years after entry into military service during the eras of World War II, the Korean War and the Vietnam conflict.

Results: Veterans were more likely to be older, white and of higher socioeconomic status than non-veterans. No differences in CHD period prevalence rates were noted among the three exposure groups, overall or by era of service. Associations between combat and ischemic stroke period prevalence may be modified by father's education, although confidence intervals were wide and event rates small.

Conclusions: Overall, middle-aged veterans with distant combat exposure are not at increased cardiovascular risk compared to those without combat exposure.

Keywords

combat; veteran; heart disease; ischemic stroke; cardiovascular disease

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INTRODUCTION

Military service can have positive as well as negative consequences (1,2) and both short-term and long-term effects.(3,4) The psychosocial stress experienced by veterans with a history of active combat has both psychological and physical components.(3,5) Approximately 65% of American men over the age of 55 served in World War II or the Korean conflict and about 25% of older American men were exposed to combat early in their lives. (3,6) Yet the long-term effects of associated exposures are so little studied that they are considered a “hidden variable” in the aging of older American men. (2,3) Studies report higher rates of adverse behaviors, (7) psychological conditions (8) and self-reported health conditions (9,10) among those with combat exposure. However, studies of the long-term cardiovascular consequences of combat stress are limited, and inconclusive. (3,11) We report on the association between exposure to military combat and coronary heart disease (CHD) and ischemic stroke (IS) in a community-based sample of men serving during the eras of World War II, the Korean War and the Vietnam Conflict.

METHODS

Study population

The Atherosclerosis Risk in Communities (ARIC) Study is a community-based study designed to investigate the etiology of cardiovascular disease (CVD) and atherosclerosis. At baseline (1987–1989), there were 15,792 African-American and Caucasian men and women ages of 45 to 64 years, sampled from four U.S. communities: Minneapolis, MN; Washington County, MD; Jackson, MS; and Forsyth County, NC. Participants from MN and MD were Caucasian; African-American participants were sampled exclusively in MS. The NC center included both African-American and Caucasian participants with an over-sampling of African-Americans. At baseline, standardized interviews obtained health history, sociodemographic and behavioral risk data. Trained and certified technicians performed standardized physical exams and subclinical CVD measurements and collected fasting blood samples. Detailed design and procedures information is published, (12,13) and quality control and study protocol information is available at http://www.cscc.unc.edu/aric. Participants underwent three additional triennial examinations, the last occurring in 1997–1999. Survivors are contacted annually to ascertain vital status, health status and hospitalizations, with a 94% success rate.

Ancillary to ARIC, the Life Course Socioeconomic Status, Social Context and Cardiovascular Disease (LC-SES) Study was initiated in 2001 to examine the association between SES across the life course and adult cardiovascular conditions. Participants were also asked about military and combat exposures. Detailed design and procedures information is published (14) and available at http://www.lifecourseepi.info. An average of fifteen years after baseline, cohort survivors were between 57 and 79 years old. The LC-SES interview included 12,716 participants, representing 81% of baseline ARIC participants and 91% of cohort survivors.

Exclusions

Because only 49 women LC-SES participants reported military service, this study was limited to men. Because testing of modification by race was of interest, men with a race other than African-American or Caucasian (n=14) and African-Americans from Washington County or Minneapolis (n=21) were excluded due to limited numbers. Further excluded were 53 men with missing/unknown military service status, leaving 5,347 men for analyses.

Military service and combat exposures

During the LC-SES interview, participants were asked about military service. Participants reporting service were further queried about: [1] age at entry, [2] years of service, and whether

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they [3] served in a combat zone, [4] were ever under fire or fired at the enemy, [5] saw others wounded or killed or [6] were ever wounded or missing in action. (15) Combat exposure was established based on a positive response to one or more of questions 3–6. A three-level exposure variable was derived: no history of military service (non-veterans), history of military service without exposure to combat (non-combat veterans) and history of military service with exposure to combat (combat veterans). Combat and non-combat veterans were each compared separately to non-veterans, and, independently, combat and non-combat veterans were compared to one another in analyses that excluded non-veterans.

Era of service was determined using age at entry and duration of service. Veterans served during the eras of World War II (1941–1945), the Korean War (1950–1953) and the Vietnam Conflict (1961–1975). Veterans who served during multiple conflict eras were categorized using their first era of service, as this was their initial, and possibly defining, military experience. Veterans who served between periods of defined conflict were included in total analyses but were not grouped into a discrete category for era-specific analyses, as they were deemed too heterogeneous to provide meaningful results.

Risk factors

Cardiovascular risk factors measured at baseline included total cholesterol, high density lipoprotein (HDL) cholesterol, current smoking status, systolic blood pressure (SBP), use of BP medications in the past two weeks, prevalent diabetes mellitus, and left ventricular hypertrophy (LVH). Plasma total cholesterol (mg/dL) was measured using an established enzymatic method, (16) and HDL cholesterol (mg/dL) was measured after dextran-magnesium precipitation of non-high density lipoproteins. (17) Smoking status and use of blood pressure medications was based on self-report. (18) Three seated BP measurements were taken with a random-zero mercury sphygmomanometer, and the average of the last two measurements used. Prevalent diabetes was defined as a fasting glucose level $\geq$126 mg/dL, a non-fasting glucose level $\geq$200 mg/dL or a self-reported diagnosis of diabetes or use of diabetic medication. LVH by electrocardiography was defined by the Cornell score. (19,20)

Baseline sociodemographic factors included age, self-reported race and highest level of education (< high school; high school or equivalent; > high school). Childhood SES was measured by father's highest level of education, reported at the LC-SES interview.

CHD and IS events

Detailed descriptions of the methods of ascertainment of CHD and IS events have been published. (21,22) Briefly, events were ascertained by annual follow-up interview and surveillance of hospital discharges in the ARIC study areas and validated by abstraction of hospital discharge records and death certificates followed by classification according to ARIC study criteria that include trained physician reviewers. (23,24) Out-of-hospital deaths were ascertained through death certificates and, when available, coroner or autopsy reports. Events were included from enrollment in ARIC (1987–1989) until December 31, 2004.

A CHD event was defined as a validated definite or probable hospitalized myocardial infarction (based on a combination of chest pain symptoms, ECG changes, and cardiac enzyme levels) or a definite MI or CHD death (based on chest pain symptoms, underlying death certificate cause of death, and other information from the hospital chart, medical history or ARIC visit), or a silent MI by electrocardiography. An IS event was defined as a validated definite or probable hospitalized embolic or thrombotic stroke, classified according to symptom type, duration and severity as well as results of neuroimaging and other diagnostic procedures and autopsy evidence, when available. (25,26)

Statistical analysis

Baseline distributions of military experiences and socioeconomic and CVD risk factors were presented separately for the three exposure groups and compared using Student t-tests for continuous variables and chi-square tests for categorical variables. Period prevalence (PP) rates were calculated by dividing the number of events by the total time experienced for the participants followed. PP rate ratios (PPR) and 95% confidence intervals (CI) were calculated using Poisson regression, (27) with CHD and stroke event rates were modeled on a logarithmic scale as a function of military and combat exposure status. Two models were fit for each outcome (CHD and IS): one model comparing combat and non-combat veterans with a non-veteran referent and a second model comparing combat veterans to a non-combat veteran referent.

PPRs and 95% CIs were derived using a backward elimination strategy. First, sociodemographic factors shown in Table 1 were included to assess interaction and confounding, where appropriate, for consideration in full models. For models comparing the two veteran groups, era and duration of service were also tested for confounding and interaction. Because of the likelihood that physiologic risk factors presented in Table 2 were involved as intermediates, such variables were not assessed as confounders, (28) as conditioning on intermediates can lead to biased estimates of total effects. (29) Variables were included in full models if adjustment resulted in a 10% or greater change in estimate. Inclusion of variables in the final models was based on results of $p<0.1$ for -2 Log Likelihood tests for interaction terms and change in estimate of 10% or more for confounders. SAS statistical software Version 8.02 was used for all analyses. (30)

RESULTS

This study included 5,347 men: 2,042 non-veterans, 2,127 non-combat veterans and 1,178 combat veterans. Combat veterans were more likely to have served during World War II than noncombat veterans (41% vs. 15%) and less likely to have served during the Vietnam Conflict (17% vs. 24%; Table 1). Compared to non-combat veterans, combat veterans' mean age at induction was approximately one year younger (19 vs. 20 years) and mean duration of service was almost 2 years longer (3 vs. 5 years). Service in a combat zone was the most commonly reported combat exposure (83%), followed by having seen others wounded or killed during the war (73%), and having been under fire or fired at the enemy (60%). Only 13% of combat veterans reported having been wounded or missing during war.

Veterans were older and more likely to be white and of higher SES than non-veterans (Table 2). Compared to non-veterans, both combat and non-combat veterans were less likely to currently smoke than non-veterans ($p<0.01$), less likely to have prevalent LVH ($p=0.07$ and 0.02, respectively), and less likely to have elevated SBP ($p<0.01$). Non-combat veterans were less likely to be diabetic than either non-veterans ($p<0.01$) or combat veterans ($p=0.01$). Compared to both non-veterans and non-combat veterans, combat veterans had the highest average total cholesterol ($p=0.01$ and 0.05) and the lowest average HDL cholesterol ($p<0.01$ and <0.01).

From 1987 through 2004, 632 validated definite and probable CHD events occurred (Table 3), representing 11.6% of non-veterans, 11.3% of non-combat veterans and 13.2% of combat veterans. For models with a non-veteran referent, both full and final models included baseline age and adult education. For the model with a non-combat referent, duration of service dropped out during model selection, leaving a full model with only baseline age. There were no significant differences in CHD rates between non-combat veterans compared to non-veterans or between combat veterans compared to non-veterans (Table 3). When the two veteran groups

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were compared, although tests of homogeneity suggested difference in effect by era and although the direction of effects differed by era, CIs overlapped considerably.

From 1987 through 2004, 234 validated IS events occurred, representing 4.4% of non-veterans, 3.7% of non-combat veterans and 5.7% of combat veterans. The full model with a non-veteran referent included baseline age, race, adult education, father's education and interactions with father's education and race. The final model included baseline age, father's education and interaction with race. Although the interaction with race was significant, CIs overlapped considerably; therefore, combined results are presented. For the model with a non-combat veteran referent, the full model included baseline age and interactions with father's education and era of service, while the final model included only baseline age and interaction with father's education.

Although both combat and non-combat veterans had elevated IS rates compared to non-veterans in adjusted analyses (Table 4), CIs overlapped considerably. When the two veteran groups were compared, among veterans whose fathers had less than a high school education, IS PP rates were 79% higher among combat veterans, even after age adjustment (95% CI: 1.10–2.91).

DISCUSSION

Our study suggests that middle-aged veterans with a history of distant combat exposure are not at increased cardiovascular risk compared to those without combat exposure. Similarly, studies of Vietnam Conflict veterans comparing theater and non-theater veterans reported no significant differences in circulatory disorder mortality rates 20–30 years post-service (31–34) or in relative risks of circulatory disease 16 years post-service. (35) A study of World War II and Korean War veterans, however, reported higher heart disease and stroke mortality among prisoners of war (POW) compared to both non-POW veterans and non-veterans 50 years post-service. (36) Additionally, combat was associated with increased chronic disease mortality 15 years post-service in a cohort of World War II veterans. (9) Methodological differences (e.g., varying exposure definitions, endpoints, covariate adjustment, follow-up times, study designs and populations) complicate the establishment of a clear consensus.

Although veterans' CHD risk was not elevated in our study, an alternative explanation may be provided by the "healthy-warrior effect," whereby servicemen tend to be healthier than civilians due to military selection requirements. (37) Accordingly, the lack of a finding of *improved* health among veterans may suggest that health status was diminished as a result of military service. However, the lack of a difference in CHD risk between combat and non-combat veterans suggests that combat exposure is not associated with increased CHD risk.

Consistent with earlier reports, (38,39) combat and IS risk are positively associated only among men with low SES fathers. Childhood SES can influence both military factors (e.g., military service, rank and combat exposure) and health factors (e.g., skills and resources to cope with stress, health behaviors). Adult SES may be influenced by military service (e.g., education during or after service through government opportunities and benefits). Some postulate that combat exposure positively or neutrally affects people with a higher pre-military SES and negatively affects those with lower pre-military SES. (40) Accordingly, persons with fewer social and economic resources have more difficulty overcoming the negative effects of a traumatic life, while those from more privileged backgrounds are less negatively or even positively affected by combat. Although confidence intervals are wide and event rates small, our results are consistent with the hypothesis that men who entered the military at a socioeconomic disadvantage were more negatively affected by combat exposure than those with more resources.

Strengths and limitations

Key advantages of this study include validated cardiovascular risk factor and outcome measures, data from a large community-based cohort and a long follow-up time. Additionally, we included men from three different eras of military conflict and both military and civilian controls.

Because combat exposure was based on self-report, recall bias could have affected results if men in worse health differentially recalled their military experiences. Use of self-reported combat experiences has precedent (2,41,42) with reports of high reliability (43) and validity, with little evidence of falsification of traumatic experiences. (44) Still, we pursued ways to validate this information. Unfortunately, exposure to specific traumatic experiences (e.g., being under enemy fire, witnessing killing) is not captured in military service records, and veteran status, age of enlistment, duration of service and service in combat zone were not available on the majority of this cohort due to fire in National Archives Records Administration in St. Louis, MO in 1973 that destroyed most World War II and Korean War era military service records. Other validation methods were explored but deemed unfeasible as most sources (e.g., obituaries, POW lists, Medal of Honor lists, Agent Orange registry) are not population-based and would not yield appropriate data on a representative sample.

Unmeasured psychological disorders such as post-traumatic stress disorder (PTSD) may have played a role in observed relationships. (45–49) The development and persistence of PTSD has been directly associated with combat exposure among veterans, (2,50–52) and with plasma cortisol and other inflammatory markers. (53,54) While it would have been of interest to provide results stratified on PTSD status, this information is not available in our data. Other potential modifiers, though unavailable in these data, may include religious faith, other psychiatric conditions and pre- and post-military traumatic experiences.

Left censoring is a potential concern in nearly all prospective cohort studies with an outcome with inception in adulthood. While we cannot rule out differential post-service CVD mortality preceding ARIC enrollment, given low CVD mortality rates in young adulthood, any bias, if extant, is not expected to threaten the validity of our findings.

Right censoring is of greater potential concern. Combat exposure was not assessed until 12–14 years after baseline, at which time 17% of male baseline participants had died. To address this concern we conducted a pilot study on a subset of decedents from NC for whom veteran status was recorded on death certificates. We found a small (2%) but not statistically significant excess mortality among veterans, even after adjustment for age, race and education. We also conducted a sensitivity analysis to estimate the extent to which differential survival may have influenced observed results by comparing observed prevalence rates with those corrected for selection bias. (55) Applying adjusted mortality rates from the pilot study to hypothetical data with CHD as the outcome, and assuming that those who developed CHD were 1.5 times more likely to die before providing data on military history than those who did not develop CHD, our prevalence rate was underestimated by only 1.5%. Under a more extreme scenario – where the difference in mortality is assumed to be higher than was found in the pilot study (e.g., 14% for non-veterans and 18% for veterans, a 29% difference in mortality) and assuming those who developed CHD are twice as likely to die prior to providing their military history – the observed estimate still only differs from the corrected estimate by 7%. These results suggest that the potential magnitude of survivorship bias, if extant, is small.

Conclusions

These findings suggest that, overall, middle-aged men with a history of distant military and combat exposure are not at increased long-term cardiovascular risk; however, vulnerability to the ill effects of combat stress may be higher among men from lower socioeconomic backgrounds. Future studies in other populations – particularly ones that include women and persons from other races and ethnicities – should continue to explore socioeconomic and inter-era differences in the long term health effects associated with military and combat exposure. These findings provide key groundwork for future work on the lasting effects of traumatic stress of large potential impact in public health, particularly given the continued pervasiveness of military service and combat in our society today.

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ABBREVIATIONS AND ACRONYMS

ARIC	Atherosclerosis Risk in Communities
CI	confidence interval
CHD	coronary heart disease
CVD	cardiovascular disease
ECG	electrocardiograph
HDL	high density lipoprotein
IS	ischemic stroke
LC-SES	Life Course Socioeconomic Status, Social Context and Cardiovascular Disease
LVH	left ventricular hypertrophy
MI	myocardial infarction
NARA	National Archives Records Administration
POW	prisoner of war
PP	period prevalence
PPR	period prevalence ratios
PTSD	post-traumatic stress disorder
SBP	systolic blood pressure
SES	socioeconomic status

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Table 1

Profile of military and combat background reported by male veterans: ARIC Study participants who completed the LC-SES interview (2001–2002).

	Mean (SD) or n (%)		
	Non-Combat Veteran[1] (N=2127)	**Combat Veteran[1] (N=1178)**	**p-value[2]**
MILITARY HISTORY			
Mean (SD) Age in years at induction into service	19.8 (2.4)	19.1 (2.2)	<0.01
Mean (SD) Years of service	3.1 (3.2)	4.9 (5.6)	<0.01
n (%) Served during World War II era	314 (14.8)	478 (40.6)	<0.01
Korean War era	675 (31.7)	407 (34.6)	0.10
Vietnam Conflict era	506 (23.8)	198 (16.8)	<0.01
COMBAT HISTORY			
n (%) Served in combat zone		975 (82.8)	
n (%) Under enemy fire or fired at enemy		700 (59.7)	
n (%) Saw wounded or killed		853 (72.7)	
n (%) Ever wounded or missing		154 (13.1)	

[1] Combat Veterans are identified by a summary variable based on whether or not the individual served in the military and, if so, whether the individual (1) served in a combat zone, (2) was under enemy fire or fired at enemy, (3) saw wounded or killed during war, and/or (4) was ever wounded during war; Non-Combat Veterans are defined as those who served in the military but did not report any combat exposures (1–4).

[2] p-values from Student t-tests for continuous variables and chi-square tests for categorical variables.

Table 2

Baseline (1987–1989) sociodemographic and risk factor profile of men by military/combat status: ARIC Study participants who completed the LC-SES interview (2001–2002).

	Military/Combat Group[1]					
	Non- Veteran (N=2042)	Non-Combat Veteran (N=2127)		Combat Veteran (N=1178)		p-value[2]
	Mean (SD) or n (%)	Mean (SD) or n (%)	p-value[2] vs. Non-Veteran	Mean (SD) or n (%)	p-value[2] vs. Non-Veteran	vs. Non- Combat Veteran
DEMOGRAPHICS						
Mean (SD) Age in years at baseline	51.8 (5.2)	54.1 (5.1)	<0.01	57.3 (5.8)	<0.01	<0.01
n (%) Black	643 (31.5)	278 (13.1)	<0.01	155 (13.2)	<0.01	0.94
n (%) Education <high school	625 (30.7)	244 (11.5)	<0.01	209 (17.8)	<0.01	<0.01
n (%) Father's education <high school [3]	1010 (72.7)	1102 (65.1)	<0.01	634 (69.0)	0.06	0.05
RISK FACTORS						
n (%) Current cigarette smoking status 4	541 (26.5)	473 (22.3)	<0.01	247 (21.0)	<0.01	0.40
n (%) Blood pressure-lowering medications in past 2 weeks	493 (24.1)	495(23.3)	0.53	301 (25.6)	0.36	0.14
n (%) Prevalent left ventricular hypertrophy [5]	48 (2.4)	29 (1.4)	0.02	17 (1.5)	0.07	0.89
n (%) Prevalent diabetes	213 (10.6)	167 (7.9)	<0.01	123 (10.5)	0.95	0.01
Mean (SD) Systolic BP (mmHg)	121.8 (17.6)	119.9 (16.3)	<0.01	122.5 (16.7)	<0.01	0.22
Mean (SD) Total cholesterol (mg/dL)	209.7 (39.8)	210.7 (37.9)	0.42	213.5 (40.4)	0.01	0.05
Mean (SD) HDL cholesterol (mg/dL)	44.8 (13.5)	44.2 (13.2)	0.11	43.7 (12.8)	0.02	0.36

NOTE: Because of missing data, N differs for some variables. Some columns may not sum to 100% due to rounding.

[1] Combat Veterans are identified by a summary variable based on whether or not the individual served in the military and, if so, whether the individual (1) served in a combat zone, (2) was under enemy fire or fired at enemy, (3) saw wounded or killed during war, and/or (4) was ever wounded during war; Non-Combat Veterans are defined as those who served in the military but did not report any combat exposures (1–4).

[2] p-values from Student t-tests for continuous variables and chi-square tests for categorical variables.

[3] 652 non-veterans, 320 non-combat veterans and 240 combat veterans missing natural father's education; percentages shown using denominator of non-missing participants.

[4] Current cigarette smoking is defined as self-report of smoking one or more cigarettes per year at baseline; Heavy cigarette years of smoking is calculated by multiplying the number of cigarettes smoked per year by the number of years the individual has been smoking and is defined as having smoked 660 or more cigarettes; Physical inactivity is defined as having a sports activity index score less than 2.0.

[5] Presence of left ventricular hypertrophy was determined electrocardiographically using the Cornell criteria.

Table 3

Observed cumulative period prevalence (PP) rates and adjusted prevalence rate ratios (PPR)[1] of coronary heart disease (CHD) by military service and combat history: ARIC Study participants who completed the LC-SES interview (2001–2002).

	Military/Combat Group[2] TOTAL		
Referent = Non-veterans	**Non-Veteran**	**Non-Combat Veteran**	**Combat Veteran**
N	2042	2127	1178
n (%) events	236 (11.56)	240 (11.28)	156 (13.24)
PP per 10,000 person-years	17.18	16.22	18.23
PPR (95% CI)			
Crude	REF	0.98 (0.82, 1.17)	1.15 (0.94, 1.40)
Full Model[3]	REF	0.95 (0.79, 1.15)	0.97 (0.77, 1.21)
Final Model[3]	REF	0.95 (0.79, 1.15)	0.97 (0.77, 1.21)

	Military/Combat Group[2] BY ERA OF SERVICE					
	Non-Combat Veteran			Combat Veteran		
Referent = Non-combat veterans	**World War II**	**Korean War**	**Vietnam Conflict**	**World War II**	**Korean War**	**Vietnam Conflict**
N	314	675	506	478	407	198
n (%) events	47 (14.97)	76 (11.26)	48 (9.49)	70 (14.64)	61 (14.99)	13 (6.57)
PP per 10,000 person-years	19.51	15.67	14.90	18.80	20.87	10.39
PPR (95% CI)						
Crude	REF	REF	REF	0.98 (0.68, 1.42)	1.33 (0.95, 1.86)	0.69 (0.38, 1.28)
Full Model[4]	REF	REF	REF	0.96 (0.64, 1.42)	1.28 (0.91, 1.80)	0.67 (0.35, 1.28)
Final Model[5]	REF	REF	REF	0.96 (0.65, 1.42)	1.31 (0.93, 1.83)	0.70 (0.38, 1.30)

[1] Adjusted PRRs (95% confidence intervals) compare (1) combat and non-combat veterans with non-veterans in one model and (2) combat with non-combat veterans in a separate in a model excluding non-veterans.

[2] Combat Veterans are identified by a summary variable based on whether he served in the military and, if so, whether he (1) served in a combat zone, (2) was under enemy fire or fired at enemy, (3) saw wounded or killed during war, and/or (4) was ever wounded during war; Non-Combat Veterans are defined as those who served in the military but did not report any combat exposures (1–4).

[3] Adjusted for baseline age and adult education.

[4] Adjusted for baseline age and length of service.

[5] Adjusted for baseline age.

Table 4

Observed cumulative period prevalence (PP) rates and adjusted prevalence rate ratios (PPR)[1] of ischemic stroke (IS) by military service and combat history: ARIC Study participants who completed the LC-SES interview (2001–2002).

	Military/Combat Group[2] TOTAL		
Referent = Non-veterans	**Non-Veteran**	**Non-Combat Veteran**	**Combat Veteran**
N	2042	2127	1178
n (%) events	89 (4.36)	78 (3.67)	67 (5.69)
PP per 10,000 person- years	6.43	5.22	7.76
PPR (95% CI)			
Crude	REF	0.84 (0.62, 1.14)	1.31 (0.95, 1.79)
Full Model[3]	REF	2.28 (0.64, 8.16)	1.48 (0.35, 6.32)
Final Model[4]	REF	1.49 (0.89, 2.49)	1.68 (0.96, 2.95)

	Military/Combat Group[2] BY FATHER'S HIGHEST LEVEL OF EDUCATION			
	Non-Combat Veteran		Combat Veteran	
Referent = Non-combat veterans	**< High School**	**≥ High School or Equivalent**	**< High School**	**≥ High School or Equivalent**
N	1102	590	634	285
n (%) events	33 (2.99)	21 (3.56)	41 (6.47)	9 (3.16)
PP per 10,000 person-years	4.24	5.13	8.74	4.37
PPR (95% CI)				
Crude	REF	REF	2.16 (1.37, 3.42)	0.89 (0.41, 1.94)
Full Model[5]	REF	REF	1.25 (0.43, 3.61)	0.33 (0.06, 1.81)
Final Model[6]	REF	REF	1.79 (1.10, 2.91)	0.63 (0.28, 1.44)

[1] Adjusted PRRs (95% confidence intervals) compare (1) combat and non-combat veterans with non-veterans in one model and (2) combat with non-combat veterans in a separate in a model excluding non-veterans.

[2] Combat Veterans are identified by a summary variable based on whether he served in the military and, if so, whether he (1) served in a combat zone, (2) was under enemy fire or fired at enemy, (3) saw wounded or killed during war, and/or (4) was ever wounded during war; Non-Combat Veterans are defined as those who served in the military but did not report any combat exposures (1–4).

[3] Adjusted for baseline age and includes interaction with father's education and race.

[4] Adjusted for baseline age and father's education and includes interaction with race.

[5] Adjusted for baseline age and includes interaction with era of service.

[6] Adjusted for baseline age.