Military service and amyotrophic lateral sclerosis in a population-based cohort: extended follow-up 1979-2011

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eTable1: Hazard Ratios for ALS by Military Service Among Women.

	No. ALS Deaths (Total=225)	No. Followed (Total= 738,120)	Adjusted[a] HR (95% CI)
Veteran			
Yes	5	9975	1.3 (0.5, 3.2)
No	220	728,145	Reference
Period of Service			
WWI[b]	0	19	-
WWII	≤5 *	1360	1.8 (0.6, 5.2)
Korean War[b]	0	669	-
Vietnam War[b]	0	2728	-
Persian Gulf War[b,c]	0	1510	-
Other	≤5 *	3689	2.6 (0.5, 13)
No Service	220	728,145	Reference

[a]Adjusted for age (time metameter), race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, non-Hispanic other), education (less than high school, high school, some college, college, postgraduate), and percent poverty (the ratio of the actual family income to the poverty threshold defined by the number of people in the household; <=200%, 201-300%, 301-500%, >500%).
[b]There were no ALS deaths in these groups, thus a HR could not be estimated
[c]Includes any war in this region since 2000
*Exact cell counts not available for publication due to US Census Bureau Regulations
Abbreviations: CI=confidence interval; HR=hazard ratio; WWI= World War I, WWII= World War II; ALS= amyotrophic lateral sclerosis

eAppendix: additional methods, results, and discussion

To assess (birth) cohort effects, we examined the birth years of those who reported serving in each war, then restricted those years to exclude people who would have been less than 16 at the end of the war or in the oldest 2-3%. The restricted cohort therefore represented the bulk of birth years for those who served in a given war and allowed comparison of service among those who could have served in the given war. Three birth cohorts were created in this way (eTable 2). The Cox regression models were run separately for each birth cohort (i.e., restricted to individuals in each of the birth ranges). The results were generally the same as analyses among everyone (the full cohort), although the World War II (WWII) effect was slightly stronger (eTable 2).

Secondly, we further stratified the analyses by quartiles of age at survey among those within the given birth year range (eTable 3). For all birth year ranges, the hazard ratios (HRs) decreased in the oldest age quartile. Although the reduced numbers of ALS deaths in these groups must be kept in mind, it is generally thought that death certificates do not capture ALS after age 75 as well as at younger ages,[1] so this could introduce some bias in the oldest age groups. However, this might be expected to be non-differential and so generally bias to the null rather than below. Survival bias could also be acting in these older age groups, which could bias results downward, even below the null.

The HRs for WWII and Korean War service in younger age quartiles were reasonably similar with associations with ALS seen for WWII service, but not the Korean War. For the Vietnam War, there was an increased HR in the youngest age at survey group, but no association with the other groups (eTable 3). While smaller numbers must be kept in mind, the elevated HR for service during the Vietnam era among the youngest age at survey group is intriguing. This could suggest that an association with service in Vietnam is time-restricted and relative to when service ended (those older at age of survey would be more likely to have had more years since service). Additionally, it could reflect a selection bias operative at younger ages. In this regard it is important to note that homelessness is a major issue among Vietnam veterans: nearly half of all homeless veterans are from the Vietnam era.[2,3] Since the National Longitudinal Mortality Study is based on a survey of households, homeless veterans would not be captured. As the risk of homelessness likely increases with time since service, if homeless individuals were more likely to get ALS (possibly related to service aspects that also drive homelessness; 33% of all homeless veterans served in a war zone),[4] this could bias effect estimates in the older age at survey groups downwards.

eReferences

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2. Rosenheck R, Gallup P, Leda CA. Vietnam era and Vietnam combat veterans among the homeless. *Am J Public Health*. 1991;81(5):643-646.

3. Gamache G, Rosenheck R, Tessler R. The proportion of veterans among homeless men: a decade later. *Soc Psychiatry Psychiatr Epidemiol*. 2001;36(10):481-485.

4. Corporation for Supportive Housing. Ending homelessness among veterans through permanent supportive housing. New York: Corporation for Supportive Housing; 2007.

eTable 2. Hazard Ratios (95% confidence interval) for ALS Among Men by Service During Specific War Periods, Restricted to Specific Birth Years of Participants.

Birth Year Range	Service Period	Adjusted[a] HR
1907 – 1928	No military service	Ref
	Service During World War II	1.5 (1.1, 2.0)
1925 - 1936	No military service	Ref
	Service During Korean War	0.9 (0.6, 1.3)
1935 – 1958	No military service	Ref
	Service During Vietnam War	0.9 (0.6, 1.2)

[a]Adjusted for age (time metameter), race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, non-Hispanic other), education (less than high school, high school, some college, college, postgraduate), and percent poverty (the ratio of the actual family income to the poverty threshold defined by the number of people in the household; <=200%, 201-300%, 301-500%, >500%).

eTable 3: Hazard Ratios (95% confidence intervals) for ALS, for each birth cohort, stratified by quartiles (Q) of age at survey (males only).

Birth Year Range	Age at Survey Quartile	Service period	No. Followed	No. ALS Deaths	Adjusted[a] HR (95% CI)
1907-1928 WWII Era	Q1 (Ages <60)	No military service	12810	15	Ref.
		WWII service	28812	71	1.6 (0.9, 2.9)
	Q2 (Ages 60-65)	No military service	14245	14	Ref.
		WWII service	24321	45	1.9 (1.0, 3.5)
	Q3 (Ages 66-72)	No military service	24034	29	Ref.
		WWII service	20321	41	1.8 (1.0, 3.0)
	Q4 (Ages >72)	No military service	19957	21	Ref.
		WWII service	19373	22	1.0 (0.6, 1.9)
1925-1936 Korean War Era	Q1 (Ages <51)	No military service	16866	20	Ref.
		Korean War service	15215	20	0.9 (0.5, 1.6)
	Q2 (Ages 51-55)	No military service	10457	16	Ref.
		Korean War service	9478	18	1.1 (0.6, 2.3)
	Q3 (Ages 56-65)	No military service	12798	16	Ref.
		Korean War service	10529	15	1.4 (0.7, 2.8)
	Q4 (Ages >65)	No military service	13617	17	Ref.
		Korean War service	11752	7	0.4 (0.2, 1.0)
1935-1958 Vietnam War Era	Q1 (Ages <36)	No military service	95759	29	Ref.
		Vietnam War service	26983	20	1.8 (1.0, 3.3)
	Q2 (Ages 36-43)	No military service	74485	53	Ref.
		Vietnam War service	23338	11	0.6 (0.3, 1.2)
	Q3 (Ages 44-52)	No military service	78872	43	Ref.
		Vietnam War service	20297	12	0.8 (0.4, 1.6)
	Q4 (Ages >52)	No military service	68898	27	Ref.
		Vietnam War service	25516	5	0.5 (0.2, 1.2)

[a]Adjusted for age (time metameter), race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, non-Hispanic other), education (less than high school, high school, some college, college, postgraduate), and percent poverty (the ratio of the actual family income to the poverty threshold defined by the number of people in the household; <=200%, 201-300%, 301-500%, >500%).