Supplementary Data

Military Service, Deployments, and Exposures in Relation to Amyotrophic Lateral Sclerosis Etiology

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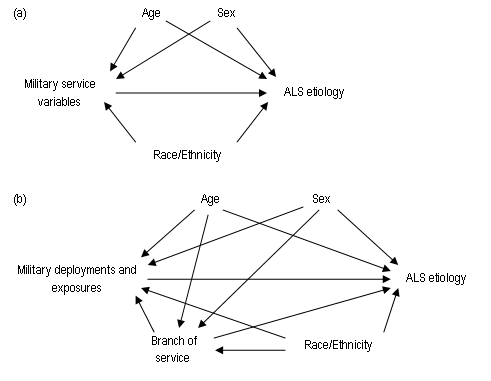
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Figure S.1. Directed acyclic graphs for: (a) military service factors and ALS etiology in GENEVA ([Schmidt et al., 2008](#_ENREF_11)) and (b) military deployments and exposures and ALS etiology in GENEVA ([Schmidt et al., 2008](#_ENREF_11)). Abbreviations: ALS, amyotrophic lateral sclerosis; GENEVA, Genes and Environmental Exposures in Veterans with Amyotrophic Lateral Sclerosis study.



S.1. Explanation of Figure S.1.

We identified the following risk factors for amyotrophic lateral sclerosis (ALS) from previous literature to consider as potential confounders: age, sex, cigarette smoking, race/ethnicity, family history of ALS or other neurodegenerative diseases, physical trauma, head injury, physical activity/professional sports, geographic residence, occupation, and exposure to pesticides, electrical injury/shock or magnetic fields (non-ionizing radiation), lead or other heavy metals, or solvents. Occupation, pesticides, non-ionizing radiation, and solvents were also exposures of interest in our study. The directed acyclic graph (DAG) ([Glymour and Greenland, 2008](#_ENREF_5); [Greenland et al., 1999](#_ENREF_7)) shown in panel (a) of Figure S.1 corresponds to all analyses in which military service factors were the explanatory variables of interest. The arrows from age, sex, and race/ethnicity to military service factors and ALS etiology depict relationships between each covariate and military service factors and ALS etiology, respectively. We did not include family history of ALS or other neurodegenerative diseases and geographic residence in the DAG because they have not been associated with military service, deployments, and/or exposures previously. Similarly, we thought that the following covariates were potentially *affected* by and/or occurred temporally *after* military service, deployments, and/or exposures, so we did not include them in our DAG: cigarette smoking, physical trauma, head injury, physical activity/professional sports, occupation, and exposure to pesticides, electrical injury/shock or magnetic fields, lead or other heavy metals, or solvents.

The DAG shown in panel (b) of Figure S.1 corresponds to all analyses in which military deployments and exposures were the explanatory variables of interest. The addition of branch of service is the only difference between the DAGs shown in panels (a) and (b) of Figure S.1. Branch of service is related to both military deployments and exposures and ALS etiology.

S.2. Statistical analyses: inverse probability weights

As stated in the main text, we calculated three types of stabilized inverse probability weights (hereafter “weights”) ([Cole and Hernan, 2008](#_ENREF_4); [Hernan et al., 2004](#_ENREF_8)) to adjust for 1) matching factors and confounders in the MSASs, 2) potential bias resulting from missing data on ALSFRS-R score for 8% of Registry cases, and 3) potential selection bias from studying a case group that disproportionately included long-term survivors at GENEVA enrollment and a control group that may differ from U.S. military veterans at large ([Schmidt et al., 2008](#_ENREF_11); [Schmidt et al., 2010](#_ENREF_12)). We calculated confounding weights for each exposure separately, but used the same weights for missing ALSFRS-R score (cases only) and selection for every exposure. We calculated selection weights, which were actually composites of a series of selection weights, for cases and controls separately. We evaluated appropriateness of the various types of weights in our analyses using established criteria ([Cole and Hernan, 2008](#_ENREF_4)). We multiplied the three types of weights to obtain overall stabilized weights and applied these to unconditional logistic regression models containing the exposure of interest as the only explanatory variable in the same way sampling weights are applied when analyzing data from complex survey sampling designs ([Cole and Hernan, 2008](#_ENREF_4); [Robins et al., 2000](#_ENREF_10)).

We calculated stabilized confounding weights for each exposure separately ([Cole and Hernan, 2008](#_ENREF_4); [Robins et al., 2000](#_ENREF_10)) by fitting linear, logistic, or polytomous logistic regression models, depending on the nature of the exposure variable, to data for the 621 ALS cases and 958 controls in the Genes and Environmental Exposures in Veterans with Amyotrophic Lateral Sclerosis study (GENEVA) who had no missing data on any covariates used to calculate the confounding weights. We calculated the numerators of these weights as predicted probabilities of exposure from intercept only models and the denominators of these weights as predicted probabilities of exposure from models that included the matching factors (age, use of U.S. Department of Veterans Affairs [VA] health care system) and the covariates in the pertinent minimally sufficient adjustment set as independent variables. For the denominator models, we centered age at 60—the median age among controls—and modeled it with linear and quadratic terms. We chose this form for age after considering linear, quadratic, cubic, natural logarithm, categorical (5-year and 10-year groups), and spline terms ([Akaike, 1974](#_ENREF_1); [Howe et al., 2011](#_ENREF_9)) because it gave the lowest value of the Akaike Information Criterion (AIC) ([Akaike, 1974](#_ENREF_1); [Howe et al., 2011](#_ENREF_9)). We included use of VA health care system, sex, race/ethnicity, and branch of longest service (for military deployments and exposures only) in the denominator models after categorizing them as shown in Tables 1 and 3.

We calculated stabilized selection weights ([Cole and Hernan, 2008](#_ENREF_4); [Hernan et al., 2004](#_ENREF_8); [Robins et al., 2000](#_ENREF_10)) for ALS cases and controls separately because cases were enrolled from the U.S. National Registry of Veterans with ALS (hereafter “Registry”) ([Allen et al., 2008](#_ENREF_2)), whereas controls were enrolled from the Veterans Benefits Administration’s Beneficiary Identification and Records Locator System (BIRLS) database ([Schmidt et al., 2008](#_ENREF_11)) and these two sampling frames contained different types and breadths of data. Furthermore, the causes of participation in GENEVA and factors related to it likely differed among cases and controls. For example, the main causes of participation among cases were likely vital status and the progression of the disease and, therefore, factors related to ALS progression and survival were also likely related to participation. For controls, the main causes of participation were likely the matching strategy employed by the study design and other causes present in typical epidemiological studies (e.g., altruism). Therefore, the matching factors and other demographic factors were likely related to participation among controls ([Schmidt et al., 2008](#_ENREF_11); [Schmidt et al., 2010](#_ENREF_12)).

For cases, we calculated two different types of stabilized selection weights ([Cole and Hernan, 2008](#_ENREF_4); [Robins et al., 2000](#_ENREF_10)) by fitting logistic regression models to data for the 1,642 Registry cases who had diagnoses of clinically definite, probable, possible, or suspected ALS and no missing data on any covariates used to calculate the selection weights. One type of weights accounted for potential selection bias due to the death of cases before they could enroll in GENEVA, whereas the other type of weights accounted for potential selection bias due to all other reasons cases did not enroll in GENEVA (e.g., active refusal, unable to be contacted, etc.).

For selection due to death, we calculated three weights, one for each of the three intervals during which cases died during the GENEVA enrollment process (Figure 1) (e.g., the time from when cases consented for the DNA Bank to when they were contacted regarding enrollment in GENEVA). The dependent variable used for each interval weight was dichotomous (e.g., alive or dead at the end of the interval). For the numerators of these weights, we calculated the predicted probabilities of staying alive until the end of the interval of interest from intercept only models; and, for the denominators of the weights, we calculated the predicted probabilities conditional on race/ethnicity, being a current patient of a VA Medical Center, most recent diagnosis category, symptom onset site, time from symptom onset to diagnosis, time from diagnosis to enrollment in the Registry, and baseline (i.e., at enrollment in the Registry) ALS Functional Rating Scale-Revised (ALSFRS-R) score ([Cedarbaum et al., 1999](#_ENREF_3)).

For selection not related to death, we calculated five weights, one for each of the five intervals during which cases were lost in the GENEVA enrollment process (Figure 1). The dependent variable used for each interval weight was dichotomous (e.g., consented or not for the DNA Bank, etc.). For the numerators of these weights, we calculated the predicted probabilities of participating in the enrollment step that occurred at the end of the interval (e.g., consented for the DNA Bank) from intercept only models; and, for the denominators of the weights, we calculated the predicted probabilities conditional on the same covariates used for the death weights. For the three intervals in which cases died, the weights were calculated among cases who remained alive at the end of the interval.

We did not include the exposures of interest in the numerator or denominator models for any of the selection weights for cases because data on the exposures of interest were only available for the 621 cases who enrolled in GENEVA. We included race/ethnicity, most recent diagnosis category, and symptom onset site in the denominator models after categorizing them as shown in Tables 1 and 2. We modeled being a current patient of a VA Medical Center with a dichotomous variable (No, Yes). We modeled time from symptom onset to diagnosis with linear, quadratic, and cubic terms; time from diagnosis to enrollment in the Registry with a linear term; and baseline ALSFRS-R score with a restricted, quadratic spline with knots at 12, 34, and 44 based on percentiles of the distribution in GENEVA cases (we used SAS code from Howe et al. ([Howe et al., 2011](#_ENREF_9)) to create the splines). We chose these forms after considering linear, quadratic, cubic, natural logarithm, categorical, and spline terms ([Akaike, 1974](#_ENREF_1); [Howe et al., 2011](#_ENREF_9)) because they gave the lowest values of the AIC ([Akaike, 1974](#_ENREF_1); [Howe et al., 2011](#_ENREF_9)). Finally, we multiplied all eight selection weights for cases together to obtain the overall stabilized selection weights for cases.

For controls, we calculated a series of stabilized selection weights ([Cole and Hernan, 2008](#_ENREF_4); [Robins et al., 2000](#_ENREF_10)) by fitting logistic regression models to data for the 10,000 potential controls obtained from the BIRLS database who had no missing data on any covariates used to calculate the selection weights. These weights accounted for potential selection bias due to all reasons potential controls did not enroll in GENEVA (e.g., death, active refusal, unable to be contacted by telephone, etc.). We calculated seven weights, one for each of the seven intervals during which potential controls were lost in the GENEVA enrollment process (Figure 2) (e.g., the time from when invitations were mailed to potential controls to when they were contacted by telephone regarding enrollment in GENEVA). The dependent variable used for each interval weight was dichotomous (e.g., invitation mailed or not, etc.). For the numerators of these weights, we calculated the predicted probabilities of participating in the enrollment step that occurred at the end of the interval (e.g., invitation mailed) from intercept only models; and, for the denominators of the weights, we calculated the predicted probabilities conditional on year of birth, use of VA health care system, and their interaction.

We did not include the exposures of interest in the numerator or denominator models for any of the selection weights for controls because data on the exposures of interest were only available for the 958 controls who enrolled in GENEVA. For all denominator models for all seven selection weights, we modeled use of VA health care system with the categories shown in Table 1 and year of birth with a restricted, quadratic spline with knots at 1920, 1947, and 1974 based on percentiles of the distribution in the BIRLS potential controls (we used SAS code from Howe et al. ([Howe et al., 2011](#_ENREF_9)) to create the splines). We chose this form for year of birth after considering linear, quadratic, cubic, natural logarithm, categorical (10-year groups), and spline terms ([Akaike, 1974](#_ENREF_1); [Howe et al., 2011](#_ENREF_9)) because it gave the lowest value of the AIC ([Akaike, 1974](#_ENREF_1); [Howe et al., 2011](#_ENREF_9)). Finally, we multiplied all seven selection weights for controls together to obtain the overall stabilized selection weights for controls.

As mentioned previously, baseline ALSFRS-R score was missing for 8% of Registry cases. Because we included baseline ALSFRS-R score as a covariate in the denominator models for all eight stabilized selection weights for cases, we needed to calculate stabilized weights for missing baseline ALSFRS-R score ([Hernan et al., 2004](#_ENREF_8)) for cases only. Consequently, we fit logistic regression models to data for the 1,798 Registry cases who had diagnoses of clinically definite, probable, possible, or suspected ALS and no missing data on any covariates used to calculate the weights for missing baseline ALSFRS-R score. The dependent variable we used was dichotomous (missing baseline ALSFRS-R score or not). For the numerators of these weights, we calculated the predicted probabilities of not missing baseline ALSFRS-R score from an intercept only model; and, for the denominators of the weights, we calculated the predicted probabilities conditional on most recent diagnosis category, symptom onset site, time from symptom onset to diagnosis, and time from diagnosis to enrollment in the Registry.

We did not include the exposures of interest in the numerator or denominator models for the weights for missing ALSFRS-R score because data on the exposures of interest were only available for the 621 cases who enrolled in GENEVA. We included most recent diagnosis category and symptom onset site in the denominator models after categorizing them as shown in Table 2. We modeled time from symptom onset to diagnosis with the natural logarithm of a linear term and time from diagnosis to enrollment in the Registry with a restricted, quadratic spline with knots at 7.72, 13.24, 23.06, and 44.19 months based on percentiles of the distribution in the Registry cases not missing baseline ALSFRS-R score (we used SAS code from Howe et al. ([Howe et al., 2011](#_ENREF_9)) to create the splines). We chose these forms after considering linear, quadratic, cubic, natural logarithm, categorical, and spline terms ([Akaike, 1974](#_ENREF_1); [Howe et al., 2011](#_ENREF_9)) because they gave the lowest values of the AIC ([Akaike, 1974](#_ENREF_1); [Howe et al., 2011](#_ENREF_9)).

We used four criteria to evaluate the appropriateness of the weights in our analyses: (1) mean weight near one; (2) few extreme weights (e.g., < 0.05 or > 20); (3) positivity (i.e., “exposed and unexposed individuals at every level of the confounders” ([Cole and Hernan, 2008](#_ENREF_4), p. 657) or at every level of variables related to selection or missing baseline ALSFRS-R score [cases only] and the outcome of interest); and (4) bias–variance tradeoff ([Cole and Hernan, 2008](#_ENREF_4)). To informally assess the bias-variance tradeoff ([Greenland, 2008](#_ENREF_6); [Winer, 1978](#_ENREF_13)), we progressively truncated the overall stabilized weights by symmetrically resetting weights less or greater than a certain percentile (e.g., 1st and 99th, 5th and 95th, 10th and 90th, etc.) to the value of that percentile ([Cole and Hernan, 2008](#_ENREF_4)). Regarding the odds ratios (ORs) derived from the untruncated weights as the “true” values, we informally evaluated bias-variance tradeoff by looking at how features of both the weights (mean, minimum, maximum) and the corresponding ORs (bias, variance) changed with increasing truncation. Truncating the overall stabilized weights at the 0.5 and 99.5 percentiles appeared to be the best balance of bias and variance in the current analysis.

Table S.1. Dose-response for military exposures and amyotrophic lateral sclerosis in GENEVA.

|  | Cases | | Controls | | Adjusteda | | Adjustedb | | IP-weightedc | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Exposure | No. | % | No. | % | OR | 95% CI | OR | 95% CI | OR | 95% CI |
| Number of anthrax vaccine shots received prior to reference date |  |  |  |  |  |  |  |  |  |  |
| 0 (Median = 0) | 493 | 95 | 803 | 93 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| 1 (1) | 8 | 2 | 20 | 2 | 0.60 | 0.26, 1.40 | 0.79 | 0.33, 1.89 | 1.80 | 0.52, 6.29 |
| 2-3 (3) | 7 | 1 | 23 | 3 | 0.47 | 0.20, 1.11 | 0.54 | 0.22, 1.32 | 0.63 | 0.22, 1.83 |
| > 3 (5) | 9 | 2 | 21 | 2 | 0.63 | 0.28, 1.42 | 0.62 | 0.26, 1.46 | 1.02 | 0.30, 3.54 |
| Missing | 102 |  | 89 |  |  |  |  |  |  |  |
| Trendd |  |  |  |  | 0.87 | 0.75, 1.01 | 0.88 | 0.76, 1.03 | 1.09 | 0.82, 1.44 |
| Prior to reference date, number of years involved in testing, transporting or spraying herbicides for military purposes |  |  |  |  |  |  |  |  |  |  |
| 0 (0) | 450 | 96 | 908 | 97 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| 1 (1) | 10 | 2 | 17 | 2 | 1.30 | 0.59, 2.89 | 1.17 | 0.52, 2.61 | 3.00 | 0.74, 12.15 |
| > 1 (2) | 8 | 2 | 12 | 1 | 1.44 | 0.58, 3.55 | 1.65 | 0.65, 4.17 | 2.31 | 0.78, 6.80 |
| Missing | 151 |  | 19 |  |  |  |  |  |  |  |
| Trendd |  |  |  |  | 1.22 | 0.82, 1.82 | 1.25 | 0.83, 1.88 | 1.47 | 0.86, 2.53 |
| Year in which pyridostigmine bromide pills taken |  |  |  |  |  |  |  |  |  |  |
| Never taken pyridostigmine bromide pills | 531 | 97 | 882 | 97 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 1990 (1978) | 10 | 2 | 11 | 1 | 1.54 | 0.65, 3.67 | 1.57 | 0.64, 3.88 | e | e |
| > 1990 (1991) | 5 | 1 | 12 | 1 | 0.67 | 0.23, 1.93 | 0.83 | 0.27, 2.57 | e | e |
| Missing | 73 |  | 51 |  |  |  |  |  |  |  |
| Trend (IQR = 13)d, f |  |  |  |  | 0.22 | 0.04, 1.18 | 0.07 | < 0.01, 1.10 | 0.13 | 0.03, 0.63 |
| Total days taken pyridostigmine bromide pills |  |  |  |  |  |  |  |  |  |  |
| 0 (0.0) | 531 | 98 | 882 | 98 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| 1-4 (2.5) | 7 | 1 | 8 | 1 | 1.49 | 0.54, 4.14 | 1.54 | 0.54, 4.40 | 7.07 | 2.21, 22.60 |
| > 4 (14.0) | 6 | 1 | 11 | 1 | 0.91 | 0.33, 2.51 | 1.13 | 0.38, 3.35 | 0.50 | 0.15, 1.72 |
| Missing | 75 |  | 55 |  |  |  |  |  |  |  |
| Trendd |  |  |  |  | 1.00 | 0.93, 1.07 | 1.01 | 0.94, 1.09 | 0.98 | 0.89, 1.09 |
| Number of pills taken in an average day on days pyridostigmine bromide pills taken |  |  |  |  |  |  |  |  |  |  |
| 0 (0) | 531 | 98 | 882 | 98 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| 1 (1) | 5 | 1 | 9 | 1 | 0.92 | 0.31, 2.79 | 1.35 | 0.41, 4.45 | 4.09 | 0.75, 22.38 |
| > 1 (3) | 5 | 1 | 9 | 1 | 0.95 | 0.31, 2.85 | 1.01 | 0.32, 3.19 | 2.53 | 0.46, 13.91 |
| Missing | 78 |  | 56 |  |  |  |  |  |  |  |
| Trendd |  |  |  |  | 0.98 | 0.69, 1.39 | 1.03 | 0.72, 1.48 | 1.36 | 0.83, 2.22 |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| Total number of pyridostigmine bromide pills taken |  |  |  |  |  |  |  |  |  |  |
| 0 (0) | 531 | 98 | 882 | 98 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| 1-20 (7) | 5 | 1 | 11 | 1 | 0.79 | 0.27, 2.29 | 0.92 | 0.30, 2.77 | 1.67 | 0.34, 8.32 |
| > 20 (75) | < 5g | 1 | 6 | 1 | 1.10 | 0.31, 3.96 | 1.46 | 0.35, 6.02 | 0.71 | 0.15, 3.33 |
| Missing | 79 |  | 57 |  |  |  |  |  |  |  |
| Trend (45)d, h |  |  |  |  | 1.04 | 0.48, 2.24 | 1.24 | 0.53, 2.89 | 0.72 | 0.25, 2.05 |
| Prior to reference date, number of times visited or resided in the island of Guam, the islands of New Guinea, or the Kii Peninsula of Japan |  |  |  |  |  |  |  |  |  |  |
| 0 (0) | 492 | 84 | 749 | 80 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| 1 (1) | 45 | 8 | 91 | 10 | 0.74 | 0.51, 1.08 | 0.70 | 0.47, 1.03 | 0.78 | 0.45, 1.35 |
| 2 (2) | 17 | 3 | 45 | 5 | 0.56 | 0.32, 0.99 | 0.53 | 0.30, 0.95 | 0.76 | 0.28, 2.07 |
| 3 (3) | 14 | 2 | 14 | 1 | 1.50 | 0.71, 3.18 | 1.69 | 0.77, 3.69 | 3.01 | 0.94, 9.65 |
| 4-5 (4) | 7 | 1 | 19 | 2 | 0.54 | 0.22, 1.30 | 0.53 | 0.22, 1.30 | 0.23 | 0.06, 0.93 |
| > 5 (10) | 8 | 1 | 17 | 2 | 0.73 | 0.31, 1.70 | 0.70 | 0.29, 1.65 | 0.28 | 0.08, 0.96 |
| Missing | 36 |  | 21 |  |  |  |  |  |  |  |
| Trendd |  |  |  |  | 0.95 | 0.88, 1.02 | 0.94 | 0.87, 1.02 | 0.89 | 0.80, 1.00 |
| Prior to reference date, total amount of time (months) spent in the island of Guam, the islands of New Guinea, or the Kii Peninsula of Japan, excluding time periods between age at first and last visits when you didn’t visit or reside in the island of Guam, the islands of New Guinea, or the Kii Peninsula of Japan |  |  |  |  |  |  |  |  |  |  |
| 0 (0.00) | 492 | 84 | 749 | 80 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| > 0-6 (0.16) | 70 | 12 | 150 | 16 | 0.70 | 0.51, 0.95 | 0.67 | 0.49, 0.93 | 0.68 | 0.43, 1.07 |
| > 6-12 (9.00) | 6 | 1 | 15 | 2 | 0.58 | 0.22, 1.52 | 0.51 | 0.19, 1.35 | 0.73 | 0.19, 2.81 |
| > 12-24 (24.00) | 10 | 2 | 8 | 1 | 1.85 | 0.72, 4.73 | 1.93 | 0.73, 5.12 | 4.26 | 0.95, 19.23 |
| > 24 (48.00) | 5 | 1 | 14 | 1 | 0.54 | 0.19, 1.52 | 0.55 | 0.19, 1.57 | 0.62 | 0.20, 1.91 |
| Missing | 36 |  | 20 |  |  |  |  |  |  |  |
| Trend (3.03)d, h |  |  |  |  | 0.99 | 0.93, 1.04 | 0.99 | 0.93, 1.04 | 1.03 | 0.96, 1.12 |
|  |  |  |  |  |  |  |  |  |  |  |
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|  |  |  |  |  |  |  |  |  |  |  |
| ***While you were in WWII, the Korean War, the Vietnam War, and/or the Gulf Wari:*** |  |  |  |  |  |  |  |  |  |  |
| Total number of preventive vaccinations received by injection  (shots) or by mouth while inside or outside the U.S. |  |  |  |  |  |  |  |  |  |  |
| 0 (0) | 57 | 33 | 82 | 28 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| 1-10 (5) | 68 | 39 | 127 | 44 | 0.68 | 0.43, 1.09 | 0.67 | 0.42, 1.08 | 1.04 | 0.52, 2.09 |
| 11-20 (13) | 25 | 14 | 39 | 13 | 0.81 | 0.43, 1.53 | 0.80 | 0.42, 1.52 | 0.59 | 0.20, 1.74 |
| 21-30 (24) | 6 | 3 | 11 | 4 | 0.68 | 0.23, 1.99 | 0.59 | 0.20, 1.77 | 1.66 | 0.39, 7.01 |
| > 30 (99) | 17 | 10 | 30 | 10 | 0.72 | 0.35, 1.46 | 0.73 | 0.35, 1.51 | 2.86 | 0.70, 11.74 |
| Missing | 58 |  | 49 |  |  |  |  |  |  |  |
| Trend (13)d, h |  |  |  |  | 0.98 | 0.90, 1.07 | 0.98 | 0.90, 1.08 | 1.18 | 0.99, 1.40 |
| ***While you were in WWII, the Korean War, the Vietnam War, and/or the Gulf Wari: number of days exposed to*** |  |  |  |  |  |  |  |  |  |  |
| Ionizing radiation from nuclear weapon testing or occupation of  Hiroshima/Nagasaki |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 212 | 98 | 327 | 99 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 5 | < 5g | 1 | < 5g | < 1 | 5.18 | 0.53, 50.47 | 5.08 | 0.49, 53.08 | 6.78 | 0.66, 69.46 |
| > 5 | < 5g | < 1 | < 5g | 1 | 0.59 | 0.06, 5.73 | 0.48 | 0.05, 4.88 | 0.51 | 0.05, 4.96 |
| Missing | 15 |  | 7 |  |  |  |  |  |  |  |
| Trendj |  |  |  |  | 0.57 | 0.14, 2.32 | 0.50 | 0.12, 2.18 | 3.40 | 0.07, 163.58 |
| Use of personal pesticides, like creams, sprays or flea collars |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 155 | 70 | 233 | 70 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 5 | 9 | 4 | 7 | 2 | 1.89 | 0.67, 5.31 | 2.12 | 0.73, 6.15 | 5.02 | 1.38, 18.32 |
| 6-30 | 8 | 4 | 14 | 4 | 0.88 | 0.35, 2.19 | 0.83 | 0.33, 2.09 | 3.26 | 1.04, 10.21 |
| > 30 | 48 | 22 | 78 | 23 | 0.89 | 0.58, 1.37 | 0.88 | 0.56, 1.38 | 1.06 | 0.51, 2.21 |
| Missing | 11 |  | 6 |  |  |  |  |  |  |  |
| Trendj |  |  |  |  | 0.94 | 0.78, 1.13 | 0.94 | 0.77, 1.13 | 1.08 | 0.82, 1.43 |
| Use of pesticides on your clothing or bedding |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 161 | 77 | 243 | 75 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 5 | 5 | 2 | 11 | 3 | 0.59 | 0.19, 1.81 | 0.60 | 0.19, 1.87 | 0.39 | 0.09, 1.71 |
| 6-30 | 9 | 4 | 7 | 2 | 1.59 | 0.55, 4.57 | 1.58 | 0.53, 4.68 | 2.59 | 0.49, 13.58 |
| > 30 | 34 | 16 | 65 | 20 | 0.79 | 0.49, 1.27 | 0.81 | 0.50, 1.32 | 1.22 | 0.59, 2.54 |
| Missing | 22 |  | 12 |  |  |  |  |  |  |  |
| Trendj |  |  |  |  | 0.91 | 0.75, 1.12 | 0.93 | 0.75, 1.14 | 1.15 | 0.86, 1.54 |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| Exhaust from heaters or generators (e.g., kerosene heaters,  tent heaters) |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 142 | 68 | 235 | 70 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 5 | 6 | 3 | 17 | 5 | 0.59 | 0.23, 1.55 | 0.61 | 0.23, 1.62 | 0.60 | 0.18, 2.04 |
| 6-30 | 12 | 6 | 14 | 4 | 1.31 | 0.57, 2.98 | 1.50 | 0.64, 3.48 | 3.67 | 1.07, 12.50 |
| > 30 | 50 | 24 | 69 | 21 | 1.12 | 0.72, 1.73 | 1.14 | 0.73, 1.78 | 1.58 | 0.90, 2.77 |
| Missing | 21 |  | 3 |  |  |  |  |  |  |  |
| Trendj |  |  |  |  | 1.06 | 0.88, 1.28 | 1.08 | 0.89, 1.30 | 1.26 | 0.99, 1.61 |
| Exposure to diesel and/or other petrochemical fumes |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 75 | 35 | 118 | 36 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 5 | 8 | 4 | 25 | 8 | 0.48 | 0.20, 1.15 | 0.50 | 0.20, 1.21 | 0.42 | 0.16, 1.10 |
| 6-30 | 14 | 7 | 20 | 6 | 1.08 | 0.51, 2.30 | 1.09 | 0.51, 2.35 | 2.24 | 0.61, 8.17 |
| > 30 | 118 | 55 | 165 | 50 | 1.05 | 0.71, 1.55 | 1.04 | 0.69, 1.55 | 0.97 | 0.55, 1.72 |
| Missing | 16 |  | 10 |  |  |  |  |  |  |  |
| Trendj |  |  |  |  | 1.06 | 0.90, 1.25 | 1.05 | 0.89, 1.24 | 1.02 | 0.80, 1.30 |
| Burning trash or burning feces/manure |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 146 | 67 | 202 | 62 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 5 | 12 | 6 | 32 | 10 | 0.48 | 0.23, 1.00 | 0.48 | 0.23, 1.03 | 0.46 | 0.18, 1.18 |
| 6-30 | 13 | 6 | 30 | 9 | 0.65 | 0.32, 1.30 | 0.61 | 0.30, 1.24 | 0.91 | 0.23, 3.68 |
| > 30 | 46 | 21 | 64 | 20 | 0.91 | 0.58, 1.45 | 0.83 | 0.51, 1.36 | 0.91 | 0.44, 1.92 |
| Missing | 14 |  | 10 |  |  |  |  |  |  |  |
| Trendj |  |  |  |  | 0.98 | 0.81, 1.20 | 0.96 | 0.78, 1.18 | 1.03 | 0.77, 1.39 |
| Exposure to paint, solvents, or petrochemical substances |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 146 | 67 | 216 | 65 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 5 | 7 | 3 | 28 | 8 | 0.42 | 0.18, 0.99 | 0.37 | 0.15, 0.90 | 0.18 | 0.05, 0.62 |
| 6-30 | 19 | 9 | 35 | 11 | 0.77 | 0.42, 1.43 | 0.65 | 0.35, 1.23 | 0.97 | 0.37, 2.59 |
| > 30 | 45 | 21 | 53 | 16 | 1.17 | 0.73, 1.86 | 0.99 | 0.61, 1.64 | 1.18 | 0.65, 2.14 |
| Missing | 14 |  | 6 |  |  |  |  |  |  |  |
| Trendj |  |  |  |  | 1.08 | 0.88, 1.31 | 1.02 | 0.83, 1.26 | 1.14 | 0.88, 1.48 |
| High-intensity radar waves (e.g., as radar operator, radio  operator, aviation electrician's mate) |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 162 | 79 | 263 | 84 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 30 | 7 | 3 | 13 | 4 | 0.91 | 0.35, 2.35 | 1.00 | 0.38, 2.63 | 1.59 | 0.47, 5.40 |
| > 30 | 37 | 18 | 38 | 12 | 1.61 | 0.98, 2.66 | 1.54 | 0.92, 2.58 | 1.94 | 0.90, 4.18 |
| Missing | 25 |  | 24 |  |  |  |  |  |  |  |
| Trendj |  |  |  |  | 1.20 | 0.97, 1.49 | 1.18 | 0.95, 1.47 | 1.30 | 0.93, 1.82 |
| Food contaminated with smoke, oil, or other chemicals |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 185 | 93 | 269 | 89 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 30 | 6 | 3 | 12 | 4 | 0.74 | 0.27, 2.03 | 0.78 | 0.28, 2.18 | 1.98 | 0.53, 7.39 |
| > 30 | 9 | 5 | 20 | 7 | 0.71 | 0.31, 1.60 | 0.73 | 0.32, 1.67 | 1.50 | 0.54, 4.21 |
| Missing | 31 |  | 37 |  |  |  |  |  |  |  |
| Trendj |  |  |  |  | 0.87 | 0.62, 1.23 | 0.88 | 0.62, 1.25 | 1.25 | 0.80, 1.95 |
| Local food other than food provided by the Armed Forces |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 110 | 50 | 167 | 50 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 5 | 32 | 15 | 41 | 12 | 1.04 | 0.60, 1.79 | 1.07 | 0.61, 1.87 | 1.56 | 0.75, 3.24 |
| 6-30 | 32 | 15 | 46 | 14 | 1.00 | 0.59, 1.68 | 1.00 | 0.58, 1.70 | 1.28 | 0.64, 2.57 |
| > 30 | 46 | 21 | 78 | 23 | 0.90 | 0.58, 1.41 | 0.92 | 0.58, 1.45 | 1.04 | 0.41, 2.60 |
| Missing | 11 |  | 6 |  |  |  |  |  |  |  |
| Trendj |  |  |  |  | 0.95 | 0.79, 1.15 | 0.96 | 0.79, 1.16 | 0.98 | 0.67, 1.44 |
| Bathing in or drinking of water contaminated with smoke, oil,  dead animals or any chemicals |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 175 | 89 | 274 | 88 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 30 | 10 | 5 | 15 | 5 | 1.17 | 0.51, 2.68 | 1.14 | 0.49, 2.64 | 2.98 | 0.85, 10.40 |
| > 30 | 11 | 6 | 21 | 7 | 0.86 | 0.40, 1.88 | 0.86 | 0.39, 1.91 | 1.18 | 0.35, 3.98 |
| Missing | 35 |  | 28 |  |  |  |  |  |  |  |
| Trendj |  |  |  |  | 0.95 | 0.68, 1.32 | 0.94 | 0.67, 1.32 | 1.30 | 0.82, 2.06 |
| Heat cramps, heat exhaustion, heat stroke or other heat illness |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 172 | 77 | 249 | 75 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 5 | 22 | 10 | 44 | 13 | 0.75 | 0.43, 1.31 | 0.75 | 0.43, 1.33 | 1.21 | 0.50, 2.95 |
| 6-30 | 17 | 8 | 19 | 6 | 1.27 | 0.62, 2.58 | 1.32 | 0.64, 2.74 | 1.39 | 0.59, 3.26 |
| > 30 | 12 | 5 | 21 | 6 | 0.87 | 0.41, 1.86 | 0.92 | 0.42, 1.99 | 2.11 | 0.55, 8.02 |
| Missing | 8 |  | 5 |  |  |  |  |  |  |  |
| Trendj |  |  |  |  | 0.99 | 0.73, 1.35 | 1.01 | 0.74, 1.39 | 1.49 | 0.92, 2.41 |
| Heard chemical alarms sounding |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 208 | 93 | 301 | 90 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 5 | 6 | 3 | 22 | 7 | 0.21 | 0.07, 0.64 | 0.22 | 0.07, 0.68 | 0.51 | 0.15, 1.68 |
| > 5 | 9 | 4 | 10 | 3 | 0.91 | 0.34, 2.45 | 1.18 | 0.42, 3.29 | 1.81 | 0.49, 6.62 |
| Missing | 8 |  | 5 |  |  |  |  |  |  |  |
| Trendj |  |  |  |  | 0.76 | 0.42, 1.36 | 0.83 | 0.46, 1.49 | 0.83 | 0.38, 1.81 |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| Explosion in the air or on the ground within one mile of you  (e.g., artillery, rockets, mortars) |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 72 | 33 | 116 | 36 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 5 | 33 | 15 | 62 | 19 | 0.87 | 0.51, 1.04 | 0.93 | 0.54, 1.60 | 1.75 | 0.86, 3.58 |
| 6-30 | 37 | 17 | 49 | 15 | 1.30 | 0.76, 2.22 | 1.30 | 0.75, 2.26 | 1.50 | 0.67, 3.40 |
| > 30 | 75 | 35 | 96 | 30 | 1.46 | 0.94, 2.27 | 1.49 | 0.95, 2.36 | 2.11 | 1.11, 3.98 |
| Missing | 14 |  | 15 |  |  |  |  |  |  |  |
| Trendj |  |  |  |  | 1.20 | 1.01, 1.43 | 1.20 | 1.00, 1.44 | 1.27 | 0.96, 1.67 |
| Have you suffered a combat-related injury that required  medical attention during your deployment? |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 177 | 78 | 257 | 77 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 5 | 22 | 10 | 25 | 8 | 1.32 | 0.72, 2.45 | 1.30 | 0.69, 2.45 | 1.21 | 0.53, 2.76 |
| 6-30 | 11 | 5 | 18 | 5 | 0.93 | 0.42, 2.03 | 0.95 | 0.42, 2.13 | 1.63 | 0.47, 5.63 |
| > 30 | 16 | 7 | 33 | 10 | 0.77 | 0.40, 1.49 | 0.74 | 0.38, 1.47 | 0.87 | 0.26, 2.88 |
| Missing | 5 |  | 5 |  |  |  |  |  |  |  |
| Trendj |  |  |  |  | 0.89 | 0.68, 1.16 | 0.87 | 0.66, 1.16 | 1.03 | 0.66, 1.60 |
| ***While you were in WWII, the Korean War, and/or the Vietnam Wari: number of days exposed to*** |  |  |  |  |  |  |  |  |  |  |
| Mixing and application of herbicides |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 202 | 98 | 303 | 99 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 5 | < 5g | 1 | < 5g | < 1 | 2.08 | 0.17, 25.95 | 2.36 | 0.20, 27.88 | 0.41 | 0.03, 6.65 |
| > 5 | < 5g | 1 | < 5g | < 1 | 5.91 | 0.60, 58.02 | 5.03 | 0.51, 49.98 | 5.16 | 0.46, 58.08 |
| Missing | 12 |  | 9 |  |  |  |  |  |  |  |
| Trendj |  |  |  |  | 2.12 | 0.72, 6.21 | 1.99 | 0.68, 5.82 | 2.34 | 0.31, 17.73 |
| Exposure to herbicides in the field |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 160 | 94 | 238 | 95 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 30 | 5 | 3 | 5 | 2 | 2.16 | 0.60, 7.76 | 3.04 | 0.77, 11.93 | 10.49 | 2.10, 52.39 |
| > 30 | 5 | 3 | 8 | 3 | 1.10 | 0.35, 3.53 | 1.02 | 0.32, 3.29 | 2.03 | 0.41, 9.89 |
| Missing | 49 |  | 63 |  |  |  |  |  |  |  |
| Trendj |  |  |  |  | 1.07 | 0.66, 1.74 | 1.04 | 0.64, 1.70 | 1.46 | 0.77, 2.73 |
| Mixing and application of riot control substances |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 213 | 99 | 307 | 98 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 5 | < 5g | < 1 | < 5g | 1 | 0.67 | 0.06, 7.88 | 0.85 | 0.07, 9.93 | 2.60 | 0.23, 29.13 |
| > 5 | < 5g | 1 | 5 | 2 | 0.53 | 0.09, 3.00 | 0.73 | 0.13, 4.14 | 1.68 | 0.17, 16.18 |
| Missing | 3 |  | 0 |  |  |  |  |  |  |  |
| Trendj |  |  |  |  | 0.47 | 0.11, 1.97 | 0.59 | 0.14, 2.47 | 0.85 | 0.22, 3.26 |
| Exposure to riot control substances in the field |  |  |  |  |  |  |  |  |  |  |
| Not exposed or ≤ 5 | 206 | 96 | 295 | 95 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| > 5 | 9 | 4 | 16 | 5 | 0.65 | 0.27, 1.60 | 0.73 | 0.29, 1.84 | 1.32 | 0.45, 3.87 |
| Missing | 4 |  | 3 |  |  |  |  |  |  |  |
| Trendj |  |  |  |  | 0.76 | 0.43, 1.33 | 0.86 | 0.48, 1.56 | 1.31 | 0.61, 2.82 |
| Mixing and application of burning agents |  |  |  |  |  |  |  |  |  |  |
| Not exposed or ≤ 5 | 199 | 94 | 304 | 98 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| > 5 | 13 | 6 | 5 | 2 | 4.06 | 1.37, 12.00 | 3.95 | 1.33, 11.71 | 6.98 | 2.19, 22.21 |
| Missing | 7 |  | 5 |  |  |  |  |  |  |  |
| Trendj |  |  |  |  | 1.97 | 1.06, 3.65 | 1.94 | 1.04, 3.60 | 3.45 | 1.21, 9.82 |
| Exposure to burning agents in the field |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 176 | 85 | 277 | 90 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 5 | 14 | 7 | 11 | 4 | 1.97 | 0.85, 4.56 | 1.95 | 0.83, 4.58 | 1.51 | 0.32, 7.10 |
| 6-30 | 7 | 3 | 9 | 3 | 1.26 | 0.44, 3.63 | 1.24 | 0.42, 3.62 | 1.94 | 0.50, 7.55 |
| > 30 | 10 | 5 | 11 | 4 | 1.36 | 0.54, 3.45 | 1.49 | 0.58, 3.86 | 1.77 | 0.39, 8.04 |
| Missing | 12 |  | 6 |  |  |  |  |  |  |  |
| Trendj |  |  |  |  | 1.15 | 0.79, 1.69 | 1.19 | 0.81, 1.77 | 1.52 | 0.82, 2.81 |
| ***While you were in the Korean War, the Vietnam War, and/or the Gulf Wari: number of days exposed to*** |  |  |  |  |  |  |  |  |  |  |
| Microwave radiation |  |  |  |  |  |  |  |  |  |  |
| Not exposed or ≤ 5 | 155 | 93 | 276 | 95 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| > 5 | 12 | 7 | 15 | 5 | 1.33 | 0.59, 3.00 | 1.34 | 0.58, 3.09 | 1.96 | 0.82, 4.65 |
| Missing | 29 |  | 36 |  |  |  |  |  |  |  |
| Trendj |  |  |  |  | 1.15 | 0.79, 1.68 | 1.16 | 0.78, 1.70 | 1.43 | 0.87, 2.37 |
| ***While you were in the Vietnam Wari, k: number of days exposed to*** |  |  |  |  |  |  |  |  |  |  |
| Mixing and application of Agent Orange |  |  |  |  |  |  |  |  |  |  |
| Not exposed or ≤ 5 | 111 | 96 | 202 | 95 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| > 5 | 5 | 4 | 11 | 5 | 0.98 | 0.29, 3.30 | 0.99 | 0.28, 3.47 | 1.02 | 0.28, 3.67 |
| Missing | 11 |  | 6 |  |  |  |  |  |  |  |
| Trendj |  |  |  |  | 0.94 | 0.48, 1.83 | 0.96 | 0.48, 1.92 | 0.92 | 0.41, 2.07 |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| Exposure to Agent Orange in the field |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 41 | 44 | 98 | 58 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 5 | 10 | 11 | 13 | 8 | 2.30 | 0.83, 6.36 | 2.37 | 0.81, 6.99 | 2.15 | 0.70, 6.62 |
| 6-30 | 8 | 9 | 16 | 10 | 2.01 | 0.66, 6.13 | 1.77 | 0.56, 5.63 | 3.32 | 0.84, 13.17 |
| > 30 | 34 | 37 | 41 | 24 | 3.14 | 1.53, 6.42 | 3.29 | 1.50, 7.22 | 2.46 | 1.08, 5.60 |
| Missing | 34 |  | 51 |  |  |  |  |  |  |  |
| Trendj |  |  |  |  | 1.55 | 1.15, 2.09 | 1.56 | 1.13, 2.16 | 1.49 | 1.10, 2.01 |
| ***While you were in the Gulf Wari: number of days exposed to*** |  |  |  |  |  |  |  |  |  |  |
| Use of depleted uranium (DU) for munitions or armor |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 8 | 62 | 23 | 85 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 30 | < 5g | 15 | < 5g | 4 | 8.00 | 0.35, 183.75 | 2.82 | 0.08, 100.26 | 1.86 | 0.14, 24.64 |
| > 30 | < 5g | 23 | < 5g | 11 | 2.85 | 0.37, 21.79 | 14.71 | 0.17, 1272.73 | 9.43 | 1.21, 73.49 |
| Missing | 3 |  | 3 |  |  |  |  |  |  |  |
| Trendj |  |  |  |  | 1.63 | 0.69, 3.87 | 3.17 | 0.52, 19.52 | 2.19 | 0.88, 5.45 |
| CARC (Chemical Agent Resistant Compound) paint |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 10 | 77 | 20 | 87 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 30 | < 5g | 8 | < 5g | 9 | 1.06 | 0.07, 15.38 | e | e | 0.39 | 0.03, 5.03 |
| > 30 | < 5g | 15 | < 5g | 4 | 2.80 | 0.17, 45.05 | 17.86 | 0.03, 10140.86 | 1.89 | 0.15, 24.46 |
| Missing | 3 |  | 7 |  |  |  |  |  |  |  |
| Trendj |  |  |  |  | 1.69 | 0.52, 5.52 | 3.53 | 0.22, 55.80 | 1.42 | 0.41, 4.89 |
| Scud missile explosion in the air or on the ground within one  mile of you |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 9 | 69 | 17 | 61 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 5 | < 5g | 23 | 9 | 32 | 0.60 | 0.10, 3.47 | 1.63 | 0.16, 16.76 | 6.32 | 0.78, 50.91 |
| 6-30 | < 5g | 8 | < 5g | 7 | 0.41 | 0.02, 7.97 | 0.76 | 0.01, 100.75 | 1.65 | 0.12, 23.30 |
| > 30 | 0 | 0 | 0 | e | e | e | e | e | e | e |
| Missing | 3 |  | 2 |  |  |  |  |  |  |  |
| Trendj |  |  |  |  | 0.33 | 0.01, 8.94 | 0.89 | < 0.01, 159.63 | 2.63 | 0.06, 125.89 |
| Smoke from oil well fires |  |  |  |  |  |  |  |  |  |  |
| Not exposed or ≤ 5 | 8 | 62 | 15 | 52 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| > 5 | 5 | 38 | 14 | 48 | 0.55 | 0.12, 2.59 | 0.58 | 0.09, 3.83 | 0.35 | 0.07, 1.76 |
| Missing | 3 |  | 1 |  |  |  |  |  |  |  |
| Trendj |  |  |  |  | 0.69 | 0.29, 1.64 | 0.56 | 0.18, 1.78 | 0.65 | 0.30, 1.40 |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| Exposure to nerve gas (e.g., during munitions destruction) |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 11 | 79 | 21 | 96 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 5 | < 5g | 7 | < 5g | 4 | 1.50 | 0.04, 57.58 | e | e | e | e |
| 6-30 | < 5g | 7 | 0 | 0 | e | e | e | e | e | e |
| > 30 | < 5g | 7 | 0 | 0 | e | e | e | e | e | e |
| Missing | 2 |  | 8 |  |  |  |  |  |  |  |
| Trendj |  |  |  |  | 1.35 | 0.72, 2.51 | e | e | e | e |
| High levels of dust/sand |  |  |  |  |  |  |  |  |  |  |
| Not exposed or ≤ 30 | 8 | 53 | 10 | 33 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| > 30 | 7 | 47 | 20 | 67 | 0.17 | 0.03, 0.90 | 0.14 | 0.02, 1.06 | 1.36 | 0.21, 8.87 |
| Missing | 1 |  | 0 |  |  |  |  |  |  |  |
| Trendj |  |  |  |  | 0.29 | 0.11, 0.77 | 0.27 | 0.09, 0.83 | 0.73 | 0.34, 1.58 |
| Ground level fumigation |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 9 | 69 | 24 | 92 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 30 | < 5g | 15 | < 5g | 4 | 5.46 | 0.42, 71.73 | 19.29 | 0.20, 1854.70 | 9.90 | 0.76, 129.45 |
| > 30 | < 5g | 15 | < 5g | 4 | 4.07 | 0.24, 68.81 | 2.33 | 0.07, 78.43 | 16.71 | 1.12, 249.59 |
| Missing | 3 |  | 4 |  |  |  |  |  |  |  |
| Trendj |  |  |  |  | 1.91 | 0.58, 6.28 | 1.68 | 0.39, 7.28 | 3.46 | 0.86, 13.81 |

Abbreviation: ALS, amyotrophic lateral sclerosis; ALSFRS-R, ALS Functional Rating Scale-Revised; BIRLS, Beneficiary Identification and Records Locator System; CARC, Chemical Agent Resistant Compound; CI, confidence interval; DU, depleted uranium; GENEVA, Genes and Environmental Exposures in Veterans with Amyotrophic Lateral Sclerosis; Gulf, 1990-1991 Persian Gulf; IP, inverse probability; IQR, interquartile range; OR, odds ratio; U.S., United States of America; VA, Department of Veterans Affairs; WWII, World War II.

a Adjusted for age (centered at age 60—the median age among controls—and modeled with linear and quadratic terms) and use of the VA health care system.

b Adjusted for age (centered at age 60—the median age among controls—and modeled with linear and quadratic terms), use of the VA health care system, sex, race/ethnicity, and military branch of longest service. War deployment-related exposures were not adjusted for sex because of model instability.

c Weighted for confounding (conditional on age [centered at age 60—the median age among controls—and modeled with linear and quadratic terms], use of the VA health care system, sex, race/ethnicity, and military branch of longest service), not missing baseline ALSFRS-R score (cases only: conditional on most recent ALS diagnosis category, symptom onset site, time from symptom onset to diagnosis [months; modeled with the natural logarithm of a linear term], and time from diagnosis to enrollment in the Registry [months; modeled with a restricted, quadratic spline with knots at 7.72, 13.24, 23.06, and 44.19 months based on percentiles of the distribution in the Registry cases not missing baseline ALSFRS-R score]), and participating in GENEVA (cases: conditional on race/ethnicity, being a current patient of a VA Medical Center, most recent ALS diagnosis category, symptom onset site, time from symptom onset to diagnosis [months; modeled with linear, quadratic, and cubic terms], time from diagnosis to enrollment in the Registry [months; modeled with a linear term], and baseline ALSFRS-R score [modeled with a restricted, quadratic spline with knots at 12, 34, and 44 based on percentiles of the distribution in GENEVA cases]; controls: conditional on year of birth [modeled with a restricted, quadratic spline with knots at 1920, 1947, and 1974 based on percentiles of the distribution in the BIRLS potential controls], use of the VA health care system, and their interaction). War deployment-related exposures were not weighted for sex because of model instability. 95% CIs were calculated with robust variance estimates.

d Used within-category medians that were calculated using all controls.

e Unable to estimate OR and 95% CI.

f Scaled the OR to an IQR-unit increase in the exposure variable. IQRs were calculated using all controls except those in the reference category. Reference category excluded for linear trend test.

g Suppressed to preserve the confidentiality of study participants.

h Scaled the OR to an IQR-unit increase in the exposure variable. IQRs were calculated using all controls except those in the reference category. Reference category included for linear trend test.

i The GENEVA study questionnaire asked "Were you deployed to..." the following wars where each war was asked about with a separate question: World War II (defined as the period from December 7, 1941, to December 31, 1946), the Korean War (defined as the period from June 27, 1950, to January 31, 1955), the Vietnam War (defined as the period from August 3, 1964, to May 7, 1975), and the Persian Gulf War (defined as the period from August 2, 1990, to December 31, 1991).

j Used category midpoints (0, 3, 18) or 50% above the lower bound of the highest category (46.5) and scaled the OR to a 20-day increase in the exposure variable. Reference category included for linear trend test.

k Restricted analyses to veterans who were born between 1939 and 1957 inclusive (i.e., they were 18-25 years old at the time of the Vietnam War, or 1964-1975) because doing so drastically improved the behavior of the IP weights used for analysis. This restriction resulted in the exclusion of 21 (14%) cases and 51 (19%) controls.

Table S.2. Feel ill from military exposures and amyotrophic lateral sclerosis in GENEVA.

|  | Cases | | Controls | | Adjusteda | | Adjustedb | | IP-weightedc | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Exposure | No. | % | No. | % | OR | 95% CI | OR | 95% CI | OR | 95% CI |
| ***While you were in WWII, the Korean War, the Vietnam War, and/or the Gulf Ward: did you feel ill from exposure to*** |  |  |  |  |  |  |  |  |  |  |
| Ionizing radiation from nuclear weapon testing or occupation of  Hiroshima/Nagasaki |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 212 | 98 | 327 | 99 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | < 5e | 2 | < 5e | 1 | 2.30 | 0.51, 10.49 | 2.16 | 0.45, 10.42 | 2.32 | 0.49, 11.00 |
| Yes | 0 | 0 | 0 | 0 | f | f | f | f | f | f |
| Missing | 15 |  | 8 |  |  |  |  |  |  |  |
| Trendg |  |  |  |  | 2.30 | 0.51, 10.49 | 2.16 | 0.45, 10.42 | 1.05 | 0.14, 7.85 |
| Use of personal pesticides, like creams, sprays or flea collars |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 155 | 72 | 233 | 71 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 54 | 25 | 86 | 26 | 0.90 | 0.59, 1.36 | 0.85 | 0.56, 1.31 | 1.36 | 0.74, 2.51 |
| Yes | 5 | 2 | 7 | 2 | 1.34 | 0.41, 4.36 | 1.39 | 0.41, 4.66 | 3.80 | 0.98, 14.78 |
| Missing | 17 |  | 12 |  |  |  |  |  |  |  |
| Trendg |  |  |  |  | 0.97 | 0.68, 1.39 | 0.94 | 0.65, 1.36 | 1.24 | 0.70, 2.20 |
| Use of pesticides on your clothing or bedding |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 161 | 79 | 243 | 75 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 39 | 19 | 69 | 21 | 0.81 | 0.51, 1.28 | 0.81 | 0.50, 1.29 | 1.21 | 0.61, 2.42 |
| Yes | 5 | 2 | 10 | 3 | 0.74 | 0.24, 2.28 | 0.98 | 0.30, 3.24 | 4.18 | 1.09, 16.11 |
| Missing | 26 |  | 16 |  |  |  |  |  |  |  |
| Trendg |  |  |  |  | 0.83 | 0.57, 1.21 | 0.87 | 0.59, 1.28 | 1.44 | 0.87, 2.36 |
| Exhaust from heaters or generators (e.g., kerosene heaters, tent  heaters) |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 142 | 67 | 235 | 71 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 57 | 27 | 77 | 23 | 1.15 | 0.76, 1.74 | 1.16 | 0.76, 1.76 | 1.52 | 0.88, 2.63 |
| Yes | 14 | 7 | 19 | 6 | 1.22 | 0.58, 2.57 | 1.48 | 0.69, 3.19 | 1.82 | 0.70, 4.75 |
| Missing | 18 |  | 7 |  |  |  |  |  |  |  |
| Trendg |  |  |  |  | 1.12 | 0.84, 1.51 | 1.19 | 0.88, 1.61 | 1.44 | 0.98, 2.12 |
| Exposure to diesel and/or other petrochemical fumes |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 75 | 36 | 118 | 36 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 109 | 52 | 174 | 53 | 0.92 | 0.62, 1.36 | 0.91 | 0.60, 1.35 | 0.87 | 0.49, 1.53 |
| Yes | 24 | 12 | 35 | 11 | 0.99 | 0.53, 1.86 | 1.02 | 0.54, 1.94 | 1.27 | 0.62, 2.59 |
| Missing | 23 |  | 11 |  |  |  |  |  |  |  |
| Trendg |  |  |  |  | 0.97 | 0.73, 1.29 | 0.98 | 0.73, 1.31 | 1.08 | 0.75, 1.56 |
|  |  |  |  |  |  |  |  |  |  |  |
| Burning trash or burning feces/manure |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 146 | 67 | 202 | 62 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 58 | 27 | 96 | 30 | 0.78 | 0.52, 1.18 | 0.74 | 0.47, 1.14 | 1.14 | 0.55, 2.37 |
| Yes | 13 | 6 | 27 | 8 | 0.64 | 0.31, 1.32 | 0.56 | 0.26, 1.20 | 0.65 | 0.24, 1.77 |
| Missing | 14 |  | 13 |  |  |  |  |  |  |  |
| Trendg |  |  |  |  | 0.79 | 0.59, 1.07 | 0.74 | 0.54, 1.03 | 1.05 | 0.68, 1.63 |
| Exposure to paint, solvents, or petrochemical substances |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 146 | 69 | 216 | 65 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 60 | 28 | 98 | 30 | 0.85 | 0.57, 1.27 | 0.71 | 0.46, 1.10 | 0.71 | 0.37, 1.36 |
| Yes | 7 | 3 | 16 | 5 | 0.73 | 0.29, 1.84 | 0.58 | 0.23, 1.50 | 1.15 | 0.38, 3.52 |
| Missing | 18 |  | 8 |  |  |  |  |  |  |  |
| Trendg |  |  |  |  | 0.85 | 0.62, 1.17 | 0.73 | 0.52, 1.04 | 0.90 | 0.55, 1.47 |
| High-intensity radar waves (e.g., as radar operator, radio operator,  aviation electrician's mate) |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 162 | 79 | 263 | 84 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 41 | 20 | 48 | 15 | 1.43 | 0.90, 2.28 | 1.39 | 0.86, 2.26 | 1.75 | 0.87, 3.54 |
| Yes | < 5e | 1 | < 5e | < 1 | 2.90 | 0.25, 33.07 | 2.29 | 0.20, 26.45 | 1.82 | 0.16, 20.40 |
| Missing | 26 |  | 26 |  |  |  |  |  |  |  |
| Trendg |  |  |  |  | 1.46 | 0.94, 2.26 | 1.41 | 0.89, 2.21 | 1.62 | 0.86, 3.04 |
| Food contaminated with smoke, oil, or other chemicals |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 185 | 93 | 269 | 90 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 8 | 4 | 24 | 8 | 0.51 | 0.22, 1.17 | 0.53 | 0.23, 1.24 | 1.59 | 0.55, 4.59 |
| Yes | 6 | 3 | 7 | 2 | 1.35 | 0.44, 4.13 | 1.30 | 0.42, 4.03 | 2.28 | 0.61, 8.47 |
| Missing | 32 |  | 38 |  |  |  |  |  |  |  |
| Trendg |  |  |  |  | 0.88 | 0.55, 1.42 | 0.88 | 0.55, 1.43 | 1.37 | 0.76, 2.49 |
| Local food other than food provided by the Armed Forces |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 110 | 50 | 167 | 50 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 98 | 44 | 128 | 38 | 1.10 | 0.76, 1.58 | 1.13 | 0.77, 1.65 | 1.50 | 0.83, 2.74 |
| Yes | 13 | 6 | 38 | 11 | 0.53 | 0.27, 1.05 | 0.50 | 0.25, 1.01 | 0.60 | 0.15, 2.46 |
| Missing | 10 |  | 5 |  |  |  |  |  |  |  |
| Trendg |  |  |  |  | 0.87 | 0.66, 1.14 | 0.86 | 0.65, 1.13 | 0.98 | 0.56, 1.71 |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| Bathing in or drinking of water contaminated with smoke, oil, dead  animals or any chemicals |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 175 | 91 | 274 | 88 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 14 | 7 | 25 | 8 | 0.97 | 0.48, 1.94 | 0.97 | 0.48, 1.97 | 0.62 | 0.14, 2.86 |
| Yes | < 5e | 2 | 12 | 4 | 0.55 | 0.17, 1.77 | 0.52 | 0.16, 1.70 | 1.26 | 0.27, 5.88 |
| Missing | 38 |  | 27 |  |  |  |  |  |  |  |
| Trendg |  |  |  |  | 0.82 | 0.53, 1.29 | 0.81 | 0.51, 1.28 | 1.03 | 0.53, 1.98 |
| Heat cramps, heat exhaustion, heat stroke or other heat illness |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 172 | 77 | 249 | 75 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 8 | 4 | 8 | 2 | 1.54 | 0.55, 4.32 | 1.76 | 0.61, 5.06 | 4.53 | 1.13, 18.13 |
| Yes | 42 | 19 | 76 | 23 | 0.81 | 0.52, 1.27 | 0.82 | 0.52, 1.29 | 1.31 | 0.59, 2.87 |
| Missing | 9 |  | 5 |  |  |  |  |  |  |  |
| Trendg |  |  |  |  | 0.91 | 0.73, 1.14 | 0.92 | 0.74, 1.15 | 1.17 | 0.84, 1.62 |
| Heard chemical alarms sounding |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 208 | 93 | 301 | 90 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 15 | 7 | 32 | 10 | 0.43 | 0.21, 0.89 | 0.49 | 0.23, 1.03 | 0.98 | f |
| Yes | 0 | 0 | < 5e | < 1 | f | f | f | f | f | f |
| Missing | 8 |  | 4 |  |  |  |  |  |  |  |
| Trendg |  |  |  |  | 0.42 | 0.21, 0.86 | 0.47 | 0.23, 0.98 | 0.64 | 0.28, 1.44 |
| Explosion in the air or on the ground within one mile of you (e.g.,  artillery, rockets, mortars) |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 72 | 33 | 116 | 36 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 135 | 61 | 187 | 58 | 1.27 | 0.87, 1.87 | 1.30 | 0.87, 1.93 | 1.78 | 1.04, 3.04 |
| Yes | 13 | 6 | 19 | 6 | 1.19 | 0.55, 2.61 | 1.17 | 0.52, 2.61 | 2.10 | 0.69, 6.42 |
| Missing | 11 |  | 16 |  |  |  |  |  |  |  |
| Trendg |  |  |  |  | 1.18 | 0.86, 1.61 | 1.19 | 0.86, 1.64 | 1.87 | 1.23, 2.84 |
| ***While you were in WWII, the Korean War, and/or the Vietnam Ward: did you feel ill from exposure to*** |  |  |  |  |  |  |  |  |  |  |
| Mixing and application of herbicides |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 202 | 98 | 303 | 99 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 5 | 2 | < 5e | 1 | 3.88 | 0.72, 20.94 | 3.64 | 0.68, 19.40 | 5.04 | 0.71, 35.53 |
| Yes | 0 | 0 | 0 | 0 | f | f | f | f | f | f |
| Missing | 12 |  | 9 |  |  |  |  |  |  |  |
| Trendg |  |  |  |  | 3.88 | 0.72, 20.94 | 3.64 | 0.68, 19.40 | 3.14 | 0.50, 19.72 |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| Exposure to herbicides in the field |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 160 | 94 | 238 | 95 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 10 | 6 | 9 | 4 | 2.01 | 0.78, 5.15 | 2.14 | 0.82, 5.63 | 1.81 | 0.48, 6.89 |
| Yes | < 5e | 1 | < 5e | 2 | 0.58 | 0.06, 5.38 | 0.59 | 0.06, 5.56 | 0.51 | 0.05, 4.82 |
| Missing | 48 |  | 63 |  |  |  |  |  |  |  |
| Trendg |  |  |  |  | 1.27 | 0.65, 2.48 | 1.31 | 0.66, 2.59 | 1.87 | 0.66, 5.25 |
| Mixing and application of riot control substances |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 213 | 99 | 307 | 98 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | < 5e | 1 | 5 | 2 | 0.83 | 0.18, 3.77 | 1.09 | 0.24, 4.95 | 2.47 | f |
| Yes | 0 | 0 | < 5e | 1 | f | f | f | f | f | f |
| Missing | 3 |  | 0 |  |  |  |  |  |  |  |
| Trendg |  |  |  |  | 0.53 | 0.16, 1.80 | 0.66 | 0.20, 2.22 | 1.65 | 0.25, 10.83 |
| Exposure to riot control substances in the field |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 202 | 94 | 285 | 92 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 9 | 4 | 14 | 5 | 0.86 | 0.35, 2.10 | 0.93 | 0.37, 2.31 | 1.52 | 0.54, 4.29 |
| Yes | < 5e | 2 | 12 | 4 | 0.29 | 0.07, 1.15 | 0.28 | 0.07, 1.16 | 3.56 | 0.47, 27.24 |
| Missing | 4 |  | 3 |  |  |  |  |  |  |  |
| Trendg |  |  |  |  | 0.63 | 0.37, 1.08 | 0.64 | 0.37, 1.11 | 1.69 | 0.71, 4.01 |
| Mixing and application of burning agents |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 197 | 93 | 303 | 98 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 12 | 6 | 5 | 2 | 3.39 | 1.13, 10.18 | 3.32 | 1.10, 9.99 | 5.94 | 1.19, 29.76 |
| Yes | < 5e | 1 | < 5e | < 1 | 5.24 | 0.52, 52.71 | 5.48 | 0.54, 55.10 | 42.16 | 3.06, 580.43 |
| Missing | 7 |  | 5 |  |  |  |  |  |  |  |
| Trendg |  |  |  |  | 2.85 | 1.24, 6.55 | 2.84 | 1.24, 6.50 | 5.02 | 1.93, 13.03 |
| Exposure to burning agents in the field |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 176 | 85 | 277 | 91 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 26 | 13 | 20 | 7 | 2.12 | 1.11, 4.02 | 2.06 | 1.08, 3.95 | 1.40 | 0.34, 5.80 |
| Yes | 6 | 3 | 9 | 3 | 1.02 | 0.34, 3.07 | 1.09 | 0.35, 3.40 | 2.68 | 0.70, 10.31 |
| Missing | 11 |  | 8 |  |  |  |  |  |  |  |
| Trendg |  |  |  |  | 1.37 | 0.89, 2.10 | 1.39 | 0.90, 2.15 | 2.08 | 1.10, 3.93 |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
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|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| ***While you were in the Korean War, the Vietnam War, and/or the Gulf Ward: did you feel ill from exposure to*** |  |  |  |  |  |  |  |  |  |  |
| Microwave radiation |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 153 | 92 | 268 | 92 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 12 | 7 | 20 | 7 | 0.92 | 0.42, 2.02 | 0.90 | 0.41, 2.01 | 1.49 | 0.53, 4.15 |
| Yes | < 5e | 1 | < 5e | 1 | 1.15 | 0.10, 13.17 | 1.40 | 0.12, 15.96 | 0.70 | 0.06, 7.86 |
| Missing | 30 |  | 37 |  |  |  |  |  |  |  |
| Trendg |  |  |  |  | 0.96 | 0.49, 1.88 | 0.97 | 0.49, 1.93 | 1.19 | 0.53, 2.68 |
| ***While you were in the Vietnam Ward, h: did you feel ill from exposure to*** |  |  |  |  |  |  |  |  |  |  |
| Mixing and application of Agent Orange |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 109 | 94 | 200 | 94 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 7 | 6 | 12 | 6 | 1.47 | 0.54, 4.01 | 1.60 | 0.57, 4.51 | 1.57 | f |
| Yes | 0 | 0 | < 5e | < 1 | f | f | f | f | f | f |
| Missing | 11 |  | 6 |  |  |  |  |  |  |  |
| Trendg |  |  |  |  | 1.35 | 0.52, 3.51 | 1.44 | 0.54, 3.81 | 1.04 | 0.35, 3.05 |
| Exposure to Agent Orange in the field |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 41 | 44 | 98 | 60 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 43 | 46 | 58 | 35 | 3.07 | 1.58, 5.95 | 3.20 | 1.58, 6.47 | 2.73 | 1.38, 5.42 |
| Yes | 9 | 10 | 8 | 5 | 2.88 | 0.85, 9.76 | 3.46 | 0.86, 13.96 | 8.96 | 2.33, 34.45 |
| Missing | 34 |  | 55 |  |  |  |  |  |  |  |
| Trendg |  |  |  |  | 2.23 | 1.34, 3.70 | 2.46 | 1.39, 4.37 | 2.82 | 1.62, 4.93 |
| ***While you were in the Gulf Ward: did you feel ill from exposure to*** |  |  |  |  |  |  |  |  |  |  |
| Use of depleted uranium (DU) for munitions or armor |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 8 | 62 | 23 | 88 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 5 | 38 | < 5e | 8 | 6.00 | 0.83, 43.54 | 6.06 | 0.35, 105.73 | 1.24 | f |
| Yes | 0 | 0 | < 5e | 4 | f | f | f | f | f | f |
| Missing | 3 |  | 4 |  |  |  |  |  |  |  |
| Trendg |  |  |  |  | 2.68 | 0.63, 11.48 | 5.17 | 0.38, 71.03 | 5.66 | 0.87, 36.71 |
| CARC (Chemical Agent Resistant Compound) paint |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 10 | 77 | 20 | 87 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | < 5e | 23 | < 5e | 9 | 2.07 | 0.26, 16.53 | 12.67 | 0.03, 5631.99 | 1.84 | f |
| Yes | 0 | 0 | < 5e | 4 | f | f | f | f | f | f |
| Missing | 3 |  | 7 |  |  |  |  |  |  |  |
| Trendg |  |  |  |  | 1.32 | 0.26, 6.71 | 9.12 | 0.05, 1520.11 | 4.17 | 0.48, 36.11 |
|  |  |  |  |  |  |  |  |  |  |  |
| Scud missile explosion in the air or on the ground within one mile of you |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 9 | 69 | 17 | 61 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | < 5e | 23 | 11 | 39 | 0.46 | 0.09, 2.42 | 1.38 | 0.14, 13.38 | 5.37 | f |
| Yes | < 5e | 8 | 0 | 0 | f | f | f | f | f | f |
| Missing | 3 |  | 2 |  |  |  |  |  |  |  |
| Trendg |  |  |  |  | 0.73 | 0.19, 2.85 | 1.52 | 0.18, 12.78 | 2.57 | 0.55, 12.00 |
| Smoke from oil well fires |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 5 | 38 | 9 | 31 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | < 5e | 23 | 16 | 55 | 0.45 | 0.07, 2.96 | 0.18 | 0.01, 4.49 | 0.23 | 0.04, 1.41 |
| Yes | 5 | 38 | < 5e | 14 | 2.56 | 0.35, 18.59 | 4.80 | 0.30, 76.22 | 1.13 | 0.17, 7.76 |
| Missing | 3 |  | 1 |  |  |  |  |  |  |  |
| Trendg |  |  |  |  | 1.51 | 0.54, 4.26 | 1.99 | 0.51, 7.72 | 1.59 | 0.44, 5.70 |
| Exposure to nerve gas (e.g., during munitions destruction) |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 11 | 79 | 21 | 95 | 1.00 | Referent | 1.00 | Referent |  | Referent |
| No | < 5e | 7 | < 5e | 5 | 4.70 | 0.21, 106.17 | 109.13 | 0.19, 61891.75 | f | f |
| Yes | < 5e | 14 | 0 | 0 | f | f | f | f | f | f |
| Missing | 2 |  | 8 |  |  |  |  |  |  |  |
| Trendg |  |  |  |  | 5.45 | 0.35, 84.96 | 109.15 | 0.19, 61833.68 | f | f |
| High levels of dust/sand |  |  |  |  |  |  |  |  |  |  |
| Not exposed | < 5e | 20 | < 5e | 7 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 12 | 80 | 25 | 83 | 0.20 | 0.03, 1.63 | 0.13 | 0.01, 1.78 | 0.92 | f |
| Yes | 0 | 0 | < 5e | 10 | f | f | f | f | f | f |
| Missing | 1 |  | 0 |  |  |  |  |  |  |  |
| Trendg |  |  |  |  | 0.17 | 0.02, 1.18 | 0.07 | 0.01, 0.81 | 1.13 | 0.19, 6.69 |
| Ground level fumigation |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 9 | 69 | 24 | 92 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | < 5e | 23 | < 5e | 4 | 7.48 | 0.56, 99.67 | 52.62 | 0.48, 5747.99 | 4.43 | 0.36, 55.20 |
| Yes | < 5e | 8 | < 5e | 4 | 2.41 | 0.12, 50.42 | 0.77 | 0.02, 30.53 | 0.86 | 0.05, 15.81 |
| Missing | 3 |  | 4 |  |  |  |  |  |  |  |
| Trendg |  |  |  |  | 2.41 | 0.61, 9.49 | 1.96 | 0.37, 10.45 | 13.90 | 1.37, 140.59 |

Abbreviation: ALS, amyotrophic lateral sclerosis; ALSFRS-R, ALS Functional Rating Scale-Revised; BIRLS, Beneficiary Identification and Records Locator System; CARC, Chemical Agent Resistant Compound; CI, confidence interval; DU, depleted uranium; GENEVA, Genes and Environmental Exposures in Veterans with Amyotrophic Lateral Sclerosis; Gulf, 1990-1991 Persian Gulf; IP, inverse probability; OR, odds ratio; VA, Department of Veterans Affairs; WWII, World War II.

a Adjusted for age (centered at age 60—the median age among controls—and modeled with linear and quadratic terms) and use of the VA health care system.

b Adjusted for age (centered at age 60—the median age among controls—and modeled with linear and quadratic terms), use of the VA health care system, race/ethnicity, and military branch of longest service. War deployment-related exposures were not adjusted for sex because of model instability.

c Weighted for confounding (conditional on age [centered at age 60—the median age among controls—and modeled with linear and quadratic terms], use of the VA health care system, race/ethnicity, and military branch of longest service), not missing baseline ALSFRS-R score (cases only: conditional on most recent ALS diagnosis category, symptom onset site, time from symptom onset to diagnosis [months; modeled with the natural logarithm of a linear term], and time from diagnosis to enrollment in the Registry [months; modeled with a restricted, quadratic spline with knots at 7.72, 13.24, 23.06, and 44.19 months based on percentiles of the distribution in the Registry cases not missing baseline ALSFRS-R score]), and participating in GENEVA (cases: conditional on race/ethnicity, being a current patient of a VA Medical Center, most recent ALS diagnosis category, symptom onset site, time from symptom onset to diagnosis [months; modeled with linear, quadratic, and cubic terms], time from diagnosis to enrollment in the Registry [months; modeled with a linear term], and baseline ALSFRS-R score [modeled with a restricted, quadratic spline with knots at 12, 34, and 44 based on percentiles of the distribution in GENEVA cases]; controls: conditional on year of birth [modeled with a restricted, quadratic spline with knots at 1920, 1947, and 1974 based on percentiles of the distribution in the BIRLS potential controls], use of the VA health care system, and their interaction). War deployment-related exposures were not weighted for sex because of model instability. 95% CIs were calculated with robust variance estimates.

d The GENEVA study questionnaire asked "Were you deployed to..." the following wars where each war was asked about with a separate question: World War II (defined as the period from December 7, 1941, to December 31, 1946), the Korean War (defined as the period from June 27, 1950, to January 31, 1955), the Vietnam War (defined as the period from August 3, 1964, to May 7, 1975), and the Persian Gulf War (defined as the period from August 2, 1990, to December 31, 1991).

e Suppressed to preserve the confidentiality of study participants.

f Unable to estimate OR and 95% CI.

g Used ordinal scores (0, 1, 2). Reference category included for linear trend test.

h Restricted analyses to veterans who were born between 1939 and 1957 inclusive (i.e., they were 18-25 years old at the time of the Vietnam War, or 1964-1975) because doing so drastically improved the behavior of the IP weights used for analysis. This restriction resulted in the exclusion of 21 (14%) cases and 51 (19%) controls.

Table S.3. Military deployments to the Vietnam Wara, b and amyotrophic lateral sclerosis in GENEVA.

|  | Cases | | Controls | | Adjustedc | | Adjustedd | | IP-weightede | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variable | No. | % | No. | % | OR | 95% CI | OR | 95% CI | OR | 95% CI |
| Total number of theaters of operation for the Vietnam War |  |  |  |  |  |  |  |  |  |  |
| Not deployed to any war/operationf | 169 | 55 | 320 | 56 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| Not deployed to the Vietnam War | 12 | 4 | 29 | 5 | 0.58 | 0.27, 1.25 | 0.61 | 0.28, 1.32 | 0.53 | 0.24, 1.15 |
| 1 (Median = 1) | 93 | 30 | 154 | 27 | 1.64 | 1.15, 2.34 | 1.39 | 0.96, 2.00 | 1.71 | 1.13, 2.60 |
| 2 (2) | 24 | 8 | 47 | 8 | 1.56 | 0.89, 2.76 | 1.39 | 0.78, 2.48 | 1.36 | 0.64, 2.89 |
| > 2 (3) | 10 | 3 | 18 | 3 | 1.68 | 0.70, 4.00 | 1.43 | 0.59, 3.47 | 2.38 | 0.88, 6.43 |
| Missing | 6 |  | 8 |  |  |  |  |  |  |  |
| Trendg |  |  |  |  | 1.06 | 0.71, 1.59 | 1.05 | 0.70, 1.59 | 1.04 | 0.68, 1.58 |
| Total length (years) of deployment to all theaters of operation for the Vietnam War |  |  |  |  |  |  |  |  |  |  |
| Not deployed to any war/operationf | 169 | 55 | 320 | 57 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| Not deployed to the Vietnam War | 12 | 4 | 29 | 5 | 0.58 | 0.27, 1.25 | 0.61 | 0.28, 1.32 | 0.53 | 0.24, 1.15 |
| ≤ 1 (0.92) | 63 | 21 | 133 | 24 | 1.28 | 0.87, 1.89 | 1.08 | 0.72, 1.61 | 1.23 | 0.77, 1.97 |
| > 1-2 (1.17) | 42 | 14 | 60 | 11 | 2.09 | 1.29, 3.38 | 1.78 | 1.08, 2.93 | 2.49 | 1.40, 4.43 |
| > 2-3 (2.09) | 12 | 4 | 12 | 2 | 2.67 | 1.13, 6.33 | 2.13 | 0.88, 5.12 | 2.45 | 0.68, 8.87 |
| > 3 (3.38) | 7 | 2 | 11 | 2 | 2.07 | 0.75, 5.74 | 2.21 | 0.80, 6.12 | 0.58 | 0.18, 1.92 |
| Missing | 9 |  | 11 |  |  |  |  |  |  |  |
| Trendg |  |  |  |  | 1.36 | 0.90, 2.05 | 1.44 | 0.95, 2.19 | 1.20 | 0.74, 1.93 |
| End of most recent period of deployment to the Vietnam War (year) |  |  |  |  |  |  |  |  |  |  |
| Not deployed to any war/operationf | 169 | 55 | 320 | 56 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| Not deployed to the Vietnam War | 12 | 4 | 29 | 5 | 0.56 | 0.26, 1.22 | 0.58 | 0.27, 1.28 | 0.53 | 0.25, 1.15 |
| ≤ 1966 (1966) | 14 | 5 | 13 | 2 | 5.54 | 2.42, 12.69 | 5.60 | 2.40, 13.09 | 4.04 | 1.55, 10.55 |
| 1967-1968 (1968) | 34 | 11 | 53 | 9 | 2.24 | 1.34, 3.76 | 1.82 | 1.07, 3.10 | 2.11 | 1.07, 4.18 |
| 1969-1970 (1969) | 43 | 14 | 78 | 14 | 1.61 | 1.02, 2.54 | 1.35 | 0.84, 2.17 | 1.95 | 1.07, 3.59 |
| 1971-1972 (1971) | 27 | 9 | 53 | 9 | 1.20 | 0.70, 2.07 | 1.04 | 0.60, 1.81 | 1.69 | 0.84, 3.39 |
| > 1972 (1974) | 6 | 2 | 22 | 4 | 0.39 | 0.14, 1.11 | 0.34 | 0.12, 0.98 | 0.65 | 0.10, 4.42 |
| Missing | 9 |  | 8 |  |  |  |  |  |  |  |
| Trendg |  |  |  |  | 0.55 | 0.46, 0.67 | 0.53 | 0.43, 0.65 | 0.78 | 0.66, 0.92 |

Abbreviation: ALS, amyotrophic lateral sclerosis; ALSFRS-R, ALS Functional Rating Scale-Revised; BIRLS, Beneficiary Identification and Records Locator System; CI, confidence interval; GENEVA, Genes and Environmental Exposures in Veterans with Amyotrophic Lateral Sclerosis; IP, inverse probability; OR, odds ratio; VA, Department of Veterans Affairs.

a The GENEVA study questionnaire asked "Were you deployed to..." the Vietnam War (defined as the period from August 3, 1964, to May 7, 1975).

b Restricted analyses to veterans who were born between 1939 and 1957 inclusive (i.e., they were 18-25 years old at the time of the Vietnam War, or 1964-1975) because doing so drastically improved the behavior of the IP weights used for analysis. This restriction resulted in the exclusion of 305 (49%) cases and 380 (40%) controls.

c Adjusted for age (centered at age 60—the median age among controls—and modeled with linear and quadratic terms) and use of the VA health care system.

d Adjusted for age (centered at age 60—the median age among controls—and modeled with linear and quadratic terms), use of the VA health care system, sex, race/ethnicity, and military branch of longest service.

e Weighted for confounding (conditional on age [centered at age 60—the median age among controls—and modeled with linear and quadratic terms], use of the VA health care system, sex, race/ethnicity, and military branch of longest service), not missing baseline ALSFRS-R score (cases only: conditional on most recent ALS diagnosis category, symptom onset site, time from symptom onset to diagnosis [months; modeled with the natural logarithm of a linear term], and time from diagnosis to enrollment in the Registry [months; modeled with a restricted, quadratic spline with knots at 7.72, 13.24, 23.06, and 44.19 months based on percentiles of the distribution in the Registry cases not missing baseline ALSFRS-R score]), and participating in GENEVA (cases: conditional on race/ethnicity, being a current patient of a VA Medical Center, most recent ALS diagnosis category, symptom onset site, time from symptom onset to diagnosis [months; modeled with linear, quadratic, and cubic terms], time from diagnosis to enrollment in the Registry [months; modeled with a linear term], and baseline ALSFRS-R score [modeled with a restricted, quadratic spline with knots at 12, 34, and 44 based on percentiles of the distribution in GENEVA cases]; controls: conditional on year of birth [modeled with a restricted, quadratic spline with knots at 1920, 1947, and 1974 based on percentiles of the distribution in the BIRLS potential controls], use of the VA health care system, and their interaction). 95% CIs were calculated with robust variance estimates.

f The GENEVA study questionnaire asked "Were you deployed to..." the following wars where each war was asked about with a separate question: World War II (defined as the period from December 7, 1941, to December 31, 1946), the Korean War (defined as the period from June 27, 1950, to January 31, 1955), the Vietnam War (defined as the period from August 3, 1964, to May 7, 1975), and the Persian Gulf War (defined as the period from August 2, 1990, to December 31, 1991). The questionnaire also asked "Ever deployed..." to the following countries where each country was asked about with a separate question: Grenada, Lebanon, Panama, Somalia, Bosnia, Kosovo, Rwanda, Afghanistan, and Iraq/Persian Gulf region (Gulf War II).

g Used within-category medians that were calculated using all controls. Individuals in the categories labeled "Not deployed to any war/operation" and "Not deployed to the Vietnam War" were excluded for the linear trend test.

Table S.4. Military exposures during deployment to the Vietnam Wara, b and amyotrophic lateral sclerosis in GENEVA.

|  | Cases | | Controls | | Adjustedc | | Adjustedd | | IP-weightede | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Did you have direct contact with/were you exposed to | No. | % | No. | % | OR | 95% CI | OR | 95% CI | OR | 95% CI |
| Mixing and application of Agent Orangef |  |  |  |  |  |  |  |  |  |  |
| No | 109 | 93 | 200 | 94 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| Yes | 8 | 7 | 13 | 6 | 1.42 | 0.52, 3.85 | 1.54 | 0.55, 4.29 | 1.15 | 0.38, 3.44 |
| Missing | 10 |  | 6 |  |  |  |  |  |  |  |
| Exposure to Agent Orange in the fieldf |  |  |  |  |  |  |  |  |  |  |
| No | 41 | 41 | 98 | 56 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| Yes | 58 | 59 | 77 | 44 | 2.91 | 1.57, 5.39 | 3.12 | 1.59, 6.09 | 2.80 | 1.44, 5.44 |
| Missing | 28 |  | 44 |  |  |  |  |  |  |  |
| Mixing and application of other herbicides |  |  |  |  |  |  |  |  |  |  |
| No | 116 | 97 | 211 | 99 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| Yes | < 5g | 3 | < 5g | 1 | 3.88 | 0.53, 28.33 | 3.69 | 0.53, 25.68 | 2.04 | 0.21, 19.69 |
| Missing | 8 |  | 6 |  |  |  |  |  |  |  |
| Exposure to other herbicides in the field |  |  |  |  |  |  |  |  |  |  |
| No | 80 | 91 | 165 | 93 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| Yes | 8 | 9 | 12 | 7 | 3.24 | 1.11, 9.45 | 3.27 | 1.08, 9.94 | 4.74 | 1.41, 15.97 |
| Missing | 39 |  | 42 |  |  |  |  |  |  |  |
| Ionizing radiation from nuclear weapon testing |  |  |  |  |  |  |  |  |  |  |
| No | 114 | 98 | 212 | 99 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| Yes | < 5g | 2 | < 5g | 1 | 1.56 | 0.24, 10.35 | 1.94 | 0.27, 13.82 | 1.00 | 0.15, 6.89 |
| Missing | 11 |  | 4 |  |  |  |  |  |  |  |
| Microwave radiation |  |  |  |  |  |  |  |  |  |  |
| No | 97 | 90 | 184 | 92 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| Yes | 11 | 10 | 15 | 8 | 1.78 | 0.69, 4.60 | 1.88 | 0.70, 5.00 | 1.22 | 0.48, 3.13 |
| Missing | 19 |  | 20 |  |  |  |  |  |  |  |
| Use of personal pesticides, like creams, sprays or flea collars |  |  |  |  |  |  |  |  |  |  |
| No | 74 | 61 | 140 | 35 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| Yes | 48 | 39 | 76 | 35 | 1.17 | 0.69, 1.99 | 1.15 | 0.67, 1.98 | 1.31 | 0.71, 2.44 |
| Missing | 5 |  | 3 |  |  |  |  |  |  |  |
| Use of pesticides on your clothing or bedding |  |  |  |  |  |  |  |  |  |  |
| No | 76 | 66 | 153 | 72 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| Yes | 39 | 34 | 60 | 28 | 1.60 | 0.91, 2.79 | 1.52 | 0.85, 2.70 | 1.83 | 0.99, 3.40 |
| Missing | 12 |  | 6 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| Exhaust from heaters or generators (e.g., kerosene heaters, tent heaters) |  |  |  |  |  |  |  |  |  |  |
| No | 76 | 63 | 158 | 73 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| Yes | 44 | 37 | 59 | 27 | 1.63 | 0.94, 2.81 | 1.69 | 0.97, 2.96 | 2.01 | 1.10, 3.68 |
| Missing | 7 |  | 2 |  |  |  |  |  |  |  |
| Exposure to diesel and/or other petrochemical fumes |  |  |  |  |  |  |  |  |  |  |
| No | 30 | 25 | 70 | 32 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| Yes | 92 | 75 | 147 | 68 | 1.51 | 0.84, 2.68 | 1.47 | 0.81, 2.64 | 1.38 | 0.75, 2.55 |
| Missing | 5 |  | 2 |  |  |  |  |  |  |  |
| Burning trash or burning feces/manure |  |  |  |  |  |  |  |  |  |  |
| No | 62 | 51 | 114 | 53 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| Yes | 60 | 49 | 100 | 47 | 1.10 | 0.66, 1.84 | 1.07 | 0.60, 1.89 | 1.02 | 0.55, 1.91 |
| Missing | 5 |  | 5 |  |  |  |  |  |  |  |
| Exposure to paint, solvents, or petrochemical substances |  |  |  |  |  |  |  |  |  |  |
| No | 76 | 63 | 133 | 61 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| Yes | 44 | 37 | 84 | 39 | 0.83 | 0.49, 1.42 | 0.75 | 0.42, 1.35 | 0.91 | 0.50, 1.66 |
| Missing | 7 |  | 2 |  |  |  |  |  |  |  |
| High-intensity radar waves (e.g., as radar operator, radio operator, aviation electrician's mate) |  |  |  |  |  |  |  |  |  |  |
| No | 83 | 75 | 172 | 84 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| Yes | 28 | 25 | 33 | 16 | 1.77 | 0.93, 3.40 | 1.91 | 0.98, 3.72 | 1.79 | 0.75, 4.27 |
| Missing | 16 |  | 14 |  |  |  |  |  |  |  |
| Food contaminated with smoke, oil, or other chemicals |  |  |  |  |  |  |  |  |  |  |
| No | 97 | 88 | 174 | 88 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| Yes | 13 | 12 | 24 | 12 | 1.08 | 0.48, 2.41 | 1.12 | 0.49, 2.58 | 1.48 | 0.59, 3.67 |
| Missing | 17 |  | 21 |  |  |  |  |  |  |  |
| Local food other than food provided by the Armed Forces |  |  |  |  |  |  |  |  |  |  |
| No | 56 | 46 | 113 | 52 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| Yes | 67 | 54 | 106 | 48 | 1.23 | 0.74, 2.03 | 1.13 | 0.67, 1.91 | 1.13 | 0.63, 2.01 |
| Missing | 4 |  | 0 |  |  |  |  |  |  |  |
| Bathing in or drinking of water contaminated with smoke, oil, dead animals or any chemicals |  |  |  |  |  |  |  |  |  |  |
| No | 88 | 83 | 169 | 84 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| Yes | 18 | 17 | 33 | 16 | 1.08 | 0.53, 2.21 | 1.15 | 0.55, 2.43 | 0.99 | 0.42, 2.35 |
| Missing | 21 |  | 17 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| Heat cramps, heat exhaustion, heat stroke or other heat illness |  |  |  |  |  |  |  |  |  |  |
| No | 84 | 69 | 152 | 70 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| Yes | 38 | 31 | 64 | 30 | 1.07 | 0.61, 1.87 | 1.09 | 0.61, 1.93 | 1.32 | 0.74, 2.36 |
| Missing | 5 |  | 3 |  |  |  |  |  |  |  |
| Heard chemical alarms sounding |  |  |  |  |  |  |  |  |  |  |
| No | 117 | 96 | 200 | 93 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| Yes | 5 | 4 | 16 | 7 | 0.54 | 0.18, 1.65 | 0.59 | 0.19, 1.83 | 0.62 | 0.17, 2.23 |
| Missing | 5 |  | 3 |  |  |  |  |  |  |  |
| Explosion in the air or on the ground within one mile of you (e.g., artillery, rockets, mortars) |  |  |  |  |  |  |  |  |  |  |
| No | 28 | 22 | 60 | 28 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| Yes | 97 | 78 | 151 | 72 | 1.57 | 0.85, 2.87 | 1.63 | 0.87, 3.07 | 2.05 | 1.10, 3.79 |
| Missing | 2 |  | 8 |  |  |  |  |  |  |  |
| Mixing and application of riot control substances |  |  |  |  |  |  |  |  |  |  |
| No | 123 | 98 | 213 | 97 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| Yes | < 5g | 2 | 6 | 3 | 0.51 | 0.08, 3.17 | 0.75 | 0.13, 4.43 | 0.22 | 0.02, 2.05 |
| Missing | 2 |  | 0 |  |  |  |  |  |  |  |
| Exposure to riot control substances in the field |  |  |  |  |  |  |  |  |  |  |
| No | 115 | 93 | 198 | 91 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| Yes | 9 | 7 | 19 | 9 | 0.64 | 0.25, 1.64 | 0.64 | 0.25, 1.69 | 0.58 | 0.21, 1.61 |
| Missing | 3 |  | 2 |  |  |  |  |  |  |  |
| Mixing and application of burning agents |  |  |  |  |  |  |  |  |  |  |
| No | 110 | 91 | 212 | 98 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| Yes | 11 | 9 | 5 | 2 | 5.00 | 1.53, 16.31 | 5.13 | 1.54, 17.14 | 4.70 | 1.33, 16.60 |
| Missing | 6 |  | 2 |  |  |  |  |  |  |  |
| Exposure to burning agents in the field |  |  |  |  |  |  |  |  |  |  |
| No | 90 | 75 | 188 | 88 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| Yes | 30 | 25 | 26 | 12 | 3.07 | 1.58, 5.94 | 3.22 | 1.63, 6.37 | 2.93 | 1.40, 6.16 |
| Missing | 7 |  | 5 |  |  |  |  |  |  |  |
| Have you suffered a combat-related injury that required medical attention during your deployment? |  |  |  |  |  |  |  |  |  |  |
| No | 94 | 76 | 156 | 72 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| Yes | 30 | 24 | 61 | 28 | 0.72 | 0.40, 1.31 | 0.78 | 0.42, 1.47 | 0.64 | 0.30, 1.40 |
| Missing | 3 |  | 2 |  |  |  |  |  |  |  |

Abbreviation: ALS, amyotrophic lateral sclerosis; ALSFRS-R, ALS Functional Rating Scale-Revised; BIRLS, Beneficiary Identification and Records Locator System; CI, confidence interval; GENEVA, Genes and Environmental Exposures in Veterans with Amyotrophic Lateral Sclerosis; IP, inverse probability; OR, odds ratio; VA, Department of Veterans Affairs.

a The GENEVA study questionnaire asked "Were you deployed to..." the Vietnam War (defined as the period from August 3, 1964, to May 7, 1975).

b Restricted analyses to veterans who were born between 1939 and 1957 inclusive (i.e., they were 18-25 years old at the time of the Vietnam War, or 1964-1975) because doing so drastically improved the behavior of the IP weights used for analysis. This restriction resulted in the exclusion of 21 (14%) cases and 51 (19%) controls.

c Adjusted for age (centered at age 60—the median age among controls—and modeled with linear and quadratic terms) and use of the VA health care system.

d Adjusted for age (centered at age 60—the median age among controls—and modeled with linear and quadratic terms), use of the VA health care system, race/ethnicity, and military branch of longest service. War deployment-related exposures were not adjusted for sex because of model instability.

e Weighted for confounding (conditional on age [centered at age 60—the median age among controls—and modeled with linear and quadratic terms], use of the VA health care system, race/ethnicity, and military branch of longest service), not missing baseline ALSFRS-R score (cases only: conditional on most recent ALS diagnosis category, symptom onset site, time from symptom onset to diagnosis [months; modeled with the natural logarithm of a linear term], and time from diagnosis to enrollment in the Registry [months; modeled with a restricted, quadratic spline with knots at 7.72, 13.24, 23.06, and 44.19 months based on percentiles of the distribution in the Registry cases not missing baseline ALSFRS-R score]), and participating in GENEVA (cases: conditional on race/ethnicity, being a current patient of a VA Medical Center, most recent ALS diagnosis category, symptom onset site, time from symptom onset to diagnosis [months; modeled with linear, quadratic, and cubic terms], time from diagnosis to enrollment in the Registry [months; modeled with a linear term], and baseline ALSFRS-R score [modeled with a restricted, quadratic spline with knots at 12, 34, and 44 based on percentiles of the distribution in GENEVA cases]; controls: conditional on year of birth [modeled with a restricted, quadratic spline with knots at 1920, 1947, and 1974 based on percentiles of the distribution in the BIRLS potential controls], use of the VA health care system, and their interaction). War deployment-related exposures were not weighted for sex because of model instability. 95% CIs were calculated with robust variance estimates.

f Repeated from Table 5.

g Suppressed to preserve the confidentiality of study participants.

Table S.5. Dose-response for military exposures during deployment to the Vietnam Wara, b and amyotrophic lateral sclerosis in GENEVA.

|  | Cases | | Controls | | Adjustedc | | Adjustedd | | IP-weightede | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Exposure | No. | % | No. | % | OR | 95% CI | OR | 95% CI | OR | 95% CI |
| Total number of preventive vaccinations received by injection (shots) or by mouth while inside or outside the U.S. |  |  |  |  |  |  |  |  |  |  |
| 0 (Median = 0) | 29 | 29 | 48 | 26 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| 1-10 (5) | 32 | 32 | 80 | 43 | 0.61 | 0.30, 1.25 | 0.61 | 0.29, 1.28 | 0.76 | 0.35, 1.64 |
| 11-20 (13) | 16 | 16 | 21 | 11 | 1.22 | 0.49, 3.03 | 1.23 | 0.48, 3.16 | 1.36 | 0.56, 3.31 |
| 21-30 (25) | 5 | 5 | 9 | 5 | 0.71 | 0.18, 2.79 | 0.72 | 0.18, 2.83 | 1.42 | 0.39, 5.23 |
| > 30 (99) | 17 | 17 | 27 | 15 | 1.03 | 0.43, 2.45 | 1.08 | 0.44, 2.64 | 2.65 | 0.80, 8.79 |
| Missing | 28 |  | 34 |  |  |  |  |  |  |  |
| Trend (IQR = 13)f |  |  |  |  | 1.03 | 0.93, 1.14 | 1.04 | 0.93, 1.15 | 1.11 | 0.96, 1.27 |
| ***Number of days exposed to*** |  |  |  |  |  |  |  |  |  |  |
| Mixing and application of Agent Orangeg |  |  |  |  |  |  |  |  |  |  |
| Not exposed or ≤ 5 | 111 | 96 | 202 | 95 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| > 5 | 5 | 4 | 11 | 5 | 0.98 | 0.29, 3.30 | 0.99 | 0.28, 3.47 | 1.02 | 0.28, 3.67 |
| Missing | 11 |  | 6 |  |  |  |  |  |  |  |
| Trendh |  |  |  |  | 0.94 | 0.48, 1.83 | 0.96 | 0.48, 1.92 | 0.92 | 0.41, 2.07 |
| Exposure to Agent Orange in the fieldg |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 41 | 44 | 98 | 58 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 5 | 10 | 11 | 13 | 8 | 2.30 | 0.83, 6.36 | 2.37 | 0.81, 6.99 | 2.15 | 0.70, 6.62 |
| 6-30 | 8 | 9 | 16 | 10 | 2.01 | 0.66, 6.13 | 1.77 | 0.56, 5.63 | 3.32 | 0.84, 13.17 |
| > 30 | 34 | 37 | 41 | 24 | 3.14 | 1.53, 6.42 | 3.29 | 1.50, 7.22 | 2.46 | 1.08, 5.60 |
| Missing | 34 |  | 51 |  |  |  |  |  |  |  |
| Trendh |  |  |  |  | 1.55 | 1.15, 2.09 | 1.56 | 1.13, 2.16 | 1.49 | 1.10, 2.01 |
| Mixing and application of other herbicides |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 116 | 97 | 211 | 99 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 30 | < 5i | 2 | < 5i | < 1 | 3.11 | 0.22, 43.31 | 3.20 | 0.25, 40.51 | 3.01 | 0.19, 48.85 |
| > 30 | < 5i | 1 | < 5i | < 1 | 5.04 | 0.28, 91.83 | 4.43 | 0.24, 81.42 | 1.74 | 0.11, 28.22 |
| Missing | 8 |  | 6 |  |  |  |  |  |  |  |
| Trendh |  |  |  |  | 2.40 | 0.71, 8.13 | 2.28 | 0.67, 7.73 | 12.74 | 0.56, 288.44 |
| Exposure to other herbicides in the field |  |  |  |  |  |  |  |  |  |  |
| Not exposed or ≤ 5 | 82 | 94 | 167 | 94 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| > 5 | 5 | 6 | 10 | 6 | 2.35 | 0.66, 8.41 | 2.10 | 0.57, 7.73 | 2.33 | 0.52, 10.46 |
| Missing | 40 |  | 42 |  |  |  |  |  |  |  |
| Trendh |  |  |  |  | 1.44 | 0.79, 2.62 | 1.34 | 0.73, 2.45 | 1.35 | 0.69, 2.63 |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| Ionizing radiation from nuclear weapon testing |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 114 | 98 | 212 | 99 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 5 | < 5i | 2 | < 5i | < 1 | 5.63 | 0.45, 71.09 | 5.82 | 0.44, 76.49 | 9.38 | j |
| 6-30 | 0 | 0 | < 5i | 1 | j | j | j | j | j | j |
| > 30 | 0 | 0 | < 5i | 1 | j | j | j | j | j | j |
| Missing | 11 |  | 4 |  |  |  |  |  |  |  |
| Trendh |  |  |  |  | 0.33 | 0.02, 7.32 | 0.40 | 0.02, 9.34 | 1.43 | 0.12, 16.90 |
| Microwave radiation |  |  |  |  |  |  |  |  |  |  |
| Not exposed or ≤ 5 | 98 | 91 | 189 | 95 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| > 5 | 10 | 9 | 10 | 5 | 2.20 | 0.77, 6.29 | 2.36 | 0.80, 6.92 | 1.79 | 0.69, 4.66 |
| Missing | 19 |  | 20 |  |  |  |  |  |  |  |
| Trendh |  |  |  |  | 1.48 | 0.91, 2.42 | 1.54 | 0.93, 2.54 | 1.19 | 0.70, 2.01 |
| Use of personal pesticides, like creams, sprays or flea collars |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 74 | 61 | 140 | 66 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 30 | 9 | 7 | 13 | 6 | 1.43 | 0.52, 3.97 | 1.36 | 0.48, 3.89 | 2.90 | 0.88, 9.53 |
| > 30 | 38 | 31 | 60 | 28 | 1.17 | 0.66, 2.08 | 1.17 | 0.65, 2.12 | 1.06 | 0.58, 1.97 |
| Missing | 6 |  | 6 |  |  |  |  |  |  |  |
| Trendh |  |  |  |  | 1.06 | 0.83, 1.35 | 1.06 | 0.82, 1.36 | 1.02 | 0.79, 1.32 |
| Use of pesticides on your clothing or bedding |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 76 | 67 | 153 | 72 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 30 | 8 | 7 | 9 | 4 | 1.89 | 0.61, 5.83 | 1.69 | 0.53, 5.38 | 3.29 | 0.94, 11.45 |
| > 30 | 30 | 26 | 50 | 24 | 1.51 | 0.82, 2.76 | 1.46 | 0.79, 2.72 | 1.65 | 0.85, 3.22 |
| Missing | 13 |  | 7 |  |  |  |  |  |  |  |
| Trendh |  |  |  |  | 1.20 | 0.93, 1.55 | 1.18 | 0.91, 1.54 | 1.24 | 0.94, 1.63 |
| Exhaust from heaters or generators (e.g., kerosene heaters, tent heaters) |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 76 | 64 | 158 | 73 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 30 | 12 | 10 | 19 | 9 | 1.57 | 0.66, 3.76 | 1.62 | 0.66, 3.96 | 2.38 | 0.85, 6.68 |
| > 30 | 30 | 25 | 40 | 18 | 1.64 | 0.88, 3.05 | 1.72 | 0.91, 3.24 | 1.65 | 0.82, 3.31 |
| Missing | 9 |  | 2 |  |  |  |  |  |  |  |
| Trendh |  |  |  |  | 1.26 | 0.97, 1.64 | 1.29 | 0.98, 1.69 | 1.31 | 0.99, 1.75 |
| Exposure to diesel and/or other petrochemical fumes |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 30 | 25 | 70 | 33 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 5 | 5 | 4 | 19 | 9 | 0.58 | 0.17, 1.97 | 0.58 | 0.17, 2.03 | 0.38 | 0.12, 1.20 |
| 6-30 | 9 | 7 | 17 | 8 | 1.34 | 0.48, 3.79 | 1.29 | 0.45, 3.72 | 1.36 | 0.47, 3.98 |
| > 30 | 77 | 64 | 109 | 51 | 1.69 | 0.93, 3.07 | 1.65 | 0.89, 3.05 | 1.53 | 0.81, 2.89 |
| Missing | 6 |  | 4 |  |  |  |  |  |  |  |
| Trendh |  |  |  |  | 1.30 | 1.02, 1.65 | 1.29 | 1.00, 1.65 | 1.28 | 0.99, 1.66 |
|  |  |  |  |  |  |  |  |  |  |  |
| Burning trash or burning feces/manure |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 62 | 52 | 114 | 54 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 5 | 10 | 8 | 25 | 12 | 0.67 | 0.27, 1.66 | 0.69 | 0.27, 1.78 | 0.36 | 0.13, 0.97 |
| 6-30 | 9 | 8 | 29 | 14 | 0.73 | 0.30, 1.77 | 0.70 | 0.28, 1.75 | 0.80 | 0.27, 2.34 |
| > 30 | 38 | 32 | 44 | 21 | 1.47 | 0.79, 2.73 | 1.35 | 0.69, 2.68 | 1.29 | 0.62, 2.67 |
| Missing | 8 |  | 7 |  |  |  |  |  |  |  |
| Trendh |  |  |  |  | 1.20 | 0.92, 1.56 | 1.18 | 0.89, 1.56 | 1.13 | 0.82, 1.56 |
| Exposure to paint, solvents, or petrochemical substances |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 76 | 63 | 133 | 62 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 30 | 17 | 14 | 45 | 21 | 0.69 | 0.34, 1.41 | 0.60 | 0.28, 1.28 | 0.74 | 0.32, 1.74 |
| > 30 | 27 | 23 | 38 | 18 | 1.04 | 0.54, 2.01 | 0.95 | 0.47, 1.93 | 0.92 | 0.45, 1.85 |
| Missing | 7 |  | 3 |  |  |  |  |  |  |  |
| Trendh |  |  |  |  | 1.06 | 0.80, 1.40 | 1.04 | 0.77, 1.40 | 1.06 | 0.78, 1.44 |
| High-intensity radar waves (e.g., as radar operator, radio operator, aviation  electrician's mate) |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 83 | 75 | 172 | 84 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 30 | 5 | 5 | 10 | 5 | 1.29 | 0.39, 4.29 | 1.47 | 0.41, 5.24 | 0.88 | 0.23, 3.46 |
| > 30 | 23 | 21 | 23 | 11 | 1.98 | 0.95, 4.10 | 2.07 | 0.98, 4.34 | 2.34 | 0.88, 6.26 |
| Missing | 16 |  | 14 |  |  |  |  |  |  |  |
| Trendh |  |  |  |  | 1.32 | 0.96, 1.80 | 1.35 | 0.98, 1.85 | 1.40 | 0.91, 2.15 |
| Food contaminated with smoke, oil, or other chemicals |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 97 | 88 | 174 | 88 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 30 | 5 | 5 | 9 | 5 | 1.02 | 0.29, 3.57 | 1.09 | 0.29, 4.06 | 1.44 | 0.32, 6.52 |
| > 30 | 8 | 7 | 14 | 7 | 1.13 | 0.41, 3.11 | 1.17 | 0.41, 3.29 | 1.58 | 0.49, 5.04 |
| Missing | 17 |  | 22 |  |  |  |  |  |  |  |
| Trendh |  |  |  |  | 1.10 | 0.72, 1.68 | 1.11 | 0.72, 1.72 | 1.29 | 0.79, 2.10 |
| Local food other than food provided by the Armed Forces |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 56 | 46 | 113 | 52 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 5 | 17 | 14 | 26 | 12 | 0.78 | 0.33, 1.87 | 0.71 | 0.29, 1.73 | 0.75 | 0.32, 1.76 |
| 6-30 | 18 | 15 | 30 | 14 | 1.28 | 0.61, 2.67 | 1.22 | 0.57, 2.59 | 0.70 | 0.32, 1.52 |
| > 30 | 31 | 25 | 49 | 22 | 1.42 | 0.76, 2.65 | 1.31 | 0.69, 2.50 | 1.45 | 0.69, 3.04 |
| Missing | 5 |  | 1 |  |  |  |  |  |  |  |
| Trendh |  |  |  |  | 1.19 | 0.92, 1.54 | 1.16 | 0.88, 1.51 | 1.20 | 0.88, 1.63 |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| Bathing in or drinking of water contaminated with smoke, oil, dead animals or  any chemicals |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 88 | 83 | 169 | 84 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 30 | 7 | 7 | 12 | 6 | 1.48 | 0.53, 4.15 | 1.48 | 0.51, 4.27 | 2.45 | 0.67, 8.97 |
| > 30 | 11 | 10 | 20 | 10 | 0.90 | 0.36, 2.27 | 1.03 | 0.40, 2.66 | 1.17 | 0.35, 3.93 |
| Missing | 21 |  | 18 |  |  |  |  |  |  |  |
| Trendh |  |  |  |  | 0.97 | 0.66, 1.43 | 1.02 | 0.68, 1.53 | 1.09 | 0.66, 1.79 |
| Heat cramps, heat exhaustion, heat stroke or other heat illness |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 84 | 69 | 152 | 70 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 5 | 15 | 12 | 31 | 14 | 0.89 | 0.41, 1.91 | 0.86 | 0.39, 1.88 | 0.76 | 0.36, 1.59 |
| 6-30 | 13 | 11 | 15 | 7 | 1.54 | 0.62, 3.86 | 1.57 | 0.61, 4.05 | 1.41 | 0.56, 3.55 |
| > 30 | 10 | 8 | 18 | 8 | 0.99 | 0.39, 2.50 | 1.11 | 0.42, 2.92 | 1.83 | 0.64, 5.21 |
| Missing | 5 |  | 3 |  |  |  |  |  |  |  |
| Trendh |  |  |  |  | 1.05 | 0.72, 1.54 | 1.10 | 0.74, 1.64 | 1.34 | 0.88, 2.04 |
| Heard chemical alarms sounding |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 117 | 96 | 200 | 93 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 5 | < 5i | 2 | 9 | 4 | 0.58 | 0.14, 2.52 | 0.62 | 0.14, 2.72 | 0.86 | 0.12, 5.96 |
| 6-30 | < 5i | 1 | < 5i | 1 | 0.67 | 0.06, 7.60 | 1.04 | 0.08, 13.83 | 4.79 | 0.43, 53.70 |
| > 30 | < 5i | 1 | < 5i | 2 | 0.47 | 0.04, 5.00 | 0.41 | 0.04, 4.69 | 0.11 | 0.01, 1.12 |
| Missing | 5 |  | 4 |  |  |  |  |  |  |  |
| Trendh |  |  |  |  | 0.69 | 0.26, 1.84 | 0.70 | 0.26, 1.86 | 0.47 | 0.16, 1.41 |
| Explosion in the air or on the ground within one mile of you (e.g., artillery,  rockets, mortars) |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 28 | 23 | 60 | 29 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 5 | 23 | 19 | 41 | 20 | 1.36 | 0.61, 3.04 | 1.51 | 0.66, 3.45 | 2.04 | 0.88, 4.75 |
| 6-30 | 22 | 18 | 36 | 17 | 1.41 | 0.62, 3.18 | 1.36 | 0.59, 3.14 | 1.73 | 0.76, 3.96 |
| > 30 | 50 | 41 | 73 | 35 | 1.70 | 0.87, 3.31 | 1.76 | 0.87, 3.57 | 2.63 | 1.30, 5.32 |
| Missing | 4 |  | 9 |  |  |  |  |  |  |  |
| Trendh |  |  |  |  | 1.19 | 0.93, 1.53 | 1.20 | 0.92, 1.56 | 1.29 | 0.98, 1.69 |
| Mixing and application of riot control substances |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 123 | 98 | 213 | 97 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 5 | < 5i | 1 | < 5i | 1 | 0.77 | 0.06, 10.56 | 1.00 | 0.08, 13.29 | 2.27 | j |
| > 5 | < 5i | 1 | < 5i | 2 | 0.36 | 0.03, 4.77 | 0.59 | 0.05, 6.73 | j | j |
| Missing | 2 |  | 0 |  |  |  |  |  |  |  |
| Trendk |  |  |  |  | 0.37 | 0.03, 4.02 | 0.53 | 0.07, 4.20 | 0.77 | 0.51, 1.16 |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| Exposure to riot control substances in the field |  |  |  |  |  |  |  |  |  |  |
| Not exposed or ≤ 5 | 116 | 94 | 206 | 95 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| > 5 | 8 | 6 | 11 | 5 | 0.87 | 0.29, 2.55 | 0.96 | 0.32, 2.94 | 1.27 | 0.40, 4.05 |
| Missing | 3 |  | 2 |  |  |  |  |  |  |  |
| Trendh |  |  |  |  | 0.90 | 0.46, 1.74 | 1.03 | 0.51, 2.05 | 1.18 | 0.51, 2.73 |
| Mixing and application of burning agents |  |  |  |  |  |  |  |  |  |  |
| Not exposed or ≤ 5 | 111 | 92 | 213 | 98 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| > 5 | 10 | 8 | < 5i | 2 | 6.64 | 1.83, 24.06 | 6.90 | 1.84, 25.89 | 4.21 | 1.18, 14.96 |
| Missing | 6 |  | 2 |  |  |  |  |  |  |  |
| Trendh |  |  |  |  | 2.52 | 1.14, 5.58 | 2.62 | 1.17, 5.88 | 4.40 | 1.49, 13.06 |
| Exposure to burning agents in the field |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 90 | 77 | 188 | 88 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 5 | 12 | 10 | 10 | 5 | 3.05 | 1.17, 7.98 | 3.05 | 1.15, 8.06 | 2.61 | 0.87, 7.83 |
| 6-30 | 7 | 6 | 8 | 4 | 2.40 | 0.71, 8.10 | 2.40 | 0.67, 8.56 | 2.28 | 0.53, 9.78 |
| > 30 | 8 | 7 | 8 | 4 | 2.55 | 0.82, 7.91 | 2.99 | 0.93, 9.68 | 5.60 | 1.68, 18.71 |
| Missing | 10 |  | 5 |  |  |  |  |  |  |  |
| Trendh |  |  |  |  | 1.56 | 0.98, 2.48 | 1.66 | 1.02, 2.68 | 2.15 | 1.25, 3.69 |
| Have you suffered a combat-related injury that required medical attention during  your deployment? |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 94 | 76 | 156 | 72 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| ≤ 5 | 16 | 13 | 16 | 7 | 1.08 | 0.47, 2.49 | 1.13 | 0.48, 2.70 | 0.87 | 0.36, 2.09 |
| 6-30 | 6 | 5 | 16 | 7 | 0.54 | 0.17, 1.71 | 0.61 | 0.19, 2.01 | 1.56 | 0.31, 7.74 |
| > 30 | 8 | 6 | 29 | 13 | 0.53 | 0.20, 1.39 | 0.57 | 0.21, 1.56 | 0.16 | 0.05, 0.53 |
| Missing | 3 |  | 2 |  |  |  |  |  |  |  |
| Trendh |  |  |  |  | 0.73 | 0.49, 1.10 | 0.76 | 0.50, 1.16 | 0.57 | 0.36, 0.90 |

Abbreviation: ALS, amyotrophic lateral sclerosis; ALSFRS-R, ALS Functional Rating Scale-Revised; CI, confidence interval; BIRLS, Beneficiary Identification and Records Locator System; GENEVA, Genes and Environmental Exposures in Veterans with Amyotrophic Lateral Sclerosis; IP, inverse probability; IQR, interquartile range; OR, odds ratio; U.S., United States of America; VA, Department of Veterans Affairs.

a The GENEVA study questionnaire asked "Were you deployed to..." the Vietnam War (defined as the period from August 3, 1964, to May 7, 1975).

b Restricted analyses to veterans who were born between 1939 and 1957 inclusive (i.e., they were 18-25 years old at the time of the Vietnam War, or 1964-1975) because doing so drastically improved the behavior of the IP weights used for analysis. This restriction resulted in the exclusion of 21 (14%) cases and 51 (19%) controls.

c Adjusted for age (centered at age 60—the median age among controls—and modeled with linear and quadratic terms) and use of the VA health care system.

d Adjusted for age (centered at age 60—the median age among controls—and modeled with linear and quadratic terms), use of the VA health care system, race/ethnicity, and military branch of longest service. War deployment-related exposures were not adjusted for sex because of model instability.

e Weighted for confounding (conditional on age [centered at age 60—the median age among controls—and modeled with linear and quadratic terms], use of the VA health care system, race/ethnicity, and military branch of longest service), not missing baseline ALSFRS-R score (cases only: conditional on most recent ALS diagnosis category, symptom onset site, time from symptom onset to diagnosis [months; modeled with the natural logarithm of a linear term], and time from diagnosis to enrollment in the Registry [months; modeled with a restricted, quadratic spline with knots at 7.72, 13.24, 23.06, and 44.19 months based on percentiles of the distribution in the Registry cases not missing baseline ALSFRS-R score]), and participating in GENEVA (cases: conditional on race/ethnicity, being a current patient of a VA Medical Center, most recent ALS diagnosis category, symptom onset site, time from symptom onset to diagnosis [months; modeled with linear, quadratic, and cubic terms], time from diagnosis to enrollment in the Registry [months; modeled with a linear term], and baseline ALSFRS-R score [modeled with a restricted, quadratic spline with knots at 12, 34, and 44 based on percentiles of the distribution in GENEVA cases]; controls: conditional on year of birth [modeled with a restricted, quadratic spline with knots at 1920, 1947, and 1974 based on percentiles of the distribution in the BIRLS potential controls], use of the VA health care system, and their interaction). War deployment-related exposures were not weighted for sex because of model instability. 95% CIs were calculated with robust variance estimates.

f Used within-category medians that were calculated using all controls. Scaled the OR to an IQR-unit increase in the exposure variable. IQRs were calculated using all controls except those in the reference category. Reference category included for linear trend test.

g Repeated from Supplementary data, Table S.1.

h Used category midpoints (0, 3, 18) or 50% above the lower bound of the highest category (46.5) and scaled the OR to a 20-day increase in the exposure variable. Reference category included for linear trend test.

i Suppressed to preserve the confidentiality of study participants.

j Unable to estimate OR and 95% CI.

k Used category midpoints (0, 3, 18) or 50% above the lower bound of the highest category (46.5). OR corresponds to a one-day increase in the exposure variable. Reference category included for linear trend test.

Table S.6. Feel ill from military exposures during deployment to the Vietnam Wara, b and amyotrophic lateral sclerosis in GENEVA.

|  | Cases | | Controls | | Adjustedc | | Adjustedd | | IP-weightede | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Did you feel ill from exposure to | No. | % | No. | % | OR | 95% CI | OR | 95% CI | OR | 95% CI |
| Mixing and application of Agent Orangef |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 109 | 94 | 200 | 94 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 7 | 6 | 12 | 6 | 1.47 | 0.54, 4.01 | 1.60 | 0.57, 4.51 | 1.57 | g |
| Yes | 0 | 0 | < 5h | < 1 | g | g | g | g | g | g |
| Missing | 11 |  | 6 |  |  |  |  |  |  |  |
| Trendi |  |  |  |  | 1.35 | 0.52, 3.51 | 1.44 | 0.54, 3.81 | 1.04 | 0.35, 3.05 |
| Exposure to Agent Orange in the fieldf |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 41 | 44 | 98 | 60 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 43 | 46 | 58 | 35 | 3.07 | 1.58, 5.95 | 3.20 | 1.58, 6.47 | 2.73 | 1.38, 5.42 |
| Yes | 9 | 10 | 8 | 5 | 2.88 | 0.85, 9.76 | 3.46 | 0.86, 13.96 | 8.96 | 2.33, 34.45 |
| Missing | 34 |  | 55 |  |  |  |  |  |  |  |
| Trendi |  |  |  |  | 2.23 | 1.34, 3.70 | 2.46 | 1.39, 4.37 | 2.82 | 1.62, 4.93 |
| Mixing and application of other herbicides |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 116 | 97 | 211 | 99 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | < 5h | 3 | < 5h | 1 | 3.88 | 0.53, 28.33 | 3.69 | 0.53, 25.68 | 2.49 | 0.29, 21.23 |
| Yes | 0 | 0 | 0 | 0 | g | g | g | g | g | g |
| Missing | 8 |  | 6 |  |  |  |  |  |  |  |
| Trendi |  |  |  |  | 3.88 | 0.53, 28.33 | 3.69 | 0.53, 25.68 | 1.89 | 0.21, 16.72 |
| Exposure to other herbicides in the field |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 80 | 92 | 165 | 94 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 7 | 8 | 7 | 4 | 3.89 | 1.17, 13.00 | 3.94 | 1.13, 13.79 | 3.63 | g |
| Yes | 0 | 0 | < 5h | 2 | g | g | g | g | g | g |
| Missing | 40 |  | 43 |  |  |  |  |  |  |  |
| Trendi |  |  |  |  | 1.81 | 0.74, 4.46 | 1.88 | 0.73, 4.79 | 2.70 | 0.72, 10.13 |
| Ionizing radiation from nuclear weapon testing |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 114 | 98 | 212 | 99 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | < 5h | 2 | < 5h | 1 | 2.21 | 0.28, 17.71 | 3.08 | 0.36, 26.45 | 1.52 | 0.20, 11.55 |
| Yes | 0 | 0 | 0 | 0 | g | g | g | g | g | g |
| Missing | 11 |  | 5 |  |  |  |  |  |  |  |
| Trendi |  |  |  |  | 2.21 | 0.28, 17.71 | 3.08 | 0.36, 26.45 | 0.78 | 0.09, 6.64 |
| Microwave radiation |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 97 | 91 | 184 | 93 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 9 | 8 | 13 | 7 | 1.61 | 0.57, 4.53 | 1.68 | 0.58, 4.86 | 1.29 | 0.45, 3.68 |
| Yes | < 5h | 1 | < 5h | 1 | 6.57 | 0.29, 150.37 | 11.63 | 0.63, 214.15 | 0.78 | 0.05, 12.65 |
| Missing | 20 |  | 21 |  |  |  |  |  |  |  |
| Trendi |  |  |  |  | 1.85 | 0.77, 4.43 | 2.11 | 0.86, 5.15 | 1.20 | 0.50, 2.88 |
|  |  |  |  |  |  |  |  |  |  |  |
| Use of personal pesticides, like creams, sprays or flea collars |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 74 | 64 | 140 | 67 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 38 | 33 | 66 | 32 | 1.03 | 0.59, 1.82 | 0.98 | 0.55, 1.75 | 1.15 | 0.58, 2.28 |
| Yes | < 5h | 3 | < 5h | 1 | 2.54 | 0.45, 14.29 | 1.95 | 0.33, 11.32 | 5.53 | 0.85, 35.83 |
| Missing | 12 |  | 10 |  |  |  |  |  |  |  |
| Trendi |  |  |  |  | 1.16 | 0.70, 1.91 | 1.08 | 0.65, 1.80 | 1.40 | 0.79, 2.48 |
| Use of pesticides on your clothing or bedding |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 76 | 68 | 153 | 73 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 31 | 28 | 49 | 23 | 1.58 | 0.86, 2.89 | 1.46 | 0.79, 2.72 | 1.85 | 0.93, 3.69 |
| Yes | < 5h | 4 | 7 | 3 | 1.08 | 0.25, 4.68 | 1.38 | 0.27, 7.01 | 6.11 | 1.25, 29.71 |
| Missing | 16 |  | 10 |  |  |  |  |  |  |  |
| Trendi |  |  |  |  | 1.33 | 0.82, 2.17 | 1.35 | 0.81, 2.27 | 1.92 | 1.14, 3.23 |
| Exhaust from heaters or generators (e.g., kerosene heaters, tent heaters) |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 76 | 65 | 158 | 74 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 31 | 27 | 45 | 21 | 1.35 | 0.73, 2.50 | 1.38 | 0.73, 2.59 | 1.74 | 0.89, 3.42 |
| Yes | 10 | 9 | 11 | 5 | 2.74 | 0.97, 7.72 | 3.13 | 1.06, 9.21 | 2.17 | 0.77, 6.11 |
| Missing | 10 |  | 5 |  |  |  |  |  |  |  |
| Trendi |  |  |  |  | 1.53 | 0.99, 2.34 | 1.59 | 1.02, 2.48 | 1.60 | 1.02, 2.49 |
| Exposure to diesel and/or other petrochemical fumes |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 30 | 25 | 70 | 33 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 70 | 59 | 123 | 57 | 1.35 | 0.74, 2.44 | 1.29 | 0.70, 2.38 | 1.29 | 0.67, 2.48 |
| Yes | 18 | 15 | 21 | 10 | 2.19 | 0.90, 5.31 | 2.24 | 0.89, 5.60 | 1.73 | 0.69, 4.35 |
| Missing | 9 |  | 5 |  |  |  |  |  |  |  |
| Trendi |  |  |  |  | 1.45 | 0.95, 2.21 | 1.44 | 0.93, 2.23 | 1.30 | 0.84, 2.02 |
| Burning trash or burning feces/manure |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 62 | 52 | 114 | 55 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 45 | 38 | 73 | 35 | 1.09 | 0.63, 1.90 | 1.08 | 0.59, 1.98 | 1.07 | 0.54, 2.13 |
| Yes | 13 | 11 | 22 | 11 | 1.15 | 0.49, 2.71 | 1.08 | 0.43, 2.72 | 0.80 | 0.29, 2.23 |
| Missing | 7 |  | 10 |  |  |  |  |  |  |  |
| Trendi |  |  |  |  | 1.08 | 0.74, 1.58 | 1.05 | 0.69, 1.60 | 0.96 | 0.59, 1.56 |
| Exposure to paint, solvents, or petrochemical substances |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 76 | 66 | 133 | 62 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 35 | 30 | 70 | 33 | 0.73 | 0.41, 1.30 | 0.62 | 0.33, 1.18 | 0.80 | 0.41, 1.57 |
| Yes | 5 | 4 | 11 | 5 | 1.01 | 0.31, 3.30 | 0.82 | 0.24, 2.82 | 1.10 | 0.29, 4.18 |
| Missing | 11 |  | 5 |  |  |  |  |  |  |  |
| Trendi |  |  |  |  | 0.85 | 0.54, 1.33 | 0.75 | 0.45, 1.24 | 0.90 | 0.51, 1.57 |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| High-intensity radar waves (e.g., as radar operator, radio operator, aviation electrician's mate) |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 83 | 76 | 172 | 85 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 24 | 22 | 30 | 15 | 1.66 | 0.84, 3.28 | 1.78 | 0.88, 3.60 | 1.81 | 0.72, 4.54 |
| Yes | < 5h | 2 | < 5h | < 1 | 2.04 | 0.13, 32.54 | 1.52 | 0.10, 23.43 | 0.40 | 0.04, 4.53 |
| Missing | 18 |  | 16 |  |  |  |  |  |  |  |
| Trendi |  |  |  |  | 1.62 | 0.87, 3.02 | 1.66 | 0.87, 3.17 | 1.60 | 0.71, 3.60 |
| Food contaminated with smoke, oil, or other chemicals |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 97 | 89 | 174 | 88 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 7 | 6 | 17 | 9 | 0.90 | 0.32, 2.52 | 0.98 | 0.34, 2.85 | 2.18 | 0.69, 6.89 |
| Yes | 5 | 5 | 6 | 3 | 1.42 | 0.36, 5.60 | 1.44 | 0.35, 5.92 | 1.92 | 0.40, 9.15 |
| Missing | 18 |  | 22 |  |  |  |  |  |  |  |
| Trendi |  |  |  |  | 1.10 | 0.61, 1.96 | 1.13 | 0.62, 2.06 | 1.26 | 0.66, 2.42 |
| Local food other than food provided by the Armed Forces |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 56 | 46 | 113 | 52 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 57 | 47 | 77 | 35 | 1.50 | 0.88, 2.56 | 1.39 | 0.80, 2.41 | 1.23 | 0.67, 2.25 |
| Yes | 8 | 7 | 28 | 13 | 0.42 | 0.15, 1.16 | 0.39 | 0.14, 1.09 | 0.73 | 0.23, 2.38 |
| Missing | 6 |  | 1 |  |  |  |  |  |  |  |
| Trendi |  |  |  |  | 0.91 | 0.62, 1.34 | 0.86 | 0.58, 1.27 | 0.97 | 0.61, 1.53 |
| Bathing in or drinking of water contaminated with smoke, oil, dead animals or any chemicals |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 88 | 85 | 169 | 84 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 12 | 12 | 23 | 11 | 1.20 | 0.52, 2.77 | 1.32 | 0.56, 3.10 | 0.93 | 0.30, 2.95 |
| Yes | < 5h | 4 | 10 | 5 | 0.63 | 0.16, 2.40 | 0.65 | 0.16, 2.57 | 1.12 | 0.23, 5.39 |
| Missing | 23 |  | 17 |  |  |  |  |  |  |  |
| Trendi |  |  |  |  | 0.92 | 0.54, 1.57 | 0.96 | 0.55, 1.67 | 1.05 | 0.55, 1.98 |
| Heat cramps, heat exhaustion, heat stroke or other heat illness |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 84 | 69 | 152 | 70 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | < 5h | 3 | 5 | 2 | 2.47 | 0.54, 11.23 | 2.95 | 0.61, 14.16 | 0.80 | 0.15, 4.22 |
| Yes | 33 | 27 | 59 | 27 | 0.94 | 0.52, 1.68 | 0.93 | 0.51, 1.70 | 1.25 | 0.66, 2.35 |
| Missing | 6 |  | 3 |  |  |  |  |  |  |  |
| Trendi |  |  |  |  | 0.98 | 0.73, 1.31 | 0.98 | 0.73, 1.32 | 1.12 | 0.83, 1.53 |
| Heard chemical alarms sounding |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 117 | 96 | 200 | 93 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 5 | 4 | 15 | 7 | 0.56 | 0.18, 1.70 | 0.61 | 0.19, 1.92 | 0.68 | g |
| Yes | 0 | 0 | < 5h | < 1 | g | g | g | g | g | g |
| Missing | 5 |  | 3 |  |  |  |  |  |  |  |
| Trendi |  |  |  |  | 0.54 | 0.18, 1.61 | 0.58 | 0.19, 1.76 | 0.60 | 0.19, 1.85 |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| Explosion in the air or on the ground within one mile of you (e.g., artillery, rockets, mortars) |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 28 | 23 | 60 | 29 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 87 | 71 | 133 | 63 | 1.64 | 0.89, 3.03 | 1.71 | 0.90, 3.24 | 2.10 | 1.12, 3.96 |
| Yes | 8 | 7 | 16 | 8 | 0.92 | 0.28, 2.98 | 0.87 | 0.26, 2.96 | 1.01 | 0.29, 3.58 |
| Missing | 4 |  | 10 |  |  |  |  |  |  |  |
| Trendi |  |  |  |  | 1.21 | 0.75, 1.96 | 1.22 | 0.74, 2.01 | 1.56 | 0.98, 2.47 |
| Mixing and application of riot control substances |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 123 | 98 | 213 | 97 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | < 5h | 2 | < 5h | 2 | 0.88 | 0.12, 6.66 | 1.27 | 0.19, 8.39 | 0.33 | g |
| Yes | 0 | 0 | < 5h | 1 | g | g | g | g | g | g |
| Missing | 2 |  | 0 |  |  |  |  |  |  |  |
| Trendi |  |  |  |  | 0.49 | 0.11, 2.22 | 0.62 | 0.15, 2.63 | 0.23 | 0.03, 1.69 |
| Exposure to riot control substances in the field |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 115 | 93 | 198 | 91 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 7 | 6 | 9 | 4 | 1.13 | 0.35, 3.64 | 1.21 | 0.38, 3.92 | 1.45 | 0.42, 4.94 |
| Yes | < 5h | 2 | 10 | 5 | 0.22 | 0.04, 1.40 | 0.19 | 0.03, 1.29 | 0.11 | 0.02, 0.54 |
| Missing | 3 |  | 2 |  |  |  |  |  |  |  |
| Trendi |  |  |  |  | 0.63 | 0.32, 1.23 | 0.62 | 0.31, 1.22 | 0.60 | 0.31, 1.19 |
| Mixing and application of burning agents |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 110 | 91 | 212 | 98 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 9 | 7 | < 5h | 2 | 5.59 | 1.48, 21.06 | 5.84 | 1.49, 22.83 | 7.53 | 1.85, 30.70 |
| Yes | < 5h | 2 | < 5h | < 1 | 3.25 | 0.27, 38.86 | 3.18 | 0.27, 37.99 | 11.85 | 0.87, 160.52 |
| Missing | 6 |  | 2 |  |  |  |  |  |  |  |
| Trendi |  |  |  |  | 3.33 | 1.20, 9.24 | 3.36 | 1.20, 9.45 | 3.62 | 1.15, 11.32 |
| Exposure to burning agents in the field |  |  |  |  |  |  |  |  |  |  |
| Not exposed | 90 | 76 | 188 | 88 | 1.00 | Referent | 1.00 | Referent | 1.00 | Referent |
| No | 22 | 19 | 17 | 8 | 3.88 | 1.80, 8.39 | 4.01 | 1.82, 8.83 | 3.14 | 1.28, 7.71 |
| Yes | 6 | 5 | 8 | 4 | 1.86 | 0.56, 6.13 | 2.06 | 0.60, 7.06 | 3.07 | 0.83, 11.31 |
| Missing | 9 |  | 6 |  |  |  |  |  |  |  |
| Trendi |  |  |  |  | 1.98 | 1.21, 3.23 | 2.08 | 1.25, 3.47 | 2.40 | 1.30, 4.41 |

Abbreviation: ALS, amyotrophic lateral sclerosis; ALSFRS-R, ALS Functional Rating Scale-Revised; BIRLS, Beneficiary Identification and Records Locator System; CI, confidence interval; GENEVA, Genes and Environmental Exposures in Veterans with Amyotrophic Lateral Sclerosis; IP, inverse probability; OR, odds ratio; VA, Department of Veterans Affairs.

a The GENEVA study questionnaire asked "Were you deployed to..." the Vietnam War (defined as the period from August 3, 1964, to May 7, 1975).

b Restricted analyses to veterans who were born between 1939 and 1957 inclusive (i.e., they were 18-25 years old at the time of the Vietnam War, or 1964-1975) because doing so drastically improved the behavior of the IP weights used for analysis. This restriction resulted in the exclusion of 21 (14%) cases and 51 (19%) controls.

c Adjusted for age (centered at age 60—the median age among controls—and modeled with linear and quadratic terms) and use of the VA health care system.

d Adjusted for age (centered at age 60—the median age among controls—and modeled with linear and quadratic terms), use of the VA health care system, race/ethnicity, and military branch of longest service. War deployment-related exposures were not adjusted for sex because of model instability.

e Weighted for confounding (conditional on age [centered at age 60—the median age among controls—and modeled with linear and quadratic terms], use of the VA health care system, race/ethnicity, and military branch of longest service), not missing baseline ALSFRS-R score (cases only: conditional on most recent ALS diagnosis category, symptom onset site, time from symptom onset to diagnosis [months; modeled with the natural logarithm of a linear term], and time from diagnosis to enrollment in the Registry [months; modeled with a restricted, quadratic spline with knots at 7.72, 13.24, 23.06, and 44.19 months based on percentiles of the distribution in the Registry cases not missing baseline ALSFRS-R score]), and participating in GENEVA (cases: conditional on race/ethnicity, being a current patient of a VA Medical Center, most recent ALS diagnosis category, symptom onset site, time from symptom onset to diagnosis [months; modeled with linear, quadratic, and cubic terms], time from diagnosis to enrollment in the Registry [months; modeled with a linear term], and baseline ALSFRS-R score [modeled with a restricted, quadratic spline with knots at 12, 34, and 44 based on percentiles of the distribution in GENEVA cases]; controls: conditional on year of birth [modeled with a restricted, quadratic spline with knots at 1920, 1947, and 1974 based on percentiles of the distribution in the BIRLS potential controls], use of the VA health care system, and their interaction). War deployment-related exposures were not weighted for sex because of model instability. 95% CIs were calculated with robust variance estimates.

f Repeated from Supplementary data, Table S.2.

g Unable to estimate OR and 95% CI.

h Suppressed to preserve the confidentiality of study participants.

i Used ordinal scores (0, 1, 2). Reference category included for linear trend test.

Table S.7. Military service and amyotrophic lateral sclerosis in GENEVA without weighting for potential missing-covariate-data or selection bias.

|  | Adjusteda | | Adjustedb | |
| --- | --- | --- | --- | --- |
| Variable | OR | 95% CI | OR | 95% CI |
| Military branch of longest service |  |  |  |  |
| Air Force (including Army Air Force) | 0.79 | 0.60, 1.05 | 0.79 | 0.59, 1.04 |
| Army | 1.00 | Referent | 1.00 | Referent |
| Marines (including Merchant Marines) | 0.90 | 0.61, 1.33 | 0.87 | 0.59, 1.29 |
| Navy | 0.95 | 0.72, 1.25 | 0.95 | 0.72, 1.25 |
| Otherc | 0.30 | 0.21, 0.44 | 0.30 | 0.20, 0.43 |
| Number of military branches of service |  |  |  |  |
| 1 (Median = 1) | 1.00 | Referent | 1.00 | Referent |
| 2 (2) | 0.28 | 0.20, 0.40 | 0.28 | 0.19, 0.39 |
| > 2 (3) | 0.24 | 0.10, 0.57 | 0.21 | 0.09, 0.52 |
| Trendd | 0.34 | 0.25, 0.45 | 0.32 | 0.24, 0.43 |
| Officer or Warrant Officer |  |  |  |  |
| No | 1.00 | Referent | 1.00 | Referent |
| Yes | 0.68 | 0.52, 0.89 | 0.70 | 0.53, 0.91 |
| Years of military service |  |  |  |  |
| ≤ 1 (0.50) | 0.66 | 0.34, 1.28 | 0.72 | 0.36, 1.41 |
| > 1-5 (3.00) | 1.00 | Referent | 1.00 | Referent |
| > 5-10 (6.74) | 0.32 | 0.23, 0.44 | 0.33 | 0.23, 0.46 |
| > 10-15 (12.00) | 0.63 | 0.37, 1.08 | 0.61 | 0.36, 1.04 |
| > 15 (22.06) | 0.36 | 0.28, 0.47 | 0.36 | 0.28, 0.47 |
| Trend (IQR = 16.91)d, e | 0.44 | 0.35, 0.55 | 0.43 | 0.34, 0.55 |
| End of most recent period of military service (month/year)f |  |  |  |  |
| ≤ 06/1950 (07/1946) | 73.68 | 28.53, 190.29 | 79.34 | 30.48, 206.53 |
| 07/1950-01/1955 (05/1954) | 20.92 | 10.63, 41.18 | 22.41 | 11.31, 44.39 |
| 02/1955-02/1961 (08/1957) | 7.54 | 4.71, 12.08 | 7.92 | 4.92, 12.75 |
| 03/1961-07/1964 (01/1963) | 3.85 | 2.27, 6.52 | 3.99 | 2.35, 6.78 |
| 08/1964-04/1975 (07/1970) | 1.00 | Referent | 1.00 | Referent |
| 05/1975-08/1980 (08/1978) | 0.34 | 0.22, 0.52 | 0.35 | 0.23, 0.55 |
| 09/1980-07/1990 (03/1985) | 0.30 | 0.20, 0.44 | 0.34 | 0.22, 0.50 |
| 08/1990-08/2001 (11/1995) | 0.30 | 0.20, 0.45 | 0.33 | 0.22, 0.50 |
| > 08/2001 (01/2006) | 0.10 | 0.05, 0.18 | 0.10 | 0.05, 0.19 |
| Trend (20 years, 11.63 months)d, e | 0.17 | 0.13, 0.22 | 0.17 | 0.13, 0.22 |

Abbreviation: CI, confidence interval; GENEVA, Genes and Environmental Exposures in Veterans with Amyotrophic Lateral Sclerosis; IQR, interquartile range; OR, odds ratio; VA, Department of Veterans Affairs.

a Adjusted for age (centered at age 60—the median age among controls—and modeled with linear and quadratic terms) and use of the VA health care system.

b Adjusted for age (centered at age 60—the median age among controls—and modeled with linear and quadratic terms), use of the VA health care system, sex, and race/ethnicity.

c Includes Coast Guard, Activated National Guard, Activated Reserves, Inactivated National Guard, Inactivated Reserves, Department of Defense, National Oceanic and Atmospheric Administration, and Public Health Service.

d Used within-category medians that were calculated using all controls.

e Scaled the OR to an IQR-unit increase in the exposure variable. IQRs were calculated using all controls.

f Category boundaries aligned with the occurrence of the major wars (e.g., the Vietnam War occurred between August 1964 and May 1975) and followed Allen et al. ([2008](#_ENREF_2)) and Schmidt et al. ([2008](#_ENREF_11)).

Table S.8. Military deployments or danger pay and amyotrophic lateral sclerosis in GENEVA without weighting for potential missing-covariate-data or selection bias.

|  | Adjusteda | | Adjustedb | |
| --- | --- | --- | --- | --- |
| Variable | OR | 95% CI | OR | 95% CI |
| ***Deployments*** |  |  |  |  |
| Ever deployed to any war/operationc |  |  |  |  |
| No | 1.00 | Referent | 1.00 | Referent |
| Yes | 1.01 | 0.82, 1.25 | 0.90 | 0.72, 1.12 |
| War/operation of longest deploymentc |  |  |  |  |
| Not deployed | 1.00 | Referent | 1.00 | Referent |
| World War II | 5.25 | 2.50, 10.99 | 5.46 | 2.56, 11.65 |
| Korean War | 1.77 | 1.03, 3.03 | 1.62 | 0.94, 2.79 |
| Vietnam War | 0.90 | 0.69, 1.16 | 0.74 | 0.57, 0.97 |
| Gulf War | 0.70 | 0.33, 1.48 | 0.77 | 0.35, 1.68 |
| Otherd | 0.57 | 0.35, 0.95 | 0.55 | 0.32, 0.92 |
| Ever deployed to any other country |  |  |  |  |
| No | 1.00 | Referent | 1.00 | Referent |
| Yes | 0.66 | 0.54, 0.81 | 0.62 | 0.50, 0.76 |
| Total time (years) of all periods of deployment to any war/operationc |  |  |  |  |
| Not deployed (Median = 0.00) | 1.00 | Referent | 1.00 | Referent |
| ≤ 1 (0.67) | 0.88 | 0.68, 1.14 | 0.78 | 0.60, 1.02 |
| > 1-2 (1.33) | 1.09 | 0.77, 1.53 | 0.95 | 0.67, 1.34 |
| > 2-3 (2.09) | 1.58 | 0.94, 2.65 | 1.39 | 0.82, 2.36 |
| > 3-5 (3.58) | 0.53 | 0.24, 1.14 | 0.47 | 0.22, 1.03 |
| > 5 (5.67) | 2.51 | 0.81, 7.78 | 2.74 | 0.86, 8.71 |
| Trende | 1.04 | 0.93, 1.17 | 1.01 | 0.89, 1.14 |
| End of most recent period of deployment to any war/operation (month/year)c, f |  |  |  |  |
| Not deployed | 1.00 | Referent | 1.00 | Referent |
| ≤ 12/1946 (12/1945) | 6.47 | 2.86, 14.66 | 6.77 | 2.94, 15.60 |
| 01/1947-01/1955 (03/1953) | 2.09 | 1.16, 3.78 | 1.94 | 1.06, 3.55 |
| 02/1955-07/1964 (10/1957) | 1.46 | 0.67, 3.18 | 1.26 | 0.57, 2.79 |
| 08/1964-04/1975 (01/1970) | 0.87 | 0.67, 1.12 | 0.71 | 0.55, 0.93 |
| 05/1975-08/1980 (04/1978) | 0.64 | 0.22, 1.85 | 0.70 | 0.24, 2.05 |
| 09/1980-07/1990 (08/1984) | 0.61 | 0.21, 1.76 | 0.61 | 0.21, 1.81 |
| > 07/1990 (08/1993) | 0.56 | 0.34, 0.93 | 0.56 | 0.33, 0.94 |
| Trend (IQR = 6 years, 1.99 months)e, g | 0.42 | 0.34, 0.51 | 0.44 | 0.36, 0.54 |
| ***Danger pay, hardship duty or combat zone tax exclusion benefits for deployment*** |  |  |  |  |
| Ever received imminent danger pay, hardship duty or combat zone tax exclusion benefits  for deployment |  |  |  |  |
| No | 1.00 | Referent | 1.00 | Referent |
| Yes | 0.59 | 0.47, 0.74 | 0.51 | 0.40, 0.65 |
| Total time (years) of all periods of deployment to any countries or sea region(s) ever  received imminent danger pay, hardship duty or combat zone tax exclusion benefits for  deployment |  |  |  |  |
| Never received imminent danger pay, hardship duty or combat zone tax exclusion  benefits for deployment (0.00) | 1.00 | Referent | 1.00 | Referent |
| ≤ 1 (0.83) | 0.60 | 0.44, 0.81 | 0.51 | 0.37, 0.70 |
| > 1-2 (1.09) | 0.55 | 0.35, 0.86 | 0.47 | 0.30, 0.74 |
| > 2 (2.66) | 0.61 | 0.30, 1.21 | 0.52 | 0.26, 1.06 |
| Trende | 0.69 | 0.55, 0.85 | 0.61 | 0.49, 0.77 |

Abbreviation: CI, confidence interval; GENEVA, Genes and Environmental Exposures in Veterans with Amyotrophic Lateral Sclerosis; Gulf, 1990-1991 Persian Gulf; IQR, interquartile range; OR, odds ratio; VA, Department of Veterans Affairs.

a Adjusted for age (centered at age 60—the median age among controls—and modeled with linear and quadratic terms) and use of the VA health care system.

b Adjusted for age (centered at age 60—the median age among controls—and modeled with linear and quadratic terms), use of the VA health care system, sex, race/ethnicity, and military branch of longest service.

c The GENEVA study questionnaire asked "Were you deployed to..." the following wars where each war was asked about with a separate question: World War II (defined as the period from December 7, 1941, to December 31, 1946), the Korean War (defined as the period from June 27, 1950, to January 31, 1955), the Vietnam War (defined as the period from August 3, 1964, to May 7, 1975), and the Persian Gulf War (defined as the period from August 2, 1990, to December 31, 1991). The questionnaire also asked "Ever deployed..." to the following countries where each country was asked about with a separate question: Grenada, Lebanon, Panama, Somalia, Bosnia, Kosovo, Rwanda, Afghanistan, and Iraq/Persian Gulf region (Gulf War II).

d Includes Grenada, Lebanon, Panama, Somalia, Bosnia, Kosovo, Rwanda, Afghanistan, and Iraq/Persian Gulf region (Gulf War II).

e Used within-category medians that were calculated using all controls.

f Category boundaries aligned with the occurrence of the major wars (e.g., the Vietnam War occurred between August 1964 and May 1975) and followed Allen et al. ([2008](#_ENREF_2)) and Schmidt et al. ([2008](#_ENREF_11)).

g Scaled the OR to an IQR-unit increase in the exposure variable. IQRs were calculated using all controls except those in the reference category. Reference category excluded for linear trend test.

Table S.9. Military exposures and amyotrophic lateral sclerosis in GENEVA without weighting for potential missing-covariate-data or selection bias.

|  | Adjustedb, c | | Adjustedc, d | |
| --- | --- | --- | --- | --- |
| Exposurea | OR | 95% CI | OR | 95% CI |
| Ever received the anthrax vaccine prior to reference date | 0.68 | 0.44, 1.05 | 0.76 | 0.48, 1.19 |
| Ever received the smallpox vaccine | 0.99 | 0.72, 1.37 | 0.99 | 0.71, 1.38 |
| Prior to reference date, ever involved in testing, transporting or spraying herbicides for military purposes | 1.27 | 0.70, 2.31 | 1.27 | 0.69, 2.34 |
| Prior to reference date, ever been treated with nasopharyngeal (NP) radium during military service | 2.09 | 0.60, 7.28 | 1.98 | 0.55, 7.15 |
| Ever taken pyridostigmine bromide, or little white pills in foil packs, sometimes called NAPPs, which are used to protect against nerve agents | 1.37 | 0.73, 2.57 | 1.53 | 0.79, 2.97 |
| Prior to reference date, ever visited or resided in the island of Guam, the islands of New Guinea, or the Kii Peninsula of Japan (including any time spent there in the military) | 0.74 | 0.56, 0.97 | 0.72 | 0.54, 0.96 |
| ***While you were in WWII, the Korean War, the Vietnam War, and/or the Gulf Ware: did you have direct contact with/were you exposed to*** |  |  |  |  |
| Ionizing radiation from nuclear weapon testing or occupation of  Hiroshima/Nagasaki | 1.78f, g | 0.32, 9.88f, g | h | h |
| Use of personal pesticides, like creams, sprays or flea collars | 0.97 | 0.66, 1.43 | 0.96 | 0.64, 1.42 |
| Use of pesticides on your clothing or bedding | 0.82 | 0.54, 1.25 | 0.84 | 0.54, 1.29 |
| Exhaust from heaters or generators (e.g., kerosene heaters, tent heaters) | 1.17 | 0.80, 1.70 | 1.21 | 0.83, 1.78 |
| Exposure to diesel and/or other petrochemical fumes | 1.01 | 0.69, 1.47 | 1.00 | 0.68, 1.46 |
| Burning trash or burning feces/manure | 0.75 | 0.51, 1.10 | 0.70 | 0.46, 1.06 |
| Exposure to paint, solvents, or petrochemical substances | 0.87 | 0.60, 1.27 | 0.74 | 0.49, 1.12 |
| High-intensity radar waves (e.g., as radar operator, radio operator, aviation  electrician's mate) | 1.44 | 0.92, 2.27 | 1.43 | 0.89, 2.27 |
| Food contaminated with smoke, oil, or other chemicals | 0.70 | 0.37, 1.34 | 0.72 | 0.38, 1.40 |
| Local food other than food provided by the Armed Forces | 0.97 | 0.68, 1.37 | 0.98 | 0.68, 1.41 |
| Bathing in or drinking of water contaminated with smoke, oil, dead animals or  any chemicals | 0.97 | 0.54, 1.73 | 0.95 | 0.52, 1.73 |
| Heat cramps, heat exhaustion, heat stroke or other heat illness | 0.90 | 0.59, 1.36 | 0.92 | 0.60, 1.41 |
| Heard chemical alarms sounding | 0.42 | 0.20, 0.87 | 0.47 | 0.22, 0.99 |
| Explosion in the air or on the ground within one mile of you (e.g., artillery,  rockets, mortars) | 1.27 | 0.87, 1.86 | 1.30 | 0.88, 1.92 |
| Have you suffered a combat-related injury that required medical attention during  your deployment? | 1.01 | 0.66, 1.53 | 1.00 | 0.65, 1.55 |
| ***While you were in WWII, the Korean War, and/or the Vietnam Ware: did you have direct contact with/were you exposed to*** |  |  |  |  |
| Mixing and application of herbicides | 4.01f, g | 0.63, 43.55f, g | h | h |
| Exposure to herbicides in the field | 1.66 | 0.73, 3.78 | 1.73 | 0.75, 4.00 |
| Mixing and application of riot control substances | 0.58f, g | 0.09, 2.63f, g | h | h |
| Exposure to riot control substances in the field | 0.59 | 0.28, 1.26 | 0.62 | 0.29, 1.35 |
| Mixing and application of burning agents | 3.69 | 1.37, 10.00 | 3.66 | 1.35, 9.94 |
| Exposure to burning agents in the field | 1.71 | 0.98, 2.97 | 1.73 | 0.98, 3.06 |
| ***While you were in the Korean War, the Vietnam War, and/or the Gulf Ware: did you have direct contact with/were you exposed to*** |  |  |  |  |
| Microwave radiation | 0.93 | 0.45, 1.91 | 0.93 | 0.44, 1.94 |
| ***While you were in the Vietnam Ware, i: did you have direct contact with/were you exposed to*** |  |  |  |  |
| Mixing and application of Agent Orange | 1.42 | 0.52, 3.85 | 1.54 | 0.55, 4.29 |
| Exposure to Agent Orange in the field | 2.91 | 1.57, 5.39 | 3.12 | 1.59, 6.09 |
| ***While you were in the Gulf Ware: did you have direct contact with/were you exposed to*** |  |  |  |  |
| Use of depleted uranium (DU) for munitions or armor | 3.52f, g | 0.50, 30.02f, g | 3.81f, j | 0.25, 214.20f, j |
| CARC (Chemical Agent Resistant Compound) paint | 1.68f, g | 0.22, 12.89f, g | 2.44f, j | 0.08, 232.81f, j |
| Scud missile explosion in the air or on the ground within one mile of you | 0.63f, g | 0.10, 3.32f, g | 1.56f, j | 0.17, 19.59f, j |
| Smoke from oil well fires | 1.12 | 0.23, 5.33 | 1.32 | 0.17, 10.30 |
| Exposure to nerve gas (e.g., during munitions destruction) | 5.06f, g | 0.24, 369.48f, g | 7.64f, j | 0.19, 882.66f, j |
| High levels of dust/sand | 0.21f, g | 0.01, 2.31f, g | 0.18f, j | 0.01, 2.55f, j |
| Ground level fumigation | 3.85f, g | 0.45, 49.05f, g | 3.57f, j | 0.29, 85.96f, j |
| In any conflicts deployed to, any other exposure or experience not asked about which you consider harmful or extremely stressful | 0.74 | 0.52, 1.06 | 0.74 | 0.51, 1.06 |

Abbreviation: CARC, Chemical Agent Resistant Compound; CI, confidence interval; DU, depleted uranium; GENEVA, Genes and Environmental Exposures in Veterans with Amyotrophic Lateral Sclerosis; Gulf, 1990-1991 Persian Gulf; IP, inverse probability; NP, nasopharyngeal; OR, odds ratio; VA, Department of Veterans Affairs; WWII, World War II.

a Information for specific exposures was missing for 0-49% of cases and 0-63% of controls.

b Adjusted for age (centered at age 60—the median age among controls—and modeled with linear and quadratic terms) and use of the VA health care system.

c Cases and controls who did not experience direct contact with each specific exposure were the reference.

d Adjusted for age (centered at age 60—the median age among controls—and modeled with linear and quadratic terms), use of the VA health care system, sex, race/ethnicity, and military branch of longest service. War deployment-related exposures were not adjusted for sex because of model instability.

e The GENEVA study questionnaire asked "Were you deployed to..." the following wars where each war was asked about with a separate question: World War II (defined as the period from December 7, 1941, to December 31, 1946), the Korean War (defined as the period from June 27, 1950, to January 31, 1955), the Vietnam War (defined as the period from August 3, 1964, to May 7, 1975), and the Persian Gulf War (defined as the period from August 2, 1990, to December 31, 1991).

f OR and 95% CI calculated using exact methods.

g Adjusted for age (centered at age 60—the median age among controls—and modeled with a linear term) and use of the VA health care system.

h Unable to estimate OR and 95% CI.

i Restricted analyses to veterans who were born between 1939 and 1957 inclusive (i.e., they were 18-25 years old at the time of the Vietnam War, or 1964-1975) because doing so drastically improved the behavior of the IP weights used for analysis. This restriction resulted in the exclusion of 21 (14%) cases and 51 (19%) controls.

j Adjusted for age (centered at age 60—the median age among controls—and modeled with a linear term), use of the VA health care system, race/ethnicity, and military branch of longest service.

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