UNDER SECRETARY OF DEFENSE
4000 DEFENSE PENTAGON
WASHINGTON, D.C. 20301-4000

PERSONNEL AND
READINESS

MAR 05 2024

The Honorable Mike D. Rogers
Chairman
Committee on Armed Services
U.S. House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

The Department's response to section 740 of the National Defense Authorization Act for Fiscal Year 2022 (Public Law 117–81), "Study on Incidence of Breast Cancer Among Members of the Armed Forces Serving on Active Duty," is enclosed. Section 740 required the Secretary of Defense to conduct a study on active duty Service members (ADSMs) who were diagnosed with breast cancer. Unfortunately, due to the nature and complexity of this issue, and required coordination with Departmental stakeholders, our response took longer than expected.

The report discusses the findings of a medical records data analysis of ASDMs who received care through the Military Health System, between 2011 and 2022. The analysis found that 0.03 percent of ADSMs were diagnosed with breast cancer during this time period. In addition to these findings and information on demographics of ADSMs diagnosed with breast cancer, the report summarizes applicable comparisons to civilian data and current efforts the Department is taking to prevent, screen, diagnose, and treat breast cancer. The analysis does not find statistically significant risk factors associated with military service.

The report also highlights that the Department follows prevailing medical standards for screening and in fact, screens ADSMs at a greater frequency than the national average for civilian screening. The Department has not identified any necessary changes to existing policies and protocols.

Thank you for your continued strong support for the health and well-being of our Service members. I am sending similar letters to the other congressional defense committees.

Sincerely,

[redacted]

Ashish S. Vazirani
Acting

Enclosure:
As stated

cc:
The Honorable Adam Smith
Ranking Member

[redacted]

UNDER SECRETARY OF DEFENSE
4000 DEFENSE PENTAGON
WASHINGTON, D.C. 20301-4000

PERSONNEL AND READINESS

MAR 05 2024

The Honorable Jack Reed
Chairman
Committee on Armed Services
United States Senate
Washington, DC 20510

Dear Mr. Chairman:

The Department's response to section 740 of the National Defense Authorization Act for Fiscal Year 2022 (Public Law 117–81), "Study on Incidence of Breast Cancer Among Members of the Armed Forces Serving on Active Duty," is enclosed. Section 740 required the Secretary of Defense to conduct a study on active duty Service members (ADSMs) who were diagnosed with breast cancer. Unfortunately, due to the nature and complexity of this issue, and required coordination with Departmental stakeholders, our response took longer than expected.

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Sincerely,

[redacted]

Ashish S. Vazirani
Acting

Enclosure:
As stated

cc:

The Honorable Roger F. Wicker
Ranking Member

[redacted]

UNDER SECRETARY OF DEFENSE
4000 DEFENSE PENTAGON
WASHINGTON, D.C. 20301-4000

PERSONNEL AND
READINESS

MAR 05 2024

The Honorable Patty Murray
Chair
Committee on Appropriations
United States Senate
Washington, DC 20510

Dear Madam Chair:

The Department's response to section 740 of the National Defense Authorization Act for Fiscal Year 2022 (Public Law 117–81), "Study on Incidence of Breast Cancer Among Members of the Armed Forces Serving on Active Duty," is enclosed. Section 740 required the Secretary of Defense to conduct a study on active duty Service members (ADSMs) who were diagnosed with breast cancer. Unfortunately, due to the nature and complexity of this issue, and required coordination with Departmental stakeholders, our response took longer than expected.

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Sincerely,

[redacted]

Ashish S. Vazirani
Acting

Enclosure:
As stated

cc:
The Honorable Susan Collins
Vice Chair

[redacted]

UNDER SECRETARY OF DEFENSE
4000 DEFENSE PENTAGON
WASHINGTON, D.C. 20301-4000

PERSONNEL AND READINESS

The Honorable Kay Granger
Chairwoman
Committee on Appropriations
U.S. House of Representatives
Washington, DC 20515

MAR 05 2024

Dear Madam Chairwoman:

The Department's response to section 740 of the National Defense Authorization Act for Fiscal Year 2022 (Public Law 117–81), "Study on Incidence of Breast Cancer Among Members of the Armed Forces Serving on Active Duty," is enclosed. Section 740 required the Secretary of Defense to conduct a study on active duty Service members (ADSMs) who were diagnosed with breast cancer. Unfortunately, due to the nature and complexity of this issue, and required coordination with Departmental stakeholders, our response took longer than expected.

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Sincerely,

[redacted]

Ashish S. Vazirani
Acting

Enclosure:
As stated

cc:
The Honorable Rosa L. DeLauro
Ranking Member

[redacted]

Report to the Congressional Defense Committees

Incidence of Breast Cancer Among Members of the Armed Forces Services on Active Duty

March 2024

The estimated cost of this report or study is approximately $30,000 in Fiscal Year 2023. This includes $25,000 in DoD labor and $5,400 in contract costs.

Table of Contents

REPORT REQUIREMENT

This report is in response to section 740 of the National Defense Authorization Act for Fiscal Year 2022 (Public Law 117–81), "Study on Incidence of Breast Cancer Among Members of the Armed Forces Serving on Active Duty." The study requirement includes determining the number of active duty Service members (ADSMs) who were diagnosed with breast cancer (BC) from January 1, 2011, and providing demographic information, such as ethnicity, sex, age, military occupational specialty, and rank of those diagnosed. Additionally, the study requirement includes a comparison of the findings with civilian population and possible risk factors associated with military service, including overseas airborne hazards, such as burn pits. In addition to the data analysis, the study requirement includes a review of existing policies and procedures for prevention, early detection, diagnosis, and treatment of BC, including possible recommendations to improve upon current efforts.

INTRODUCTION

The Department completed a retrospective cohort study to examine the incidence of BC among ADSMs. Medical records data for ADSMs (both men and women), who received care through the Military Health System (MHS) direct care system at military medical treatment facilities, between 2011 and 2022 was reviewed. Data on ADSMs who separated during this time period and were subsequently diagnosed with BC was not available. Further, this study identifies ADSMs diagnosed with BC during the time period and does not reflect a longitudinal study of ADSM BC risk.

Of the 3,400,394 ADSMs on active service during the study time period, 1,064 were diagnosed with BC, accounting for 0.03 percent of the active population. Of those diagnosed, 24 were male ADSMs and 1,040 were active duty Service women (ADSWs). The study found slightly higher rates of BC diagnosis among ADSMs (18.23 percent) than civilian women (12.5 percent). While this rate aligns with prior studies that indicate ADSW risk of BC is between 20 to 40 percent[1] greater than the civilian population, the current data indicates a decline in overall incidence rates over time, as outlined in this report. This study also indicates that there is no significant difference in risk factors for BC among ADSW and civilian women. Further, the study found no statistical difference of BC rates between deployed and non-deployed ADSW.

BC remains the most common form of cancer for ADSW, consistent with cancer diagnoses among civilian women. The Department therefore is committed to ensuring all ADSMs have ongoing access to quality medical care and comprehensive screening for BC that aligns with prevailing standards of care. This report highlights the Departmental efforts to prevent, screen, and promote early detection of BC among all ADSMs.

[1] Zhu K., Devesa, S. S., Wu, H., Zahm, S. H., Jatoi, I., Anderson, W. F., Peoples, G. E., Maxwell, L. G., Granger, E., & Potter, J. F. (2009). Cancer incidence in the US military population: comparison with rates from the SEER program. *Cancer Epidemiology Biomarkers & Prevention*, *18*(6), 1740-1745.

BC BACKGROUND INFORMATION

National Data on BC Rates

BC has become the most commonly diagnosed cancer in women,[2] with the probability of a woman being diagnosed with BC during her lifetime having increased from 1 in 11 in 1975 to 1 in 8 today.[3] There is also an increasing trend in early-onset (less than 50 years of age) in BC in the United States.[4] Additionally, BC incidence rates increased among White, Hispanic, and Pacific Islanders, and were stable among Black and American Indian/Alaska Native females.[5] While BC mortality rates have only seen a slight increase within the United States, per the Congressionally Directed Medical Research Program, mortality rates among non-Hispanic Black women are 40 percent higher than non-Hispanic White women.

BC Risk Factors

There are several known risk factors for BC; some that may be controllable or modifiable, while others are intrinsic,[6] or factors one cannot change, as outlined in Tables 1 and 2 below. The study associated with this report did not find any additional statistically significant risk factors for ADSMs associated with their military service.

Table 1: Intrinsic Risk Factors

Being Born Female	Race and Ethnicity
Risk of BC increases with age (most BCs are found over the age of 50)	Inherited changes (mutations) to certain genes, such as BRCA1 and BRCA2
Previous radiation therapy (women who have had radiation therapy to the chest before age 30 have a higher risk of getting BC later in life)	Exposure to diethylstilbestrol, a synthetic form of the female hormone estrogen, prescribed between 1940 to 1971 to prevent miscarriage, premature labor, and related complications of pregnancy (women who took the medication, and their daughters, may be at greater risk of BC)
Having Dense Breasts (Dense breasts have more connective tissue than fatty tissue, which can sometimes make it hard to see tumors on mammogram. Women with dense breasts are more likely to get BC)	Starting menstrual periods before age 12 and starting menopause after age 55 exposes women to hormones longer, raising breast cancer risk

[2] Congressionally Directed Medical Research Programs. (October 2021). *The BC Landscape*. Washington, DC.
[3] Giaquinto, A. N., Sung, H., Miller, K. D., Kramer, J. L., Newman, L. A., Minihan, A., Jemal, A., & Siegel, R. L. (2022). BC Statistics, 2022. *CA Cancer J Clin*, *72*(6), 524-541.
[4] Koh, B., Tan, D. J. H., Ng, C. H., Fu, C. E., Lim, W. H., Zeng, R. W., Yong, J. N., Koh, J. H., Syn, N., Meng, W., Wijarnpreecha, K., Liu, K., Chong, C. S., Muthiah, M., Luu, H. N., Vogel, A., Singh, S., Yeoh, K. G., Loomba, R., & Huang, D. Q. (2023). Patterns in Cancer Incidence Among People Younger Than 50 Years in the US, 2010 to 2019. *JAMA Netw Open*, *6*(8), e2328171.
[5] Cronin, K. A., Scott, S., Firth, A. U., Sung, H., Henley, S. J., Sherman, R. L., Siegel, R. L., Anderson, R. N. Kohler, B. A., & Benard, V. B. (2022). Annual report to the nation on the status of cancer, part 1: National cancer statistics. *Cancer*, *128*(24), 4251-4284.
[6] American Cancer Society, 2023; Center for Disease Control and Prevention, 2023.

Personal history of breast or certain non-cancerous breast diseases (i.e., atypical hyperplasia, lobular carcinoma)	Family history of breast or ovarian cancer (i.e., first-degree relative or multiple family members on either mother's or father's side who have had breast or ovarian cancer)
Previous radiation therapy (women who have had radiation therapy to the chest before age 30 have a higher risk of getting BC later in life)	Exposure to diethylstilbestrol, a synthetic form of the female hormone estrogen, prescribed between 1940 to 1971 to prevent miscarriage, premature labor, and related complications of pregnancy (women who took the medication, and their daughters, may be at greater risk of BC)
Klinefelter syndrome (men)	Liver disease (men)
Testicular conditions in men (i.e., undescended testicle, surgical remove of a testicle)	Height (increased height increases risk)

Table 2: Controlled Risk Factors	
Overweight/obesity	Physical inactivity
Alcohol consumption (i.e., 2-3 drinks a day may increase the risk by 20 percent)	Smoking
Use of hormones: Birth control methods with hormones or hormone replacement therapy for women; estrogen treatment for men	Reproductive history (risk slightly increases for women who have not had children or who had their first child after the age of 30)

ARMED FORCES STUDY ON BC DIAGNOSES

Methods and Study Population

A retrospective cohort study examined the incidence of BC among ADSMs who received treatment through the MHS, and their demographic, military, and health characteristics. The study population included all 3,400,394 ADSMs between January 1, 2011 and October 31, 2022. Data was obtained from the Epidemiology and Analysis Branch, Armed Forces Health Surveillance Division, and the Public Health Directorate of the Defense Health Agency.

Data Elements

Demographic Information and Risk Factors

Demographic information and some risk factors were collected for all ADSMs during the study period. Demographic data collected included age, sex at birth, race, ethnicity, branch of service, and rank. Age was defined as age at first deployment during the study period. Additionally, the study reviewed occupation data. The Department of Defense (DoD) occupation codes were categorized into the following occupations: communications/intelligence, infantry/artillery/armor/combat engineer, motor transport, pilot/air crew, repair/engineering, healthcare, or other. Time spent in each occupation category was calculated, and the occupation

individuals were in for the longest time period was selected as their primary occupation. Branch of service was defined as the branch of service for the first deployment during the study period. Rank was defined as the highest rank during the study period and was divided into five categories: junior enlisted, senior enlisted, junior officer, senior officer, and warrant officer. Risk factors identified included tobacco use, contraceptive use, family history of BC, and family history of ovarian cancer as defined using International Classification of Diseases (ICD)-9 and ICD-10 codes (see Table 3). Personal history of BC included incident BC cases prior to an individual's first deployment start date within the study period and encounters with a relevant diagnosis code.

Identification of ADSMs with BC

The case definition for either malignant neoplasm of female breast, malignant neoplasm of male breast or carcinoma in situ of breast was based on: (1) an inpatient encounter with an ICD code of interest as the primary diagnosis code; (2) an inpatient encounter with a treatment procedure code as the primary diagnosis and relevant diagnosis code as a secondary diagnosis; or (3) three or more inpatient encounters within a 90-day period (but not on the same day) with a relevant diagnosis code. Individuals with multiple incidences of BC were only counted once.

Burn Pit Exposure

Exposure to burn pit was defined as any exposure to smoke from burning trash or feces or exposure to smoke from oil fires or deployment for any amount of time at Camp Taji or Balad Air Base.

Table 3. ICD Codes Used to Define Incident BC Case and Risk Factors

Category	ICD 9 Codes	ICD 10 Codes
Incident BC	233.0, 174.0-174.9, 610.8, 175.xx V10.3	C50.0 - C50.929, D05.02, D05.01, D05.11, D05.12, D05.8, D05.81, D05.82, N60. 89
Tobacco use	V15. 82	Z72.0 Add tobacco use disorder codes (F codes)
Contraceptive use	V25.0 - V25.9	Z30.0 - Z30.9
Personal history of BC		Z85.3
Family history of BC		Z85.3
Family history of ovarian cancer	V16. 41	Z80. 41

Statistical Analysis

The incidence of BC among ADSMs of the military who received care at a military medical treatment facility was reported. The demographic, military, and health characteristic make-up of all ADSMs and for ADSMs diagnosed with BC was reported. Single variable and multivariable log-binomial regression models were fit to directly estimate risk ratios and 95 percent confidence intervals. A negative intercept was used to improve convergence. Variables in the multivariate log-binomial regression model included sex, ethnicity, age, exposure to burn pits, primary

occupation, service branch, rank, tobacco use, contraceptive use, personal history of BC, family history of BC, and family history of ovarian cancer. The percentage of service members with exposure to burn pits and the incidence of BC within this population was reported.

Results

Among the 3,400,394 ADSMs within the timeframe identified for the study, 1,064 were diagnosed with BC, as identified in MHS medical records data. This accounted for a small percentage, 0.03 percent, of the active military population.

Sex of ADSMs Diagnosed with BC

Of the 1,064 BC diagnoses, the vast majority were among ADSW, who had 1,040 (97.74%) diagnoses with 24, or 2.26 percent, of those diagnosed being male ADSMs.[7] The ADSW population is 16.78 percent of the overall ADSMs, with 0.18 percent of ADSW receiving a BC diagnosis to zero percent of male ADSM BC diagnoses.

Age of ADSMs Diagnosed with BC

Of those diagnosed with BC, the highest number of diagnoses was among those ages 30-39, with the age range of 17-29 representing the second largest number of those diagnosed with BC (30.45 percent). The smallest number of diagnoses were among ADSMs over the age of 50, 2.73 percent.

However, when compared to all ADSMs in each age group, the percentage of ADSMs that are diagnosed with BC increases with age. While the smallest number of ADSMs with a BC diagnosis, 29, are among ADSMs over the age of 50, those ADSMs represent the highest percentage of BC diagnoses of all ADSMs in any age group, at 0.20 percent. The second largest age group among ADSMs with BC is ages 17-29, however, this represents the lowest percentage of ADSM in that age group to receive a BC diagnosis. This is notable, because 82.72 percent of all ADSMs are ages 17-29.

Table 4: Age of ADSMs w/BC Compared to all ADSMs

Age	ADSMs diagnosed with BC		All ADSMs	
	Number	Percent	Number	Percent
17-29	324	0.01%	2,812,647	82.72%
30-39	471	0.11%	431,528	12.69%
40-49	240	0.17%	141,378	4.16%
50+	29	0.20%	14,841	0.44%

[7] Information on sex was unknown for 4 ADSMs.

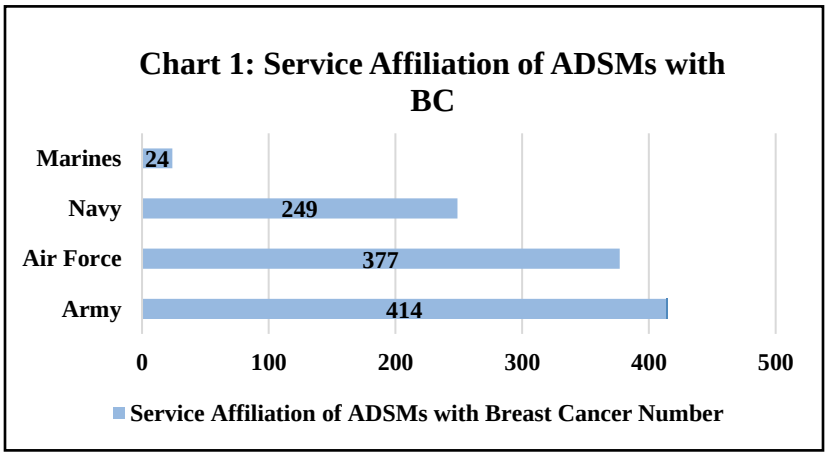
Table 5: Race & Ethnicity of ADSMs with BC Compared to all ADSMs				
Race/Ethnicity	ADSMs diagnosed with BC		Total ADSMs	
	Number	Percent	Number	Percent
Overall	1,064	0.03%	3,400,390	N/A
Race				
White	555	0.02%	2,385,186	72.61%
Black	338	0.06%	585,506	17.82%
Other	115	0.04%	314,079	9.56%
+ Ethnicity*				
Non-Hispanic White	487	0.02%	1,971,968	58.9%
Non-Hispanic Black	326	0.06%	552,516	16.5%
Hispanic	124	0.02%	520,293	15.54%
Asian/Pacific Islander	44	0.03%	131,330	3.92%
American Indian/Alaskan Native	9	0.03%	32,946	0.98%
Other	58	0.04%	139,069	4.15%

Race and Ethnicity of ADSMs Diagnosed with BC

Of the ADSMs with a BC diagnosis, White ADSMs make up over half, at 52.16%, with Black ADSMs representing 31.77%.[8] The percentage of Hispanic ADSMs with BC is 11.65%, with Asian/Pacific Islander and American Indian/Alaskan representing a much smaller percentage, just under 5%, of BC diagnoses.[9] When comparing BC diagnosis data with the overall population of ADSMs in each racial or ethnic group, the percentages of ADSMs from most racial and ethnic groups were relatively comparable, except that black ADSMs and Non-Hispanic Black ADSMs had a higher percentage of BC diagnoses than the overall population average by 0.03%.

Military Service of ADSMs Diagnosed with BC

Of the 1,064 ADSMs diagnosed with BC, ADSMs in the Army and Air together represented 74.34 percent of all ADSMs diagnosed with BC. While 60 percent of the entire active duty force are in the Army (39.31 percent) and Air Force (20.75 percent), the Navy has a slightly higher number (23.11 percent) of ADSMs than Air Force, but a lower number of ADSMs with BC, with the Marine Corps having the smallest number of ADSMs with a BC diagnosis.



[8] Data on race was unknown for 56 ADSMs with BC and 115,623 of total ADSMs.
[9] Data on ethnicity was unknown for 16 ADSMs with BC and 52,272 total ADSMs.

Rank Information for ADSMs with a BC Diagnosis

ADSMs in more senior ranks (enlisted, officer, and warrant officer) make up the largest percentage of ADSMs diagnosed with BC, for a combined 89.2 percent of all BC diagnoses. Senior enlisted ADSMs make up over half of all diagnoses, with a 40 percent increase in diagnoses than senior officers and a 96 percent increase than warrant officer diagnoses. Junior ADSMs make up the smallest percentage of those diagnosed with BC, at less than 11 percent.

Table 6: Rank of ADSMs Diagnosed with Cancer		
Rank	**ADSMs diagnosed with BC**	
	Number	**Percent**
Junior Enlisted	55	5.17%
Senior Enlisted	581	54.61%
Junior Officer	60	5.64%
Senior Officer	346	32.52%
Warrant Officer	22	2.07%

However, when comparing the number of ADSMs with a BC diagnosis to all ADSMs in their rank group, senior officers hold the highest percentage of BC diagnoses at 0.18 percent, with warrant officers having the second highest percentage at 0.06 percent and senior enlisted having the third highest, at 0.05 percent (See Table 7).

Table 7: Comparison of ADSMs Diagnoses with BC to All ADSMs by Rank Group			
Rank	**Total ADSMs with BC**	**Percent of ADSMs with BC**	**All ADSMs**
Junior Enlisted	55	0.00%	1,695,021
Senior Enlisted	581	0.05%	1,255,810
Junior Officer	60	0.03%	222,841
Senior Officer	346	0.18%	188,451
Warrant Officer	22	0.06%	38,271

Primary Occupational Specialties of ADSMs Diagnosed with BC

The study identified six categories for military occupation: five of the top ranking occupations and an "other" category for all other military occupations. ADSMs in a communications or intelligence occupation made up the largest group of those with a BC diagnosis, with ADSMs in healthcare making up the second largest group of those diagnosed with BC.

However, when compared to all ADSMS in their occupation, ADSMs in healthcare had the highest percentage of BC diagnoses at 0.11 percent , with communications/intelligence have the

second and all other occupations having under 0.02 percent, including all occupations identified in the "other category".

Table 8: Comparison of ADSMs with BC to All ADSMs by Primary Occupation			
Occupations	**Total ADSMs w/BC**	**Percentage of All ADSMs**	**All ADSMs**
Communications/Intelligence	363	0.05%	788,393
Healthcare	304	0.11%	267,420
Repair/Engineering	149	0.02%	926,896
Motor Transport	28	0.02%	159,291
Infantry/Artillery/Armor/Combat Engineer	27	0.00%	567,899
Pilot/Aircrew	16	0.02%	96,470
Other	177	0.03%	594,025

POTENTIAL FACTORS ASSOCIATED WITH MILITARY SERVICE THAT MAY INCREASE BC RISK

Nationally Recognized Risk Factors

Risk factors among ADSMs are consistent with national data on risk factors associated with BC. ADSW are at a greater risk than their male counterparts for BC. Additionally, while 30.45 percent of ADSMs diagnosed with BC were between ages 17-29, when the data was adjusted for other risk factors (age, tobacco use, contraceptive use, personal or family history of BC or ovarian cancer), ADSMs over the age of 30 were at a higher risk than their younger counterparts. Further, consistent with civilian data, non-Hispanic Black individuals and those with other ethnicities are at a greater risk than their non-Hispanic white counterparts (See Table 9 in the appendix).

Tobacco use increased risk of BC by 40 percent, however, family history of BC or family history of ovarian cancer were stronger risk factors than any other nationally identified risk factors. In fact, individuals with a family history of ovarian cancer had 2.36 times the risk of BC, and those with a family history of BC had 8.16 times the risk. However, contraceptive use as a risk factor was not statistically significant among ADSMs.

Airborne Hazards/Burn Pits

Between January 1, 2011 and October 31, 2022, there were 559,799 ADSMs with documented exposure to burn pits. This accounts for 16.46 percent of all active duty personnel within that time frame. The incidence of BC among ADSMs exposed to burn pits was 0.06 percent, compared to 0.03 percent among Service members without exposure. After adjusting for other risk factors, the risk of BC was 1.06 times higher for ADSMs with exposure to burn pits (95 percent CI: 0.93-1.22). The increased risk was not statistically significant see Table 9 in the appendix).

DISCUSSION

When comparing BC rates over time, the Armed Forces Surveillance Branch examined incident diagnoses of BC among female ADSMs between the years 2000 and 2012.[10] In the 2013 study, 22.3 percent of female ADSMs were diagnosed with BC, compared to this current study where the rate among female ADSMs is lower at 18.23 percent. The current data does indicate a decline in overall incidence rates over time. When comparing military service, in the 2013 study the Army had the highest BC rates (42.2 percent), consistent with the results of this current study (38.9 percent). It is important to note that the Army has the largest population of ADSMs in comparison to the other Armed Services.

When looking at racial and ethnic disparities over time, there have also been some changes. In the 2013 study, Black, non-Hispanic women (49.0 percent) had higher rates than White (40.7 percent), Hispanic (22.1 percent) and Other (37.5 percent) women. In this current study, Non-Hispanic White women had higher rates (46.5 percent) compared to Non-Hispanic Black women (31.1 percent). When looking at trends in age by BC diagnosis in armed service members, in the 2013 study, women 40 years of age and older had the highest rates as did senior officers (55.7 percent) and healthcare occupations (58.9 percent). Results of the current study are consistent with the 2013, that the highest rates of BC are among ADSMs over the age of 40, senior officers and healthcare occupations.

When looking at whether deployment is a risk factor for developing BC in the armed forces, a study[11] examined whether women Veterans who were deployed post-9/11 had higher rates of BC than ADSW who were not deployed. The researchers found that, despite the exposures of deployment, there was a significantly lower incidence of BC among women who deployed versus those who did not deploy. In fact, they found that there was a 23 percent lower incidence of BC among women who were deployed post 9/11 compared to those women who did not deploy. Although this current study found a higher risk of BC for ADSMs with exposure to burn pits, the increased risk was not statistically significant.

This current study did exhibit some significant findings. First, it demonstrates the presence of racial disparities in BC incidence in ADSMs. Non-Hispanic Black service members and those who identified race as Other had significantly higher risk ratios than Non-Hispanic White members. ADSMs in occupations of repair/engineering and infantry also have significantly higher risk ratios than other occupations, such as pilots/aircrew who have the lowest risk. While the military rank of Senior Enlisted, Senior Officer, and Warrant Officer had higher risk ratios than junior members of the armed forces, this could most likely be explained by older age due to time in rank. Most significant is the increased risk ratios for those aged 40-49 and even more so for those aged 30-39.

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[10] Armed Forces Surveillance Branch, "Incident Diagnoses of Breast Cancer, Active Component Service Women, U.S. Armed Forces 2000-2012, Medical Surveillance Monthly Report, September 2013, Volume 20, Number 9.

[11] Gaffey, A. E., Han, L., Ramsey, C. M., Skanderson, M., Dziura, J., Driscoll, M., Burg, M. M., Brandt, C. A., Bastian, L. A., & Haskell, S. G. (2023). Post-9/11 deployment history and the incidence of breast cancer among women veterans. *Ann Epidemiol*, *77*, 98-102.

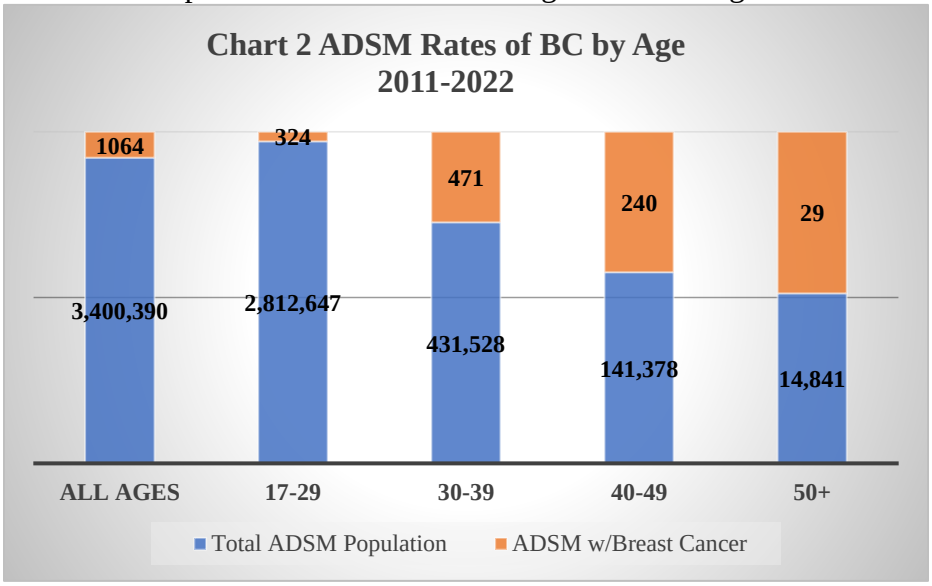
There are intrinsic health characteristics that are known to increase BC risk, as also seen with members of the Armed Forces, including personal or family history of breast and ovarian cancer, thereby making screening and genetic testing imperative. Further, tobacco use among ADSMs is a risk factor for BC that can be controlled or changed. The Department has taken many steps to support smoking cessation among ADSMs.

STUDY LIMITATATIONS

A limitation of this study is the use of secondary data for analysis. Several issues have been identified that limit the quality of the data when using electronic health records: lack of standardization of data, missing data, and provider error in selecting the correct diagnosis.[12] Another limitation of this study is that it only examines incidence of BC among ADSMs who received care through the MHS. It does not account for ADSMs who have left the service and receive care elsewhere. It is also not a longitudinal study; therefore, it does not reflect the odds of BC over time through airborne exposures while deployed.

COMPARISON OF BC INCIDENCE BETWEEN ARMED FORCES AND THE US POPULATION

The National Cancer Institute estimates a 15.2 percent rate of new BCs diagnoses[13] among women, while estimated rates among ADSW is slightly lower, at 12.5 percent.[14] While these rates vary slightly, BC remains the most common cancer among women, both civilian and ADSW. BC rates among men remain low in both civilian and military populations.

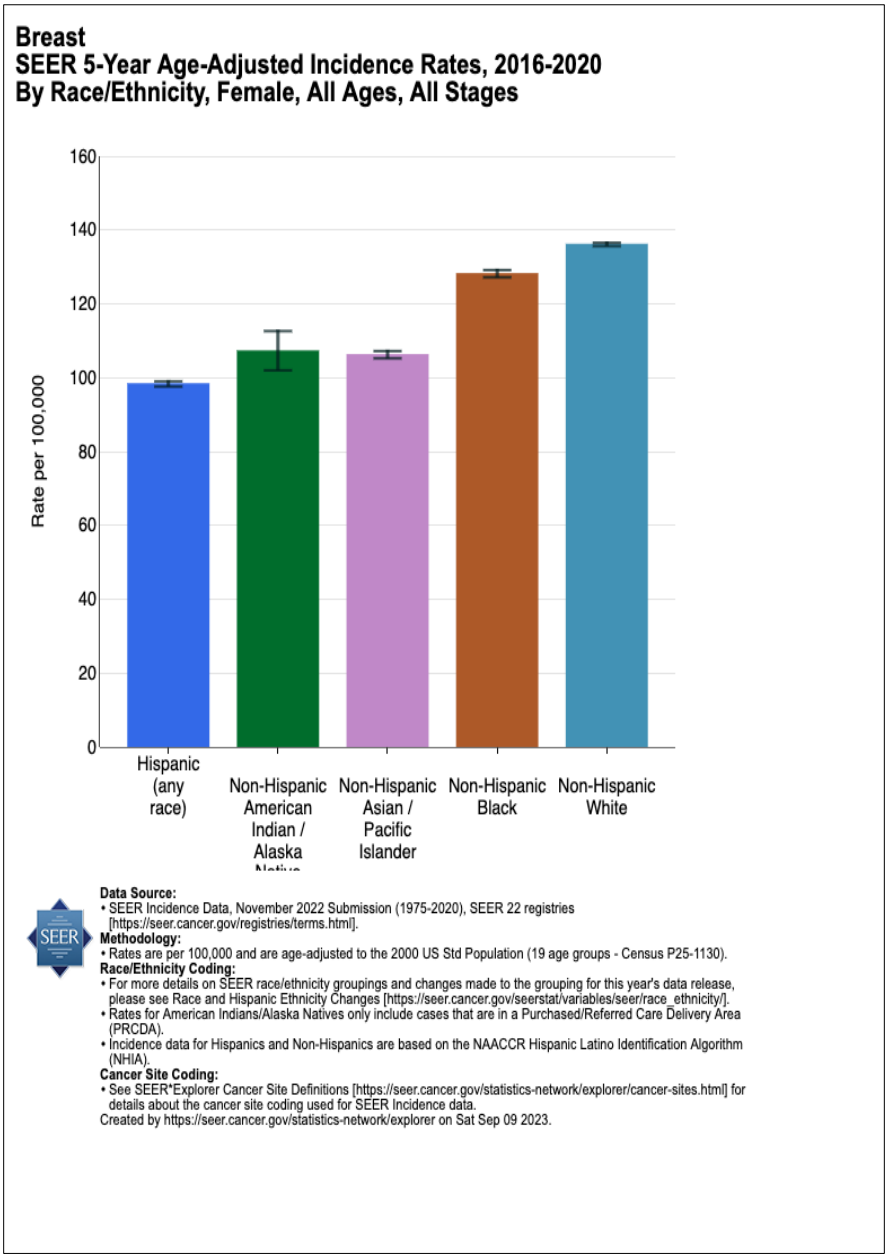


BC Rates Based Upon Age

National data on BC rates among women of all ages, races, and ethnicities at all stages of BC. Data was derived from the Surveillance, Epidemiology, and End Results (SEER) Program[15] for BC cases between 2016 to 2022. As outlined in this figure, BC rates increase by age, with women over the age of 65 representing the greatest population of women with BC.

[12] Feder, S. L. (2018). Data quality in electronic health records research: Quality domains and assessment methods. *Western journal of nursing research*, *40*(5), 753-766. Myers, L., & Stevens, J. (2016). Using EHR to conduct outcome and health services research. In *Secondary Analysis of Electronic Health Records* (pp. 61-70). Springer.
[13] National Institutes of Health, National Cancer Institute, Surveillance, Epidemiology, and End Results Program.
[14] Guiquinto et.al, 2022; Siegel et al., 2022.
[15] National Institutes of Health, National Cancer Institute, Surveillance, Epidemiology, and End Results Program.

The SEER data provides a picture of BC rates through shorter period of time, 2016-2020, while the data analysis completed for this report included Calendar Years 2011-2022. Therefore, a direct comparison is not possible. However, in reviewing trends, while rates of BC continue to rise among civilian women as they age, particularly over the age of 65, rates among ADSMs appear to decline. In fact, rates among ADSMs over the age of 50 represent the smallest population of those diagnosed with BC. This could potentially be explained by the decline of ADSMs on active service. Approximately 0.44 percent of ADSMs are over the age of 50, compared to the 95.41 percent of ADSMs between the ages of 17-39. The increased BC rates among younger ADSMs may be explained by the regular, ongoing access to healthcare that ADSMs experience. This creates greater opportunity for screening, and efforts to promote early detection, recognizing that ADSW, diagnosed at a younger age often experience greater adverse outcomes due to the aggressiveness of the cancer.



BC Rates by Race and Ethnicity

As presented in Chart 3 below, Non-Hispanic White ethnicity has the highest incidence in BC in both the U.S. and Armed Forces population, followed by Non-Hispanic Black ethnicity. Asian/Pacific Islander and American Indian/Alaskan ethnicities have the third and fourth highest incidence in the United States, while in the Armed Forces they have the sixth and fifth highest incidence respectively.

The difference between the U.S. population and the Armed Forces population is the incidence rate in those who identify as Hispanic. In the United States, non-military Hispanics have the fifth highest incidence of BC compared with active duty Armed Forces personnel with the third

highest incidence of BC. Those in the Armed Forces active duty personnel who identify race/ethnicity as "Other" have the fourth highest incidence of BC. Of note though, as mentioned previously in this report, Non-Hispanic Black and Other ethnicities in the Armed Forces have an increased risk of BC compared to their Non-Hispanic White counterparts.

DEPARTMENT OF DEFENSE OUTREACH

Cancer Research Partnerships to Advance Prevention, Detection and Treatment Efforts

The MHS strives to prevent, screen, detect, treat, cure, rehabilitate, and mitigate the impacts of cancer (and treatment) to promote a medically ready force and ensure a good quality of life. The Uniformed Services University Murtha Cancer Center Research Program (MCCRP) was established to manage cancer care within the Department. The MCCRP partners with other Federal agencies, including the National Institutes of Health, National Cancer Institute, Department of Veterans Affairs (VA), and the Department of Energy and Pacific Northwest National Laboratory, with established collaborative relationships with civilian equities. The efforts of the MCCRP support the MHS's provision of effective and efficient world-class cancer care that integrates research cancer programs with other Federal and non-Federal organizations.

This first, one-of-a-kind Federal and civilian cancer network consists of nine military medical treatment facilities and medical centers, seven VA medical centers and two civilian medical centers. It increases access to clinical trials, translational research, patient data, tissue and oncology specialists; education and treatment, recruitment and retention and optimizes Federal cancer resources. The DoD Clinical Breast Care Project and Project for Military Exposures and Toxin History Evaluation in US Service Members (PROMETHEUS) are two of the research projects within MCCRP with insights regarding BC impacts among ADSMs.

The Clinical Breast Care Project has engaged in 20 years of focused research on surveillance, screening, early detection, curative treatments, and post-treatment Return-to Duty Survivorship Program. It leverages a multi-disciplinary approach as the standard of care for researching and treating breast diseases and BC. In addition to the integration of prevention, screening, early detection and continuing care, the Clinical Breast Care Project incorporates advances in risk reduction, biomedical informatics, tissue banking and translational research. Biospecimens and data have been used in a number of publications, include 28 in Fiscal Year 2022.

Created in support of the Biden Administration's White House Cancer Moonshot Initiative, 2022,[16] PROMETHEUS is a Cancer Moonshot 2.0 project, to better understand and prevent exposures to toxic substances. PROMETHEUS is a multi-Federal and public-private partnership collaboration to study gaps in research regarding the link between potential exposures to possible environmental contaminants and toxic hazards and ADSM health and future development of conditions, such as cancer. By integrating the scientific platforms of DoD, VA, Department of Energy, National Institutes of Health, National Cancer Institute, and National Institute of Environmental Sciences, as well as other civilian and academic equities, research studies can access integrated data on exposures unique to the military population.

[16] Biden Administration Cancer Moonshot.

In addition to these efforts, the MHS developed a signature clinical research program, in collaboration with VA and the National Cancer Institute, and Applied Proteogenomic Organizational Learning and Outcomes Consortium, commonly referred to as the APOLLO network, to understand the impact of service related toxic exposures on the development of cancer among ADSMs and veterans. APOLLO will support more rapid identification of unique pathways of care for detection and treatment. While the initial cohort was focused on lung cancer, APOLLO has expanded to multiple types of cancer, including BC.

Identification of Risk and Screening

Utilizing data from the Clinical Breast Care Project, a 2021 study[17] determined how many high-risk ASDW without cancer pursued genetic tests, how many undiagnosed ADSW who carry the germline mutations in cancer predisposition genes (previvors) employed risk-reducing strategies, and the number of undiagnosed previvors within the ADSW population. The study identified all ADSW within the Clinical Breast Care Project with no current or previous history of cancer and found that, of 336 cancer-free ADSW in the project, 23 percent were classified as high-risk for BC due to their family history. Thirty-five percent of these women then had genetic testing and 40 percent of those tests (3 percent of the total sample) revealed genetic mutations that would place them at risk for BC. The study underscored the importance of health care provider collection of detailed family histories of cancer and encouragement of genetic testing among those who are identified as high risk.

Further, through the Clinical Breast Care Project, APOLLO 4C performed research on young women with BC by comparing molecular features of tumors from young women (under the age of 40 years old) and older women. The study indicated that younger women have more BRCA1/2 mutations and generally have worse outcomes when diagnosed with BC than their older counterparts. This further underscores the importance of health care provider activities to support early detection, such as assessment or risk and referrals for genetic testing as appropriate.

Through collaborative efforts of the VA/DoD Health Executive Committee Women's Health Workgroup, a targeted training for health care providers, "Women's Health BC Genetic Testing"[18] was developed to identify appropriate patients for BC genetic counseling referral and testing. The training aims to describe genetic BC risk factors, identify appropriate information for referrals, and explain how genetic testing decisions were made. This evidence-based webinar was widely disseminated among MHS and VA health care providers and remains as an enduring training available to all MHS and VA health care providers.

There is currently no MHS benchmark or goal for annual BC screening rates. However, screening rates among MHS beneficiaries is slightly higher than the national median. The Healthcare Effectiveness Data and Information Set tool is used by more than 90 percent of U.S. health plans to measure performance on important dimensions of care and service (U.S. Department of Health and Human Services, 2023). The Healthcare Effectiveness Data and

[17] Lovejoy, L.A., et. al (2021) Cancer Previvors in an Active Duty Service Women Population; An Opportunity for Prevention and Increase Force Readiness, *Military Medicine*, 186(7-8).
[18] Women's Health_BC Genetic Testing Recording - TRAIN Learning Network - powered by the Public Health Foundation.

Information Set assesses women 50-74 years of age who had at least one mammogram to screen for BC in the past 2 years. Between the years 2011 and 2021, the national average for breast screening rate was 72.4 percent .[19] The U.S. Government Accountability Office reported[20] that the MHS median rate for BC screening was 75.1 percent, slightly higher than the national median. In another study,[21] researchers examined mammography screening rates among ADSW between the years 2009 and 2015 and found no racial disparities in mammography utilization among female ADSMs.

Burn Pit Exposure Risks

In 2014, the VA established the Airborne Hazards and Open Burn Pit Registry (AHOBRP). The purpose of this registry is to provide a database for research that better understands whether long-term health conditions may be related to these exposures. Registry enrollment is voluntary. veterans and ADSMs are eligible to participate in the registry if they were deployed to the Southwest Asia theater of operations or Egypt any time after August 2, 1990, or Afghanistan, Djibouti, Syria, or Uzbekistan on or after September 11, 2001.

The Airborne Hazards and Burn Pits Center of Excellence (AHBPCE), established by VA in 2019, conducts research to better understand how a range of exposures, injuries, and other factors related to certain health conditions that veterans may experience. The center uses information from the AHOBPR to support this research. As reported by the AHBPCE in January 2023[22], the vast majority of the participants in the AHOBRP (350,270) reported no cancers. Among those who reported a cancer (19,809 or 0.06 percent), the frequency of all participants' reporting BC was 667, or 0.03 percent (595 female + 72 male). Thus, the frequency of female participants reporting BC is 0.1698 percent and the rate of BC for males in the AHOBRP is 0.0002 percent. When looking at BC diagnoses codes associated with inpatient and outpatient visits within the AHOBPR database, 80 percent are in the VA healthcare system. While this information provides insight on veteran diagnoses of BC, the Department's continued collaboration with VA ensures awareness of potential risk factors for ADSMs in current military service.

Tobacco Cessation Efforts

Use of tobacco, such as smoking, is one of the key risk factors that individuals can control in mitigating their overall risk of BC. The DoD promotes tobacco-free living and continues to take steps to prevent starting and support quitting tobacco use. While law does not allow a ban on tobacco sales in defense retail systems, DoD policies restrict physical locations where tobacco use is permitted. Further, DoD engages in approaches tobacco screening and cessation support. Tobacco use screening is included in the Periodic Health Assessment and Post Deployment

[19] National Committee for Quality Assurance (2023).
[20] Defense Health Care: Efforts to Ensure Beneficiaries Access Specialty Care and Receive Timely Effective Care. (GAO-21-143).
[21] Bytnar, J.A., et. al, The Impact of Mammography Screening Guideline Changes Among Women Serving in the US Military., *Military Medicine* 185(11-12).
[22] https://www.warrelatedillness.va.gov/WARRELATEDILLNESS/AHBPCE/index.asp, https://www.publichealth.va.gov/exposures/burnpits/index.asp.

Health Assessment forms. Resources for tobacco cessation include medical interventions and cessation education.

The Department provides clinical resources and tobacco cessation resources to all beneficiaries to promote tobacco-free living. This includes TRICARE coverage for over the counter and prescription tobacco cessation products and counseling through TRICARE authorized providers. Embedded pharmacists and behavioral health providers offer additional counseling at the unit level.

Educational resources are also available through several websites including TRICARE, Health.mil, Service-specific medical and public health websites. Additionally Armed Forces Wellness Centers located on military installations incorporate tobacco assessment, education, and referrals. Lastly, the Department's tobacco education campaign, YouCanQuit2 serves to provide widespread awareness and education on tobacco use. In addition to these resources, the Military Services have policies that discuss tobacco usage and promote tobacco-free living for optimal health.

CURRENT DOD MAMMOGRAPHY SCREENING POLICY

Current BC recommendations now recommend screening begin at 40 years of age, instead of previous recommendations at 50 years. This is outlined in two separate guidelines. The U.S. Preventive Services Task Force now recommends women start BC screening at age 40[23] instead of the previously recommended starting age of 50[24] and receive screening mammograms every other year from ages 40 to 74. The National Comprehensive Cancer Network 2023 guidelines update[25] makes a strong recommendation for all annual screening mammograms (age 40 or greater) to be performed with tomosynthesis, regardless of risk category. For those individuals considered at increased risk of BC, supplemental screening with annual breast magnetic resonance imaging (MRIs) with and without contrast are recommended in addition to annual screening mammograms with tomosynthesis (digital, three-dimensional mammogram). For those individuals who cannot have an MRI, the recommendation is to do either a contrast-enhanced mammography or molecular breast imaging.

The MHS follows The National Comprehensive Cancer Network recommendations for BC screening. TRICARE covers annual digital breast tomosynthesis mammograms for all female beneficiaries starting at the age of 40 and for female beneficiaries aged 30 or older who have at least a 15 percent greater lifetime risk of developing BC,[26] consistent with the proposed revision to U.S. Preventive Services Task Force guidelines. In addition to annual mammograms, TRICARE covers annual breast MRIs for women beginning at age 30 who have a 20 percent or greater lifetime risk of BC. Lastly, TRICARE also covers genetic counseling before BRCA1 or BRCA2 gene testing for persons identified as high risk for BC based on medical and family history.

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[23] U.S. Preventive Services Task Force (2023, May 9, 2023). *Draft Recommendation Statement BC: Screening.*
[24] Sui, A.L. & Force, U.P.S.T. (2016) Screening of BC: US Preventive Services Task Force Recommendation Statement, Annals of Internal Medicine.
[25] Bevers, T.B, et. al, "NCCN Guidelines Insights" BC Screening and Diagnosis, Version1.2023.
[26] TRICARE Manual, Covered Services: Breast Exams.

CONCLUSION

Information on BC rates among ADSMs varies depending on the methods used to obtain the information. The analysis completed for this study of BC incidence among ADSMs from 2011-2022 indicates that a small percentage of those ADSMs who receive their care at military medical treatment facilities are diagnosed with BC, (.03 percent). However, BC remains the most common form of cancer among ADSW with approximately 75 percent of those diagnosed being under the age of 40 at the time of diagnosis. While research varies on the inherent risk of BC associated with active service, it does not demonstrate that ADSM who deploy are at greater risk than those who do not deploy. The Department's BC screening efforts are more comprehensive and occur at greater rates than the national average. Given that DoD utilizes prevailing guidelines for screening and no additional risk were identified associated with airborne hazards, no changes to Departmental screening policy are identified as necessary at this time. DoD will continue the multiple collaborative efforts to continue to identify ways to prevent, detect, and treat BC in ADSMs.

APPENDIX

ACRONYMS

ADSM	active duty Service member
ADSW	active duty Service woman
AHBPCE	Airborne Hazards and Burn Pits Center of Excellence
AHOBPR	Airborne Hazards and Open Burn Pit Registry
APOLLO	Applied Proteogenomic Organizational Learning and Outcomes Consortium
BC	breast cancer
BRCA	Breast Cancer Gene
DoD	Department of Defense
ICD	International Classification of Diseases
MCCRP	Murtha Cancer Center Research Program
MHS	Military Health System
MRI	magnetic resonance imaging
PROMETHEUS	Project for Military Exposures and Toxin History Evaluation in US Service Members
SEER	Surveillance, Epidemiology, and End Results
VA	Department of Veterans Affairs

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Additional Supporting Data

TABLE 9: RISK RATIOS FOR INCIDENT BC AMONG ADSMS

	Unadjusted RR	95% CI	Adjusted RR	95% CI
Demographic Characteristics				
Ethnicity				
Non-Hispanic White (Ref)	1.00	--	1.00	--
Non-Hispanic Black	**2.39**	**2.08-2.75**	**1.31**	**1.13-1.51**
Hispanic	0.97	0.79-1.18	1.12	0.92-1.37
Asian/Pacific Islander	1.36	1.00-1.85	1.23	0.90-1.67
American Indian/Alaskan Native	1.11	0.57-2.14	0.84	0.44-1.62
Other	**1.69**	**1.29-2.22**	**1.43**	**1.09-1.87**
Sex				
Male (Ref)	1.00	--	1.00	--
Female	**214.90**	**143.38-322.09**	**144.66**	**93.77-223.17**
Age				
17-29 (Ref)	1.00	--	1.00	--
30-39	**9.48**	**8.23-10.91**	**3.87**	**3.31-4.52**
40-49	**14.74**	**12.47-17.41**	**5.51**	**4.55-6.67**
50+	**16.96**	**11.61-24.79**	**4.59**	**3.07-6.87**
Military Characteristics				
Exposure to burn pits	**2.12**	**1.86-2.42**	1.06	0.93-1.22
Occupation				
Comm/Intel (Ref)	1.00	--	1.00	--
Healthcare	**2.47**	**2.12-2.88**	1.15	0.98-1.35
Repair/Engineering	**0.35**	**0.29-0.42**	**1.22**	**1.01-1.48**
Motor Transport	**0.38**	**0.26-0.56**	1.19	0.80-1.75
Infantry/Artillery/Armor/Combat eng	**0.10**	**0.07-0.15**	1.28	0.86-1.90
Pilot/Aircrew	**0.36**	**0.22-0.59**	0.83	0.50-1.38
Other	**0.65**	**0.54-0.77**	1.18	0.98-1.41
Rank				
Junior Enlisted (Ref)	1.00	--	1.00	--
Senior Enlisted	**14.26**	**10.81-18.80**	**6.69**	**5.00-8.95**
Junior Officer	**8.30**	**5.76-11.96**	**4.28**	**2.94-6.21**
Senior Officer	**56.58**	**42.57-75.20**	**11.70**	**8.51-16.09**
Warrant Officer	**17.72**	**10.81-29.04**	**7.89**	**4.74-13.12**
Service				
Army (Ref)	1.00	--	1.00	--
Air Force	**1.73**	**1.50-1.98**	1.06	0.92-1.23
Navy & Marines	**0.65**	**0.56-0.76**	0.95	0.81-1.12
Health Characteristics				
Tobacco Use	1.13	0.99-1.29	**1.40**	**1.22-1.61**
Contraceptive Use	**12.93**	**10.92-15.30**	1.18	0.99-1.42
Personal History of Breast Cancer	**99.86**	**71.98-138.55**	**1.41**	**1.01-1.97**
Family History of Breast Cancer	**112.78**	**99.98-127.21**	**8.16**	**7.14-9.32**
Family History of Ovarian Cancer	**79.00**	**65.18-95.76**	**2.36**	**1.93-2.88**

Bolded entries indicate $p<0.05$