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Acute Respiratory Infections Among Active Component Service Members Who Use Combustible Tobacco Products and/or E-cigarette/Vaping Products, U.S. Armed Forces, 2018–2019

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Smoking is known to contribute to the risk of acute respiratory illness (ARI) and long-term medical conditions but little is known about the acute health effects of e-cigarette/vaping product use. The annual electronic Periodic Health Assessment (ePHA), which includes questions related to smoking and e-cigarette/vaping product use, is a screening tool used by the U.S. Armed Forces to evaluate the health and medical readiness of military members. Based on responses to questions on ePHAs completed in 2018, active component service members (ACSMs) were categorized as e-cigarette/vaping product only users, smoking only, dual-product users (users of both cigarettes and e-cigarette/vaping products), or non-users. ACSMs in the youngest age groups were more likely than their older counterparts to use e-cigarette/vaping products. Unadjusted incidence rates of ARI were higher among e-cigarette/vaping product only users and dual-product users than smokers and nonusers. After adjusting for age, sex, service branch, and military occupation, the incidence rate of ARI among dual-product users was higher than the rate among nonusers; this difference was small but statistically significant. Improved understanding of the health impact of e-cigarette/vaping product use has the potential to inform policy related to use of these products and prevent unnecessary harm.

WHAT ARE THE NEW FINDINGS?

This is the first report to describe self-reported data on smoking and vaping habits from the ePHA. Unadjusted incidence rates of acute respiratory infection (ARI) were highest among members who reported either e-cigarette/vaping product use, or smoking and e-cigarette/vaping product (dual-use) as compared to smokers and non-users. Adjusted incidence rates of ARI revealed that members who are dual-users had statistically significantly higher rates of ARI.

WHAT IS THE IMPACT ON READINESS AND FORCE HEALTH PROTECTION?

Relatively little is known about electronic cigarette/vaping product use in the military, or how the use of these products impacts short- and long-term health. Understanding the health impact of e-cigarette/vaping product use has the potential to inform policy related to their use and prevent unnecessary harm.

An estimated 200,000–300,000 active component service members (ACSM) are diagnosed with acute respiratory infection (ARI) annually.[1–6] ARI among ACSMs affects their ability to perform their duties because of lost duty hours for medical visits and sick days required for recovery.

Numerous studies have linked smoking to cardiovascular disease, lung disease, and premature death.[7] Smoking also contributes to the risk of infectious diseases, including ARI, in both smokers and those exposed to secondhand smoke.[8–11] There has been a rapid increase in the use of electronic cigarettes (e-cigarettes), vaping products, and other electronic nicotine delivery systems (ENDS) among adolescents and young adults in the U.S. According to the 2018 National Health Interview Survey, among young adults aged 18–24 years, prevalence of reported current e-cigarette use was 7.6% (up from 5.2% in 2017).[12] The popularity of these products raises the concern that e-cigarette/vaping product use, may, like smoking, contribute to the burden of respiratory infections and illnesses.[13–16]

The Department of Defense's annual electronic Periodic Health Assessment (ePHA), which includes questions related to smoking and tobacco product use, is a screening tool used by the Armed Forces to evaluate the health and medical readiness of military members. In 2018, questions about smoking and e-cigarette/vaping product use were added to the ePHA questionnaire allowing respondents to provide detailed information about their smoking and other tobacco use behaviors. Among the 1.2 million ACSM ePHA respondents since 2018, over 113,000 reported using cigarettes, 63,000 reported using e-cigarette/vaping products, and 6,700 reported using both cigarettes and e-cigarette/vaping products (AFHSD, unpublished data, 2019).

The aims of this study were twofold. The first aim was to describe the demographic and military characteristics of self-reported smokers, e-cigarette/vaping product users, users of both smoking and e-cigarette/vaping products (dual-product users), and nonusers among ACSMs. The second aim was to compare incidence rates of ARI among groups of self-reported cigarette smokers, e-cigarette/vaping product users, dual-product users, and nonusers. To date, there have been no studies that examine the relationship between self-reported use of e-cigarette/vaping products and ARI among ACSMs.

METHODS

Data used in this study were derived from the Defense Medical Surveillance System (DMSS) which includes inpatient and outpatient medical encounter data, Theater Medical Data Store (TMDS) data, and ePHA results. The surveillance period was 01 January 2018 through 30 September 2019. The surveillance population included all ACSMs in the U.S. Army, Navy, Air Force, and Marine Corps who completed an ePHA questionnaire between 1 January 2018 and 31 December 2018. ACSMs whose DMSS records contained diagnoses of underlying chronic respiratory diseases including asthma, chronic obstructive pulmonary disease, emphysema, chronic bronchitis, or bronchiectasis at any time were excluded.[17–19] If an ACSM completed more than 1 ePHA during the study period, only the most recent ePHA data were included.

ACSMs were classified into 4 different exposure categories based on self-reported past 30-day (recent) tobacco product use. Exposure category was determined by an ACSM's response to the following ePHA question: "In the past 30 days, which of the following products have you used on at least one day?" Respondents were classified as smoking only if they did not endorse "electronic cigarettes, e-cigarettes, or vape pens" but responded affirmatively to using any of the following: "cigarettes", "cigars, cigarillos, or little cigars", "hookahs or water-pipes", "pipes filled with tobacco (not water-pipes)", or "bidis (small brown cigarettes wrapped in a leaf)". Respondents were categorized as e-cigarette/vaping product only users if they endorsed the response option "electronic cigarettes, e-cigarettes, or vape pens" and did not endorse any of the smoking products. Dual-product users included those who were classified as both smokers and e-cigarette/vaping product users. Respondents were identified as nonusers if they marked "none" or only endorsed any of the following: "chewing tobacco, snuff, or dip", "snus" (moist tobacco powder placed under the lip), "dissolvable tobacco products", or "other" (specify). The nonuser group also included all ever users who had not used any products in the past 30 days.

Demographic and military characteristics of ACSMs as well as duration of tobacco use and exposure to secondhand smoke were examined by user group. Demographic and military characteristics obtained from the DMSS included age, sex, race/ethnicity group, education level, service branch, rank/grade, military occupation, and marital status. Background characteristics from the ePHA included number of deployments in the past five years, previous tobacco use, with duration of any tobacco product use categorized as "less than 1 year", "1 to 5 years", "5 to 10 years", "11 to 15 years", or "more than 15 years", and exposure to secondhand smoke, determined by using responses to the yes/no question "Are you regularly exposed to secondhand smoke, a mixture of smoke that comes out of the burning end of a cigarette, cigar, pipe and the smoke breathed out by the smoker (housemate, carpool, work environment)?"

Incident cases of ARI among the ACSMs in the 4 groups were identified during the 9 months following ePHA administration date using a retrospective cohort study design. The case definition was 1 inpatient, outpatient or TMDS encounter with a qualifying diagnosis of ARI occurring in the first diagnostic position **(Table 1)**. Incident cases were identified using a 14-day gap rule; ICD-9 and ICD-10 codes for ARI were not counted in the 14 days after the first recorded code, as they likely represented a continuation of the same ARI and not a new incident case of ARI. It is important to note that, because TMDS had not fully transitioned to ICD-10, ICD-9 codes appeared in the analysis. Multivariable Poisson regression models were used to calculate adjusted incidence rate ratios (AIRRs) for the user groups using nonusers as the referent and controlling for age, sex, service branch, and military occupation. Statistical analyses were conducted using SAS/STAT software, version 9.4 (2014, SAS Institute, Cary, NC).

RESULTS

Of the 802,621 ACSMs who completed an ePHA in 2018, 651,561 (81.2%) were nonusers, 37,915 (4.7%) were e-cigarette/vaping product only users, 91,135 (11.4%) were in the smoking only group, and 22,010 (2.7%) were dual-product users **(Table 2)**. Nearly one-quarter (23.9%) of e-cigarette/vaping product only users and 31.8% of dual-product users were under 21 years old, as compared to 10.7% of smokers, and 10.4% of nonusers. More than half (56.9%) of e-cigarette/vaping product only users were under 25 years old and more than two-thirds (68.8%) of dual-product users were under 25 years old. The distributions of race/ethnicity group and service branch were broadly similar across the user groups.

Among ACSMs who completed an ePHA in 2018, the crude incidence rates of ARI per 1,000 person-years (p-yrs) during the 9 months after assessment were 281.1 for dual-users, 273.4 for e-cigarette/vaping product only users, 234.7 for non-users, and 229.3 for smokers **(Table 3)**. Across all groups, the incidence rates of ARI among females were at least 1.9 times those of males (IRR for female nonusers was 1.9 times that of males, IRR for female dual-users was 2.4 times that of males). In all study groups, incidence rates of ARI were highest among ACSMs 18–20 years old and generally decreased with increasing age. Incidence rates of ARI were highest among e-cigarette/vaping product only users and dual-product users with an education level of high school or less compared to those with higher levels of educational attainment. Similarly, the incidence rates of ARI were highest among e-cigarette/vaping product only users and dual-product users in ranks E1–E4 and decreased with increasing rank. The incidence rates of ARI were highest among ACSMs who had not deployed in the past 5 years **(Table 3)**.

After adjusting for age, sex, service branch, and military occupation, e-cigarette/vaping product only users and those in the smoking only group had similar incidence rates of ARI compared to nonusers (AIRR=1.02, 95% CI: 0.99–1.04, p=.123; AIRR=1.01, 95% CI: 0.99–1.03, p=.304, respectively) **(Table 4)**. The rate of ARI among dual-product users was higher than the rate among nonusers; this difference was small but statistically significant (AIRR=1.04, 95% CI: 1.01-1.07, p=.021).

EDITORIAL COMMENT

The majority of ACSMs who reported e-cigarette/vaping product only use were

TABLE 1. ICD-9 and ICD-10 diagnostic codes used to identify cases of ARI

Diagnosis	ICD-10 codes[a]	ICD-9 codes[a,b]
Nasopharyngitis	J00*	460*
Sinusitis	J01*	461*
Acute pharyngitis	J02*	462*
Acute laryngitis and tracheitis	J04*	464.0, 464.10, 464.20, 464.30, 464.50
Acute obstructive laryngitis and epiglottitis	J05*	464.01, 464.11, 464.21, 464.31, 464.4, 464.51
Acute upper respiratory infections of unspecified site	J06*	465*
Influenza due to certain identified flu strain	J09*	488*
Influenza due to other identified flu strain	J10*	487*
Influenza due to unknown flu strain	J11*	NA - new code
Viral pneumonia not elsewhere classified	J12*	480*
Pneumonia due to *Streptococcus pneumoniae*	J13*	481*
Pneumonia due to *Haemophilus influenzae*	J14*	482.2
Bacterial pneumonia not elsewhere classified	J15*	482*
Pneumonia due to other infectious organisms	J16*	484*, 483.0, 483.1, 483.8
Pneumonia unspecified organism	J18*	486, 485
Acute bronchitis	J20*	466.0*
Acute bronchiolitis	J21*	466.1*
Unspecified acute lower respiratory tract infection	J22*	519.8
Acute tonsilitis	J03*	463, 034.0
Peritonsilar abscess	J36	475
Retropharyngeal and parapharyngeal abscess	J39.0	478.22, 478.24
Other abscess of pharynx	J39.1	478.21
Diphtheria	A36.0, A36.1, A36.2, A36.9	032.0, 032.1, 032.3, 032.9
Scarlet fever	A38*	34.1
Whooping cough	A37*	033.0, 033.9, 033.8
Adenovirus	B34.0	NA - new code
Measles	B05*	055.0, 055.1, 055.2, 055.8, 055.9,
Rubella	B06*	056.00, 056.01, 056.09, 056.79, 056.9
Streptococcus Group A	B95.0	041.01,
Streptococcus pneumoniae as the cause of disease classified elsewhere	B95.3	041.09,
Mycoplasma pneumoniae	B96.0	041.81,
Klebsiella pneumoniae	B96.1	041.3,
H. Influenzae	B96.3	041.5,
Adenovirus	B97.0	079.0,
Coronovirus	B97.2	NA - new code
Respiratory syncytial virus (RSV)	B97.4	79.6

[a]An asterisk (*) indicates that any subsequent digit/character is included.
[b]Because TMDS had not fully transitioned to ICD-10, ICD-9 codes appeared in the analysis.
ICD, International Classification of Diseases; ARI, acute respiratory infection, NA, not applicable.

less than 25 years old. A majority of e-cigarette/vaping product only users and dual-product users had a high school education or less, a rank of E1–E4, never deployed, and were single, never married. More than half of those in the e-cigarette/vaping product only or dual-product user categories reported using any tobacco products for 5 years or less. This is consistent with reports that adolescents in middle and high school initiate use of e-cigarettes/vaping products.[13,20]

Female service members made up similar percentages of smokers, e-cigarette/vaping product users and dual users. Published data on sex differences in e-cigarette/vaping product use are limited. Some studies suggest that males are more likely to use e-cigarettes/vaping products than females, but rapidly evolving marketing techniques and social messaging have the potential to change these patterns.[21]

The youngest age group had the highest incidence rates of ARI across all user groups and the nonuser group. Incidence rates of ARI tended to decrease with increasing age. Women had incidence rates of ARI that were twice the rates of men across all the user groups. Women have been reported to demonstrate increased care seeking behavior compared to men, which may partially explain this finding.[22]

ACSMs who reported dual use of e-cigarette/vaping products and smoking products on the ePHA during 2018 had the highest crude incidence rate of ARI, followed

TABLE 2. Demographic and military characteristics of active component service members who completed an ePHA in 2018, by exposure category

	E-cigarette/vaping product use only		Smoking only		Dual-product use		Nonuse	
	No.	%	No.	%	No.	%	No.	%
Total	37,915	100.0	91,135	100.0	22,010	100.0	651,561	100.0
Sex								
Male	33,759	89.0	80,650	88.5	19,851	90.2	531,446	81.6
Female	4,156	11.0	10,485	11.5	2,159	9.8	120,115	18.4
Age group (years)								
18–20	9,043	23.9	9,742	10.7	7,006	31.8	67,724	10.4
21–24	12,541	33.1	24,336	26.7	8,128	36.9	153,590	23.6
25–29	8,184	21.6	22,431	24.6	3,782	17.2	161,874	24.8
30–34	4,382	11.6	15,404	16.9	1,705	7.8	115,082	17.7
35–39	2,641	7.0	11,839	13.0	970	4.4	83,640	12.8
40–49	1,091	2.9	6,853	7.5	405	1.8	62,132	9.5
50+	33	0.1	530	0.6	14	0.1	7,519	1.2
Race/ethnicity group								
Non-Hispanic white	22,724	59.9	53,201	58.4	13,032	59.2	372,006	57.1
Non-Hispanic black	5,285	13.9	15,617	17.1	3,220	14.6	103,465	15.9
Hispanic	5,434	14.3	12,580	13.8	3,399	15.4	103,928	16.0
Asian/Pacific Islander	1,407	3.7	4,137	4.5	1,018	4.6	24,397	3.7
American Indian/Alaska Native	352	0.9	859	0.9	194	0.9	5,033	0.8
Other/unknown	2,713	7.2	4,741	5.2	1,147	5.2	42,732	6.6
Education level								
High school or less	31,765	83.8	65,479	71.9	19,597	89.0	360,795	55.4
Some college	3,922	10.3	13,377	14.7	1,583	7.2	97,427	15.0
College or more	2,228	5.9	12,279	13.5	830	3.8	193,339	29.7
Marital status								
Single, never married	19,673	51.9	37,240	40.9	13,595	61.8	249,920	38.4
Married	16,498	43.5	47,915	52.6	7,573	34.4	369,016	56.6
Other/unknown	1,744	4.6	5,980	6.6	842	3.8	32,625	5.0
Service								
Army	12,672	33.4	44,711	49.1	10,425	47.4	246,515	37.8
Navy	7,137	18.8	14,757	16.2	2,955	13.4	113,241	17.4
Air Force	13,740	36.2	20,614	22.6	5,127	23.3	230,203	35.3
Marine Corps	4,366	11.5	11,053	12.1	3,503	15.9	61,602	9.5
Rank/grade								
Junior enlisted (E1–E4)	23,695	62.5	39,148	43.0	16,328	74.2	240,935	37.0
Senior enlisted (E5–E9)	13,198	34.8	44,045	48.3	5,348	24.3	262,098	40.2
Junior officer (O1–O3)	629	1.7	4,504	4.9	235	1.1	85,047	13.1
Senior officer (O4–O10)	182	0.5	2,334	2.6	46	0.2	53,472	8.2
Warrant officer (WO1–WO5)	211	0.6	1,104	1.2	53	0.2	10,009	1.5
Military occupation								
Combat-specific[a]	3,378	8.9	15,698	17.2	3,556	16.2	81,263	12.5
Motor transport	1,180	3.1	3,252	3.6	924	4.2	14,742	2.3
Pilot/air crew	394	1.0	1,702	1.9	117	0.5	31,626	4.9
Repair/engineering	16,133	42.6	30,007	32.9	8,371	38.0	179,619	27.6
Communications/intelligence	8,010	21.1	20,470	22.5	4,650	21.1	146,164	22.4
Healthcare	2,211	5.8	6,343	7.0	1,166	5.3	73,925	11.4
Other/unknown	6,609	17.4	13,663	15.0	3,226	14.7	124,222	19.1
Number of deployments in past 5 years								
Never deployed	15,145	39.9	30,840	33.8	11,457	52.1	202,465	31.1
None	9,765	25.8	19,427	21.3	4,018	18.3	181,686	27.9
1	8,172	21.6	23,977	26.3	4,366	19.8	159,839	24.5
2	2,995	7.9	10,237	11.2	1,400	6.4	64,686	9.9
3	1,016	2.7	3,575	3.9	427	1.9	22,494	3.5
4	361	1.0	1,415	1.6	151	0.7	8,537	1.3
5+	436	1.2	1,567	1.7	179	0.8	10,978	1.7
Missing	25	0.1	97	0.1	12	0.1	876	0.1
Duration of tobacco use (years)								
Less than 1	12,614	33.3	17,796	19.5	4,986	22.7	5,830	0.9
1–5	15,898	41.9	30,899	33.9	10,111	45.9	21,122	3.2
6–10	4,266	11.3	18,065	19.8	3,709	16.9	13,665	2.1
11–15	2,147	5.7	11,146	12.2	1,658	7.5	7,079	1.1
Greater than 15	2,213	5.8	11,960	13.1	1,294	5.9	6,304	1.0
Missing	777	2.1	1,269	1.4	252	1.1	597,561	91.7
Exposure to secondhand smoke								
Yes	7,040	18.6	30,365	33.3	9,647	43.8	60,994	9.4
No	30,875	81.4	60,770	66.7	12,363	56.2	590,567	90.6

[a]Infantry/artillery/combat engineering/armor.
ePHA, electronic Periodic Health Assessment; No, number.

TABLE 3. Incident cases and incidence rates of ARI in the 9 months following ePHA, by exposure category, by demographic and military characteristics, active component, U.S. Armed Forces, 2018–2019

	E-cigarette/vaping product use only		Smoking only		Dual-product use		Nonuse	
	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]
All	7,529	273.4	15,043	229.3	4,434	281.1	111,385	234.7
Sex								
Male	6,005	244.8	11,739	202.3	3,528	248.0	77,467	200.0
Female	1,524	506.5	3,304	437.4	906	585.5	33,918	388.0
Age group (years)								
18–20	2,016	302.5	1,798	254.3	1,576	308.7	12,718	254.0
21–24	2,627	291.4	4,225	246.2	1,611	281.0	26,714	241.3
25–29	1,514	256.8	3,636	225.5	690	255.8	27,027	230.0
30–34	774	241.1	2,580	228.7	312	252.7	20,144	238.4
35–39	438	225.0	1,846	212.9	181	257.2	14,424	234.3
40–49	158	202.5	886	180.5	64	222.1	9,285	206.4
50+	2	84.2	72	192.8	0	0.0	1,073	201.0
Race/ethnicity group								
Non-Hispanic white	4,745	287.6	8,776	229.2	2,629	281.9	63,087	232.9
Non-Hispanic black	968	252.6	2,732	244.1	718	312.9	17,854	237.2
Hispanic	1,033	261.7	1,974	217.8	633	259.3	18,420	243.2
Asian/Pacific Islander	174	170.1	523	175.3	145	197.4	3,258	182.9
American Indian/Alaska Native	53	209.7	136	220.2	47	331.9	798	217.8
Other/unknown	556	280.6	902	261.4	262	314.3	7,968	255.1
Education level								
High school or less	6,363	276.2	10,764	229.8	3,997	285.1	61,872	236.5
Some college	746	260.6	2,375	243.3	289	252.3	18,282	256.8
College or more	420	257.4	1,904	212.0	148	244.5	31,231	220.2
Marital status								
Single, never married	3,988	279.0	6,135	230.2	2,717	278.3	40,803	224.4
Married	3,139	261.9	7,735	223.4	1,493	276.0	63,696	236.6
Other/unknown	402	319.9	1,173	271.6	224	374.3	6,886	291.4
Service								
Army	1,933	211.8	6,190	193.7	1,760	237.7	33,792	189.1
Navy	1,437	275.9	2,711	251.6	636	296.2	19,489	235.1
Air Force	3,512	349.2	4,736	315.3	1,504	405.3	50,506	299.6
Marine Corps	647	205.8	1,406	179.5	534	212.7	7,598	170.7
Rank/grade								
Junior enlisted (E1–E4)	5,052	294.6	7,013	253.3	3,480	298.6	44,390	254.9
Senior enlisted (E5–E9)	2,313	240.1	6,894	215.0	904	233.3	44,206	231.3
Junior officer (O1–O3)	116	250.2	677	203.3	38	220.9	13,227	210.5
Senior officer (O4–O10)	31	229.9	339	199.1	8	245.6	8,284	211.5
Warrant officer (WO1–WO5)	17	109.8	120	148.0	4	101.3	1,278	173.5
Military occupation								
Combat-specific[b]	375	156.1	1,554	139.6	393	157.4	7,598	129.7
Motor transport	187	218.5	489	210.5	160	243.7	2,121	198.7
Pilot/air crew	78	268.5	298	238.8	33	384.3	5,174	223.0
Repair/engineering	2,962	252.5	4,773	220.0	1,650	273.3	28,485	217.6
Communications/intelligence	1,815	310.9	3,871	262.1	1,084	324.1	28,832	270.7
Healthcare	663	414.2	1,537	335.4	386	461.0	16,684	309.0
Other/unknown	1,449	300.9	2,521	256.0	728	314.8	22,491	247.7
Number of deployments in past 5 years								
Never deployed	2,917	265.4	5,097	231.9	2,247	273.5	33,119	225.1
None	2,407	337.0	3,747	265.8	1,092	374.7	36,669	275.4
1	1,431	242.2	3,686	213.4	727	235.3	25,552	220.1
2	489	226.5	1,561	211.0	246	244.9	9,766	207.8
3	161	217.2	517	199.1	73	240.3	3,346	203.8
4	50	191.7	190	184.5	23	216.6	1,223	197.0
5+	70	221.0	223	195.4	21	162.0	1,580	196.6
Missing	4	219.4	22	306.6	5	567.8	130	202.8
Duration of tobacco use (years)								
Less than 1	2,571	279.4	3,285	254.8	1,066	293.9	803	188.4
1–5	3,297	286.5	5,249	237.9	2,078	287.8	2,710	176.7
6–10	837	271.3	2,872	221.2	725	275.3	1,860	187.3
11–15	348	222.4	1,732	214.5	323	274.5	938	181.3
Greater than 15	338	209.5	1,704	196.7	203	217.4	826	179.8
Missing	138	245.4	201	220.3	39	216.0	104,248	239.4
Exposure to secondhand smoke								
Yes	1,343	264.4	4,869	224.6	1,905	277.0	9,712	221.0
No	6,186	275.5	10,174	231.7	2,529	284.4	101,673	236.1

[a]Rate per 1,000 person-years

[b]Infantry/artillery/combat engineering/armor.

ARI, acute respiratory infection; ePHA, electronic Periodic Health Assessment; No., number

TABLE 4. Adjusted incidence rate ratios (AIRR) of ARI in 9 months following ePHA, by exposure group, active component, U.S. Armed Forces, 2018–2019

	AIRR	95% CI	p-value
E-cigarette/vaping product use only	1.02	0.99–1.04	.123
Smoking only	1.01	0.99–1.03	.304
Dual-product use	1.04	1.01–1.07	.021

[a]Nonuse group was the reference group. Models adjusted for age group, sex, service branch, and military occupation.
ARI, acute respiratory infection; ePHA, electronic Periodic Health Assessment; CI, confidence interval.

by e-cigarette/vaping product only users. After adjusting for age, sex, service branch, and military occupation, ACSMs who self-reported dual-product use had a statistically significantly higher rate of ARI compared to nonusers, although the difference was small.

This study has several limitations. First, self-report of health-risk behaviors can be associated with under-reporting. Second, other factors that mitigate or aggravate the risk of ARI (including living environment [e.g., barracks vs an apartment/house], contact with young children, stress, and other comorbidities) were not considered here. Third, recruits completing basic or early training are not included in this study population, as the first ePHA is completed after training at the first permanent duty station. Fourth, the current analysis did not adjust for race/ethnicity group or education level which have been shown to be associated with tobacco use behavior. Fifth, the difference in the adjusted rates of ARI among dual-product users and nonusers, although statistically significant, was very small. Further analysis may provide evidence as to whether this difference is relevant. Finally, while the ePHA is mandatory, completion rates differ by the different service branches such that the study population does not fully represent the actual ACSM population.

Current findings suggest that dual use of e-cigarette/vaping and smoking products may be associated with ARI. However, further investigation of this potential relationship should take into account the type of e-cigarette/vaping product used as well as the duration and frequency of use. The ePHA provides a rich source of data related to e-cigarette/vaping product use that can be merged with other data sources to monitor health impacts over time. Studies adjusting for factors not considered here, such as race/ethnicity group and education are warranted. Gaining a better understanding of the risks associated with e-cigarette use/vaping is important for ensuring both the short- and long-term health of ACSMs. Such an understanding would promote military readiness, especially given that e-cigarette/vaping product users tend to be younger with potentially long military careers ahead of them.

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Fibromyalgia: Prevalence and Burden of Disease Among Active Component Service Members, U.S. Armed Forces, 2018

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This report uses routinely collected data in the Defense Medical Surveillance System (DMSS) to characterize the prevalence and burden of fibromyalgia (FM) among members of the active component of the U.S. Armed Forces between 1 Jan 2018 and 31 Dec 2018. During the study period, the prevalence of FM was 0.15%. There was a trend of increasing prevalence with increasing age. Prevalence was highest among women (0.59%), those in the oldest age group (0.52%), non-Hispanic blacks (0.25%), those in the Air Force (0.21%), those in a healthcare occupation (0.36%), senior enlisted (0.24%) and warrant officers (0.24%). The prevalence of FM was approximately twice as high among non-Hispanic blacks compared to non-Hispanic whites. The average number of medical encounters per FM patient per year was 57 (median 38, LQ=21, UQ=66, range=1–263) compared to an average of 13 in the total patient population. The groups of conditions most commonly associated with an FM diagnosis were musculoskeletal and mental health conditions. The burden of FM disease poses clear readiness and retention concerns.

WHAT ARE THE NEW FINDINGS?

The prevalence of fibromyalgia (FM) among the active component of the U.S. Armed Forces has not been evaluated since the change from ICD-9 to ICD-10 diagnosis coding, which allows for more accurate capture of FM diagnoses. The estimated prevalence of FM was 0.15% in calendar year 2018.

WHAT IS THE IMPACT ON READINESS AND FORCE HEALTH PROTECTION?

Although the prevalence of FM was low in this study population, the high number of healthcare encounters per affected individual constitute a relatively large burden of disease. The average number of encounters per patient per year was 57 (range=1–263). This clearly presents a significant concern for the readiness and performance of these patients.

Fibromyalgia (FM) is a common cause of widespread musculoskeletal pain.[1] The American College of Rheumatology (ACR) created diagnostic criteria for FM based on a composite score from the Widespread Pain Index and symptom severity scale.[2] In order for a diagnosis of FM to be made a syndrome of focal areas of pain, not explainable by other conditions, must be present in at least 4 of 5 regions of the body and must have been present for at least 3 months, potentially including other somatic symptoms.[2]

FM is present in 1.75% of the civilian population according to data from the 2012 National Health Interview Survey.[3] Walitt et al. found that FM occurred predominantly in women, beginning in the second decade of life, increased with age, and had similar prevalence by race with the exception of a lower prevalence in Asians.[3] These findings are consistent with the results of several studies of FM prevalence in the U.S.[1, 3, 4]

Patients with an FM diagnosis have comorbid conditions at 1.45 times the rate of those without an FM diagnosis.[5] Mental disorders, diseases of the musculoskeletal system, and painful neuropathic disorders among other comorbid conditions occur frequently in FM patients.[6] FM can be a prolonged and debilitating condition that is difficult to manage, especially given its association with increased comorbidities.[5] The severity and frequency of symptoms can make employment difficult for those with FM.[7]

In a 2008 study, White and colleagues found that the prevalence of disability was approximately twice as high in patients with FM compared to their peers without FM.[7] FM patients in the White et al. study missed an average of 30 days of work per year.[7] Patients with FM are often frequent consumers of health care services, utilizing care at a rate 5 times that of the insured U.S. population and averaging up to 6.9 visits per 3-month period.[8] Absenteeism and presenteeism (the concept of reduced performance at work due a specific cause) are important to consider as well. Chandran and colleagues found that up to 20% of FM patients reported missing 5 or more days of work in the past month.[8] Patients in this study also reported that up to 252 days of work per year were adversely affected by FM.[8]

Results of a 2017 study of women veterans suggested that exposure to environmental, physical, and psychological stressors associated with military and combat duty increased the risk of developing FM in this population.[9] Prevalence of FM among U.S. military members was last formally assessed in a 2014 study that reported an increasing prevalence of FM from 0.31% in 2006 to 0.52% in 2010.[10] However, this study estimated FM prevalence among all TRICARE beneficiaries, not just active component service members and relied on the nonspecific International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) code for FM (729.1, myalgia and myositis, unspecified). Using this code likely resulted in inflated counts of FM diagnoses because active component personnel typically experience muscle strain at rates higher than the general population. The current study describes the prevalence of FM in active component service members and the corresponding burden on FM patients and the Military Health System (MHS).

METHODS

The surveillance period was from 1 January 2018 through 31 December 2018. The surveillance population included all individuals who served in the active component of the U.S. Army, Navy, Air Force, or Marine Corps. All data used in this analysis were derived from records routinely maintained in the Defense Medical Surveillance System (DMSS). These records capture information from care received in military and civilian treatment facilities so long as they were reimbursed through the MHS.

For this study, a case was defined as an active component service member with at least 1 inpatient hospitalization during 2018 for which the DMSS record showed a diagnosis for FM (ICD-10 M79.7) in any diagnostic position or at least 2 outpatient visits within 365 days (at least one of the encounters must have been in 2018) with FM diagnosed in any diagnostic position. Prevalence was calculated by dividing the total number of unique individuals meeting the preceding criteria by the population at the midpoint of the year. Mid-year population was used because the active component of the armed forces is an open population with members entering and leaving throughout the year. The following demographic information was captured for each patient at mid-year: age, sex, race/ethnicity group, branch of service, rank, and military occupation.

The numbers of hospitalizations, bed days, and outpatient encounters were totaled for all individuals diagnosed with FM in 2018 to quantify the burden of FM. For this FM burden calculation, the inpatient or outpatient encounter must have had a diagnosis of FM in the first diagnostic position. Only one encounter per patient per day was counted with priority given to inpatient encounters.

The burden of illness and injury comorbidities among the prevalent cases of FM was tabulated in accordance with previously published methodology used for the *MSMR* burden of disease reports.[11] For those who met the case definition for FM, all illness and injury diagnoses recorded in the first diagnostic position of an inpatient or outpatient encounter during calendar year 2018 were ascertained. These encounters were then grouped into 25 burden of disease major categories based on a modified version of the Global Burden of Disease Study.[12] Again, only one encounter per patient per day was included in the analysis. These comorbid diagnoses were also grouped by the 17 ICD-10 chapters with the 5 most frequently diagnosed conditions reported for each chapter.

RESULTS

In 2018, a total of 1,955 active component service members met the case definition for FM. This count of cases represents a total prevalence of 0.15% **(Table 1)**. Prevalence increased linearly with age from 0.042% in the 17-24 age group to 0.52% in the 45+ age group. FM was 9.29 times more common in women than men. The prevalence of FM in non-Hispanic blacks (0.245%) was 2 times higher than that in the non-Hispanic white (0.12%) population, and prevalence was very similar between whites and Asian/Pacific Islanders (0.11%). FM was most common in the Air Force (0.21%) and least common in the Marine Corps (0.06%). Senior enlisted and warrant officers were diagnosed with FM at similar levels (both 0.24%), while junior enlisted had the lowest levels (0.06%). Communications/intelligence and healthcare personnel had the greatest prevalence of FM diagnosis compared to other occupational groups (0.24% and 0.36%, respectively), while combat-specific occupations had a relatively low prevalence of 0.04% **(Table 1)**.

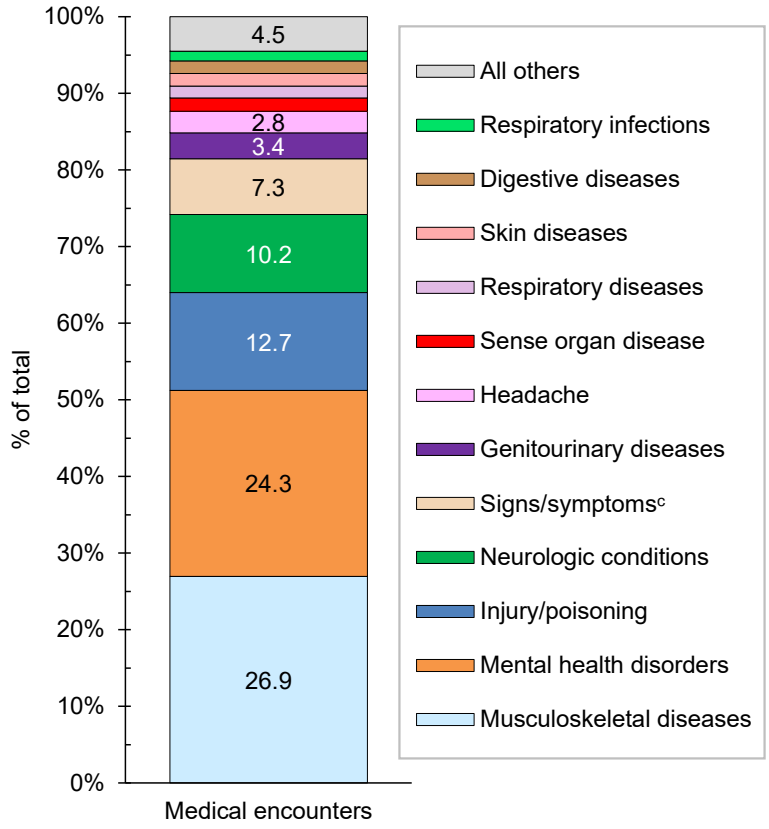
In 2018, there was 1 inpatient encounter with the ICD-10 code for FM in the first diagnostic position. Other diagnosis codes listed in the discharge summary for this admission included eosinophilia, abdominal pain, constipation, and leaving against medical advice. There were 6,801 outpatient encounters with FM in the first diagnostic position among 1,535 individual patients meeting criteria to be considered a patient with FM in this study **(data not shown)**. This represents an average of 4.4 outpatient encounters attributable to FM per patient with FM per year. Patients with FM had an average of 57 medical encounters per year (median 38, LQ = 21, UQ = 66, range=1–263) **(data not shown)**. The *MSMR* burden of disease report for the same year found that all active component service members had an average of 13 encounters per year.

TABLE 1. Demographic and military characteristics of patients diagnosed with FM, active component, U.S. Armed Forces, 2018

	No.	% total	Prevalence (%)
Total	1,955	100.0	0.15
Age group (years)			
17–24	216	11.0	0.04
25–34	653	33.4	0.13
35–44	833	42.6	0.37
45+	253	12.9	0.52
Sex			
Male	692	35.4	0.06
Female	1,263	64.6	0.59
Race/ethnicity group			
Non-Hispanic white	893	45.7	0.12
Non-Hispanic black	510	26.1	0.24
Hispanic	326	16.7	0.16
Asian/Pacific Islander	60	3.1	0.11
Other/unknown	166	8.5	0.18
Service			
Army	713	36.5	0.15
Navy	450	23.0	0.14
Air Force	677	34.6	0.21
Marine Corps	115	5.9	0.06
Rank			
Junior enlisted (E1–E4)	360	18.4	0.06
Senior enlisted (E5–E9)	1,208	61.8	0.24
Junior officer (O1–O3)	325	16.6	0.16
Senior officer (O4–O10)	18	0.9	0.15
Warrant officer (W1–W5)	44	2.3	0.24
Military occupation			
Combat-specific[a]	76	3.9	0.04
Motor transport	30	1.5	0.08
Pilot/air crew	17	0.9	0.04
Repair/ engineering	393	20.1	0.10
Communications/ intelligence	678	34.7	0.24
Healthcare	416	21.3	0.36
Other/unknown	345	17.6	0.13

[a]Infantry/artillery/combat engineering/armor.
FM, fibromyalgia.

FIGURE. Percentage of medical encounters[a] attributable to burden of disease major categories,[b] service members with FM, active component, U.S. Armed Forces, 2018



FM, fibromyalgia.
[a]Medical encounters include total hospitalizations and ambulatory visits for the condition (with no more than 1 encounter per individual per day per condition).
[b]Burden of disease major categories based on a modified version of those defined in the Global Burden of Disease Study.[12]
[c]Includes ill-defined conditions.

Encounters for comorbid conditions were counted for all 1,955 prevalent cases of FM. The 5 *MSMR* burden of disease major categories of diagnoses with the most encounters among the 1,955 FM cases in 2018 were musculoskeletal diseases (26.9% of all encounters), mental health disorders (24.3%), injury/poisoning (12.7%), neurologic conditions (10.2%), and signs, symptoms and ill-defined conditions (7.3%) **(Figure 1)**. These 5 burden of disease major categories accounted for 81.4% of all FM patient encounters in 2018. Among patients with FM, nearly all (96.3%; n=1883) had an encounter for a musculoskeletal disease **(Table 2)**, accounting for 25,842 encounters. Within the major category of musculoskeletal disease, the two most common sub-categories were 'all other musculoskeletal diseases' (n=14,099), and 'other back problems' (n = 10,920) **(data not shown)**. The sub-category 'all other musculoskeletal diseases' included the diagnosis of FM. Within the mental health disorders (n=23,299) category, the two most common sub-categories were anxiety disorders (n=9,421) and mood disorders (n=6,904). The two most common sub-categories within injury/poisoning (n=12,221) were arm and shoulder injuries (n=3,464) and knee injuries (n=2,333). Within neurologic conditions (n=9,786) the 2 most common sub-categories were organic sleep disorders (n=5,382) and 'all other neurologic conditions' (n=4,144) (excluding epilepsy, multiple sclerosis, and mononeuritis). Lastly, within signs and symptoms (n=6,975) the 2 most common sub-categories were 'abdomen and pelvis' (n=1,405) and 'all other signs and symptoms' (n=4,414) (excluding the only other category, 'respiratory and chest' (n=1,183)) **(data not shown)**.

Outpatient encounters were also quantified according to ICD-10 chapters and specific ICD-10 diagnostic codes **(Table 3, 4a, and 4b)**. The distribution of diagnoses was broadly similar for men and women. The top 5 comorbid diagnoses by ICD-10 major diagnostic category for FM patients were for musculoskeletal system disorders (30.5%), mental health disorders (20.1%), factors influencing health status and contact with health services (17.0%), disorders of the nervous system and sense organs (12.6%), and signs, symptoms, and ill-defined conditions (7.9%) **(Table 3)**.The 2 most common diagnoses within the musculoskeletal system chapter were fibromyalgia and low back pain, comprising 19.4% and 17.9% of all musculoskeletal system primary diagnoses, respectively. Within the mental health disorders category, post-traumatic stress disorder (PTSD) and adjustment disorder were the 2 most common diagnoses accounting for 26.5% and 9.4% of mental health disorder-related outpatient encounters, respectively **(Tables 4a, 4b)**. Among nervous system and sense organ diagnoses obstructive sleep apnea and chronic pain were the most common with 29.0% and 26.1% of encounters, respectively. Lastly, within the signs, symptoms, and ill-defined conditions chapter, pelvic and perineal pain accounted for 11.7% of visits and headache accounted for 7.1% of visits.

EDITORIAL COMMENT

The period prevalence of FM in the active component of the U.S. armed forces was found to be 0.15% in 2018 based on diagnoses made in medical encounters. Prevalence in the U.S. was 1.75% based on diagnoses made via modified ACR criteria based on responses to the 2012 National Health Interview Survey.[3] Jeffery et al. found a prevalence of 0.52% in 2010 among all TRICARE beneficiaries including active duty, dependents, and retirees.[10] The Jeffery et al. study utilized the ICD-9 code 'myalgia and myositis, unspecified' which they acknowledge likely misclassified the outcome by including additional conditions such as myalgia, a common diagnosis for the active component.[10]

The marked difference in the prevalence estimate from the current analysis (0.15%) and that reported by Walitt et al. (1.75%) is

TABLE 2. Medical encounters, individuals affected, and hospital bed days, by burden of disease major category, service members with FM, active component, U.S. Armed Forces, 2018

Burden of disease major category	Outpatient encounters	Inpatient encounters	Individuals affected	Hospital bed days
Musculoskeletal diseases	25,842	39	1,883	108
Mental health disorders	23,299	100	1,375	1,013
Injury/poisoning	12,221	19	1,408	116
Neurologic conditions	9,786	5	1,294	16
Signs/symptoms	6,975	27	1,445	71
Genitourinary diseases	3,238	23	741	57
Headache	2,711	6	835	16
Sense organ diseases	1,679	0	744	.
Digestive diseases	1,574	20	624	86
Skin diseases	1,549	7	596	23
Respiratory diseases	1,489	7	425	24
Respiratory infections	1,224	2	689	4
Cardiovascular diseases	909	12	349	40
Maternal conditions	834	54	102	190
Infectious/parasitic diseases	593	4	373	14
Endocrine disorders	430	3	184	6
Other neoplasms	430	8	245	21
Nutritional disorders	235	3	128	10
Blood disorders	215	2	81	4
Malignant neoplasms	179	3	32	13
Metabolic/immunity disorders	162	1	100	3
Congenital anomalies	156	4	67	10
Oral conditions	88	2	66	4
Diabetes mellitus	84	0	28	.
Perinatal conditions	14	0	4	.
Total	95,916	351	---	1,849

FM, fibromyalgia.

TABLE 3. Medical encounters, individuals affected, and hospital bed days, by ICD-10 major diagnostic category, service members with FM, active component, U.S. Armed Forces, 2018

Major diagnostic category (ICD-10-CM)	Outpatient encounters	Inpatient encounters	Individuals affected	Hospital bed days
Musculoskeletal system (M00-M99)	33,805	41	1,906	112
Mental health disorders (F01-F99)	22,286	100	1,375	1,013
Other (Z00–Z99, except pregnancy-related)	18,794	10	1,830	74
Nervous system and sense organs (G00-G99, H00-H95)	13,902	11	1,610	31
Signs, symptoms, and ill-defined conditions (R00-R99)	8,749	30	1,529	79
Respiratory system (J00-J99)	2,492	9	863	28
Genitourinary system (N00-N99)	2,098	22	681	56
Injury and poisoning (S00-T98, DOD0101-DOD0105)	1,692	15	621	94
Skin and subcutaneous tissue (L00-L99)	1,567	7	608	23
Digestive system (K00-K95)	1,527	22	627	100
Endocrine, nutrition, immunity (E00-E89)	839	7	371	19
Circulatory system (I00-I99)	780	11	296	38
Pregnancy and delivery (O00-O99, relevant Z codes)	636	48	99	168
Neoplasms (C00-D49)	575	11	246	34
Infectious and parasitic diseases (ICD-10: A00-B99)	557	4	351	14
Hematologic and immune disorders (D50-D89)	223	3	88	8
Congenital anomalies (Q00-Q99)	156	4	67	10
Total	110,678	355	---	1,901

FM, fibromyalgia.

likely partially explained by differences in methodology. In the Walitt et al. study, only 27% of respondents diagnosed with FM via the survey reported having the FM diagnosis. Applying this percentage to their reported prevalence yields a prevalence of formally diagnosed FM of 0.47%. The remaining difference may be partially explained by the healthy worker effect, the younger age of the active component population, and/or the disincentive for seeking care among active component service members (e.g., loss of flight privileges).

The Armed Forces have strict retention criteria, which may have also contributed to the low prevalence observed in this study. For example, the Air Force Medical Standards Directory states that patients with "fibromyalgia requiring regular use of controlled medications, schedule II-IV, or requiring frequent follow up or duty restrictions" are not qualified for retention.[13] The document does not define the frequency of follow up. Similar language is present in the Department of Defense Instruction 6490.07 and DoD Instruction 1332.45 (Deployment-Limiting Medical Conditions for Service

TABLE 4a. Most frequent diagnoses during ambulatory visits by ICD-10 major diagnostic category, male service members with FM, active component, U.S. Armed Forces, 2018

Diagnostic category (ICD-10-CM codes)	No.	%
01 Infectious and parasitic diseases (A00–B99)		
Viral intestinal infection, unspecified, A084	19	10.4
Human immunodeficiency virus [HIV] disease, B20	12	6.6
Tinea unguium, B351	12	6.6
Viral infection, unspecified, B349	11	6.0
Helicobacter pylori as the cause of diseases classified elsewhere, B9681	11	6.0
03 Neoplasms (C00–D49)		
Neoplasm of uncertain behavior of skin, D485	29	22.5
Malignant neoplasm of colon, unspecified, C189	8	6.2
Nodular sclerosis class Hodgkin lymphoma, nodes mult site, C8118	7	5.4
Melanocytic nevi of trunk, D225	6	4.7
Benign neoplasm of pituitary gland, D352	6	4.7
03 Endocrine, nutrition, immunity (E00–E89)		
Testicular hypofunction, E291	87	31.1
Obesity, unspecified, E669	18	6.4
Hyperlipidemia, unspecified, E785	14	5.0
Vitamin D deficiency, unspecified, E559	13	4.6
Hypothyroidism, unspecified, E039	11	3.9
04 Hematologic and immune disorders (D50–D89)		
Iron deficiency anemia, unspecified, D509	16	24.6
Anemia, unspecified, D649	15	23.1
Antiphospholipid antibody with hemorrhagic disorder, D68312	5	7.7
Neutropenia, unspecified, D709	4	6.2
Sarcoidosis of lymph nodes, D861	4	6.2
05 Mental health disorders (F01-F99)		
Post-traumatic stress disorder, chronic, F4312	1,774	21.2
Post-traumatic stress disorder, unspecified, F4310	1,100	13.2
Adjustment disorder with mixed anxiety and depressed mood, F4323	751	9.0
Anxiety disorder, unspecified, F419	518	6.2
Major depressive disorder, recurrent severe w/o psych features, F332	420	5.0
06 Nervous system and sense organs (G00-G99, H00-H95)		
Obstructive sleep apnea (adult) (pediatric), G4733	2,517	40.2
Other chronic pain, G8929	781	12.5
Chronic pain syndrome, G894	664	10.6
Insomnia, unspecified, G4700	198	3.2
Migraine with aura, not intractable, w/o status migrainosus, G43109	155	2.5
07 Circulatory system (I00-I99)		
Essential (primary) hypertension, I10	122	32.5
Paroxysmal atrial fibrillation, I480	29	7.7
Athlerosclerotic heart disease of native coronary artery w/o angina pectoris, I2510	16	4.3
Other pulmonary embolism without acute cor pulmonale, I2699	16	4.3
Supraventricular tachycardia, I471	15	4.0
08 Respiratory system (J00-J99)		
Allergic rhinitis due to pollen, J301	132	15.2
Acute upper respiratory infection, unspecified, J069	77	8.9
Acute pharyngitis, unspecified, J029	66	7.6
Allergic rhinitis, unspecified, J309	60	6.9
Acute nasopharyngitis [common cold], J00	34	3.9
09 Digestive system (K00-K95)		
Gastro-esophageal reflux disease without esophagitis, K219	99	17.8
Gastro-esophageal reflux disease with esophagitis, K210	32	5.7
Hemorrhage of anus and rectum, K625	30	5.4
Noninfective gastroenteritis and colitis, unspecified, K529	22	3.9
Irritable bowel syndrome with diarrhea, K580	19	3.4
10 Genitourinary system (N00–N99)		
Enlarged prostate with lower urinary tract symptoms, N401	32	12.0
Right testicular pain, N50811	28	10.5
Calculus of kidney, N200	22	8.3
Overactive bladder, N3281	17	6.4
Left testicular pain, N50812	11	4.1
11 Pregnancy and delivery (O00–O99, relevant Z codes)		
Pregnancy and childbirth (ICD-10: O00-O99, relevant Z codes)	.	.
Pregnancy and childbirth (ICD-10: O00-O99, relevant Z codes)	.	.
Pregnancy and childbirth (ICD-10: O00-O99, relevant Z codes)	.	.
Pregnancy and childbirth (ICD-10: O00-O99, relevant Z codes)	.	.
Pregnancy and childbirth (ICD-10: O00-O99, relevant Z codes)	.	.
12 Skin and subcutaneous tissue (L00–L99)		
Dermatitis, unspecified, L309	48	10.4
Other psoriatic arthropathy, L4059	24	5.2
Acne vulgaris, L700	19	4.1
Psoriasis, unspecified, L409	15	3.3
Ingrowing nail, L600	15	3.3
13 Musculoskeletal system (M00–M99)		
Low back pain, M545	2,389	19.3
Fibromyalgia, M797	2,127	17.2
Cervicalgia, M542	631	5.1
Pain in right shoulder, M25511	475	3.8
Pain in right knee, M25561	423	3.4
14 Congenital anomalies (Q00-Q99)	.	.
Ehlers-Danlos syndrome, Q796	6	15.8
Arnold-Chiari syndrome without spina bifida or hydrocephalus, Q0700	5	13.2
Atrial septal defect, Q211	5	13.2
Hypospadias, balanic, Q540	4	10.5
Other specified congenital malformations of brain, Q048	2	5.3
15 Signs, symptoms, and ill-defined conditions (R00-R99)	.	.
Headache, R51	213	7.5
Paresthesia of skin, R202	163	5.7
Dizziness and giddiness, R42	136	4.8
Unspecified abdominal pain, R109	119	4.2
Chest pain, unspecified, R079	111	3.9
16 Injury and poisoning (S00-T98, DOD0101-DOD0105)		
Personal history of TBI, level mild, DOD0102	100	14.5
Personal history of TBI, level unknown, DOD0101	38	5.5
Diffuse TBI w loss of consciousness of unspecified duration, subs, S062X9D	23	3.3
Superior glenoid labrum lesion of right shoulder, initial encounter S43431A	16	2.3
Strain of muscle, fascia and tendon of lower back, initial encounter, S39012A	15	2.2
17 Other (Z00-Z99, except pregnancy-related)		
Encounter for other administrative examinations, Z0289	1,164	18.1
Other specified counseling, Z7189	686	10.7
Encounter for therapeutic drug level monitoring, Z5181	344	5.3
Encounter for other orthopedic aftercare, Z4789	293	4.6
Encounter for administrative examinations, unspecified, Z029	267	4.2

FM, fibromyalgia; w/o, without; TBI, traumatic brain injury; w/, with.

TABLE 4b. Most frequent diagnoses during ambulatory visits by ICD-10 major diagnostic category, female service members with FM, active component, U.S. Armed Forces, 2018

Diagnostic category (ICD-10-CM codes)	No.	%
01 Infectious and parasitic diseases (A00-B99)		
Viral intestinal infection, unspecified, A084	53	14.2
Viral infection, unspecified, B349	53	14.2
Candidiasis of vulva and vagina, B373	36	9.6
Infectious gastroenteritis and colitis, unspecified, A09	21	5.6
Zoster without complications, B029	14	3.7
02 Neoplasms (C00-D49)		
Leiomyoma of uterus, unspecified, D259	42	9.4
Malig neoplasm of upper-outer quadrant of left female breast, C50412	31	7.0
Neoplasm of uncertain behavior of skin, D485	31	7.0
Benign neoplasm of pituitary gland, D352	24	5.4
Malig neoplm of upper-outer quadrant of right female breast, C50411	20	4.5
03 Endocrine, nutrition, immunity (E00-E89)		
Hypothyroidism, unspecified, E039	45	8.1
Vitamin D deficiency, unspecified, E559	36	6.4
Type 2 diabetes mellitus without complications, E119	31	5.5
Polycystic ovarian syndrome, E282	30	5.4
Obesity, unspecified, E669	29	5.2
04 Hematologic and immune disorders (D50-D89)	.	.
Iron deficiency anemia, unspecified, D509	54	34.2
Anemia, unspecified, D649	26	16.5
Other iron deficiency anemias, D508	16	10.1
Iron deficiency anemia secondary to blood loss (chronic), D500	13	8.2
Elevated white blood cell count, unspecified, D72829	10	6.3
05 Mental health disorders (F01-F99)		
Post-traumatic stress disorder, chronic, F4312	1,724	12.4
Adjustment disorder with mixed anxiety and depressed mood, F4323	1,333	9.6
Post-traumatic stress disorder, unspecified, F4310	1,307	9.4
Major depressive disorder, recurrent, moderate, F331	1,273	9.1
Anxiety disorder, unspecified, F419	1,215	8.7
06 Nervous system and sense organs (G00-G99, H00-H95)		
Obstructive sleep apnea (adult) (pediatric), G4733	1,515	19.8
Other chronic pain, G8929	1,299	17.0
Chronic pain syndrome, G894	881	11.5
Insomnia, unspecified, G4700	331	4.3
Migraine w/o aura, not intractable, w/o status migrainosus, G43009	257	3.4
07 Circulatory system (I00-I99)		
Essential (primary) hypertension, I10	137	33.8
Postmastectomy lymphedema syndrome, I972	36	8.9
Venous insufficiency (chronic) (peripheral), I872	29	7.2
Raynaud's syndrome without gangrene, I7300	26	6.4
Ventricular premature depolarization, I493	20	4.9
08 Respiratory system (J00-J99)		
Allergic rhinitis due to pollen, J301	290	17.8
Acute upper respiratory infection, unspecified, J069	218	13.4
Acute pharyngitis, unspecified, J029	142	8.7
Allergic rhinitis, unspecified, J309	101	6.2
Acute nasopharyngitis [common cold], J00	97	6.0
09 Digestive system (K00-K95)		
Constipation, unspecified, K5900	118	12.2
Gastro-esophageal reflux disease without esophagitis, K219	112	11.5
Noninfective gastroenteritis and colitis, unspecified, K529	45	4.6
Mixed irritable bowel syndrome, K582	45	4.6
Irritable bowel syndrome with constipation, K581	39	4.0
10 Genitourinary system (N00-N99)		
Stress incontinence (female), N393	151	8.2
Mixed incontinence, N3946	120	6.6
Abnormal uterine and vaginal bleeding, unspecified, N939	98	5.3
Acute vaginitis, N760	95	5.2
Urinary tract infection, site not specified, N390	89	4.9
11 Pregnancy and delivery (O00-O99, relevant Z codes)		
Pregnant state, incidental, Z331	31	4.9
Supervision of elderly multigravida, third trimester, O09523	28	4.4
Supervision of preg with history of pre-term labor, third trimester, O09213	19	3.0
Threatened abortion, O200	19	3.0
Oth pregnancy related conditions, second trimester, O26892	18	2.8
12 Skin and subcutaneous tissue (L00-L99)		
Dermatitis, unspecified, L309	91	8.2
Acne vulgaris, L700	81	7.3
Other specified dermatitis, L308	77	7.0
Scar conditions and fibrosis of skin, L905	61	5.5
Hirsutism, L680	36	3.3
13 Musculoskeletal system (M00-M99)		
Fibromyalgia, M797	4,415	20.6
Low back pain, M545	3,646	17.0
Cervicalgia, M542	1,513	7.1
Pain in right shoulder, M25511	675	3.2
Myalgia, M791	604	2.8
14 Congenital anomalies (Q00-Q99)	.	.
Ehlers-Danlos syndrome, Q796	32	27.1
Arnold-Chiari syndrome without spina bifida or hydrocephalus, Q0700	11	9.3
Oth congenital malform of spine, not associated with scoliosis, Q7649	8	6.8
Congenital spondylolisthesis, Q762	7	5.9
Polycystic kidney, unspecified, Q613	5	4.2
15 Signs, symptoms, and ill-defined conditions (R00-R99)	.	.
Pelvic and perineal pain, R102	1,040	17.6
Headache, R51	404	6.8
Dizziness and giddiness, R42	296	5.0
Unspecified abdominal pain, R109	249	4.2
Paresthesia of skin, R202	181	3.1
16 Injury and poisoning (S00-T98, DOD0101-DOD0105)		
Personal history of TBI, level mild, DOD0102	98	9.8
Personal history of TBI, level unknown, DOD0101	24	2.4
Strain of muscle, fascia and tendon at neck level, initial encounter, S161XXA	22	2.2
Allergy, unspecified, initial encounter, T7840XA	21	2.1
Contusion of left elbow, subsequent encounter, S5002XD	15	1.5
17 Other (Z00-Z99, except pregnancy-related)		
Encounter for other administrative examinations, Z0289	1,785	14.4
Other specified counseling, Z7189	1,772	14.3
Encounter for therapeutic drug level monitoring, Z5181	490	4.0
Encounter for other specified aftercare, Z5189	469	3.8
Encounter for immunization, Z23	431	3.5

FM, fibromyalgia; TBI, traumatic brain injury; w/, with.

Members and DoD Civilian Employees and Retention Determinations for Non-Deployable Service Members respectively).[14,15] Patients with FM within the active component had an average of 4.4 FM-related outpatient encounters and 57 total medical encounters per year. These counts represent a 3 to 4-fold increase above those seen in the total active component. Such levels of healthcare utilization may result in those with FM not being retained in the Armed Forces, contributing to a lower prevalence. Such personnel losses represent a significant amount of time and impact on readiness.

The trend of increasing prevalence with age in the active component is similar to that seen in the U.S. civilian population.[3] In addition, the difference in prevalence between men and women (1:9) is similar to that reported in the published literature.[1, 3-7] More senior ranks had greater prevalence consistent with the age trend, but senior officers were the exception. This finding may represent some protective feature of this population or it may be that men comprise a greater portion of the senior officer population. Individuals in healthcare occupations had the greatest prevalence of FM. This observation may be explained by the comparative ease of making/keeping appointments, reduced stigma surrounding FM in a healthcare setting, or increased awareness of the condition. Prevalence in non-Hispanic Blacks was more than twice as high as that in non-Hispanic Whites. This relationship was not evident in the literature reviewed. It may be that non-Hispanic Blacks experience barriers to care, and thus barriers to diagnosis/capture, in the civilian population, whereas, this effect may not be present in the military health system due to universal access to care. There is no clear explanation of this finding in the data, so this is a topic that deserves future research.

There is a marked difference in the distribution of mental health diagnoses between the FM patient population and the total active component (as described in the annual *MSMR* burden of disease reports[11]). Mental health diagnoses comprise twice the percentage of encounters in the FM population compared to the total active component. In 2018, PTSD accounted for more than a quarter of the encounters among active component service members affected by FM which is double the proportion in the total active component population in the same year. These data support existing theory that emotional stress can precipitate or exacerbate FM.[16] These comorbidities pose a substantial burden to the readiness of these patients.

The limitations of this study include potential misclassification bias due to the case definition for FM. Patients who had FM but did not have an encounter with FM as a diagnosis in 2018 were not included in the prevalence estimate. Those who were being ruled out for FM may have been included in the prevalence estimate despite not truly having FM. This was a study of the active component of the U.S. Armed Forces and thus has limited generalizability outside of this population. This was a cross-sectional study without evaluation of an exposure of interest.

This study established the prevalence and burden of FM in the active component as well as the burden of comorbidities among patients with FM. FM requiring frequent follow up is grounds for a medical evaluation board and subsequent separation. This was a cross-sectional study and thus did not provide longitudinal data. A future study in which a cohort of patients with FM were followed would be useful in addressing several knowledge gaps. Such a study could assess whether patients with FM are receiving standard of care, if the frequency of encounters related to the quality of care, and which patients are medically separated. Answers to these questions would give actionable information regarding the FM patient population.

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Update: Cold Weather Injuries, Active and Reserve Components, U.S. Armed Forces, July 2015–June 2020

From July 2019 through June 2020, a total of 415 members of the active (n=363) and reserve (n=52) components had at least 1 medical encounter with a primary diagnosis of cold injury. The crude overall incidence rate of cold injury for all active component service members in 2019–2020 (27.4 per 100,000 person-years [p-yrs]) was lower than the rate for the 2018–2019 cold season (35.1 per 100,000 p-yrs) and was the lowest rate during the 5-year surveillance period. In 2019–2020, frostbite was the most common type of cold injury among active component service members in all 4 services. Among active component members during the 2015–2020 cold seasons, overall rates of cold injuries were generally highest among males, non-Hispanic black service members, the youngest (less than 20 years old), and those who were enlisted. The number of cold injuries associated with overseas deployments during the 2019–2020 cold season (n=10) was the lowest count during the 5-year surveillance period. Frostbite accounted for three-fifths (n=6; 60.0%) of the cold weather injuries diagnosed and treated in service members deployed outside of the U.S during the 2019–2020 cold season.

WHAT ARE THE NEW FINDINGS?

For all active component service members, the rate of cold weather injuries in 2019–2020 was the lowest of the last 5 seasons. Cold injury rates were much higher among members of the Marine Corps and Army. The number of cold injuries associated with deployment during 2019–2020 was lower than any of the previous 4 years.

WHAT IS THE IMPACT ON READINESS AND FORCE HEALTH PROTECTION?

U.S. military forces will likely be deployed in cold, northern latitudes for peacekeeping and national security operations because of the opening of new shipping lanes in the Arctic Ocean. Such operations will require renewed emphasis on effective cold weather injury prevention strategies and adherence to the policies and procedures in place to protect service members against such injuries.

Cold weather injuries are of significant military concern because of their adverse impact on operations and the high financial costs of treatment and disability.[1,2] In response, the U.S. Armed Forces have developed and improved training, doctrine, procedures, and protective equipment and clothing to counter the threat from cold environments.[3–8] Although these measures are highly effective, cold injuries have continued to affect hundreds of service members each year because of exposure to cold and wet environments.[9]

The term cold weather injuries is used to describe injuries that have a central effect, such as hypothermia, as well as those that primarily affect the peripheries of the body, such as frostbite and immersion injuries. The human physiologic response to cold exposure is to retard heat loss and preserve core body temperature, but this response may not be sufficient to prevent hypothermia if heat loss is prolonged.[9] Moreover, the response includes constriction of the peripheral (superficial) vascular system, which may result in non-freezing injuries or hasten the onset of actual freezing of tissues (frostbite).[9]

Hypothermia occurs when the core temperature of the body falls below 95°F.[7] The most common mechanisms of accidental hypothermia are convective heat loss to cold air and conductive heat loss to water.[10] Freezing temperatures are not required to produce hypothermia.[10] In response to cold stress, peripheral blood vessels constrict and the hypothalamus stimulates heat production through shivering and elevated thyroid, adrenal, and catecholamine activity.[10] The sympathetic nervous system mediates further vasoconstriction to minimize heat loss by reducing blood flow to the extremities, where the most cooling occurs.[10] As the body's basal metabolic rate decreases, core temperature falls, body functions slow down, and muscular and cerebral functions are impaired.[10] Neurologic functioning begins declining even above a core body temperature of 95°F.[11] Severe hypothermia can lead to pulmonary edema, reduced heart rate, coma, ventricular arrhythmias (including ventricular fibrillation), and asystole.[10–12]

Cold injuries affecting the body's peripheries can be classified as freezing and non-freezing injuries.[13] Freezing peripheral injury is defined as the damage sustained by tissues when exposed to temperatures below freezing.[13] The tissue damage of frostbite is the result of both direct cold-induced cell death and the secondary effects of microvascular thrombosis and subsequent ischemia.[14] Rapid freezing generally results in extra- and intracellular ice crystal formation.[15] These crystals cause direct injury to the cell membrane that results in cellular dehydration, lipid derangement, electrolyte fluxes as well as membrane lysis, and death.[14–16] An inflammatory process follows, resulting in tissue ischemia and additional cell death.[15] The initial cellular damage and the ensuing inflammatory processes are worsened with thawing of the affected area.[15,16] With rewarming, edema from melting ice crystals leads to epidermal blister formation and ischemia-reperfusion injury may be

initiated[14–16]; vasoconstriction and platelet aggregation caused by inflammatory mediators, prostaglandins, and thromboxanes exacerbate ischemia.[17] The areas of the body most frequently affected by frostbite include the ears, nose, cheeks, chin, fingers, and toes.[18,19] A substantial proportion of patients with peripheral frostbite experience permanent changes in their microcirculation and disruption of local neurological functions (e.g., reduced sensation in the affected area).[19] Although most frostbite damage is minor, severe injury may lead to impaired functioning and ability to work because of cold hypersensitivity, chronic ulceration, vasospasm, localized osteoarthritis, and/or chronic pain.[14,19]

Non-freezing peripheral cold injury includes a spectrum of localized injuries to the soft tissues, nerves, and vasculature of distal extremities that result from prolonged exposure (12 to 48 hours) to wet, cold (generally 32 to 59°F) conditions; the injury process generally happens at a slower rate in warmer water.[13,20] Although non-freezing peripheral cold injuries most often involve feet (immersion foot), any dependent body part can be affected by the condition, including the hands.[21] Immersion foot generally presents as waterlogging of the feet, with the most marked effect occurring in the soles.[17,20] The foot becomes hyperemic (increased blood flow), painful, and swollen with continuous exposure; progression to blistering, decreased blood flow, ulceration, and gangrene is gradual.[17,20] Long-term complications of non-freezing cold injury such as immersion foot (e.g., hypersensitivity to cold, chronic pain) are similar to and as debilitating as those produced by frostbite (e.g., severe pain provoked by walking).[14,16,17,20]

Factors that increase the risk of cold weather injuries include outdoor exposure, inadequate and/or wet clothing, cold water submersion, older age, exhaustion, dehydration, inadequate caloric intake, alcohol use, smoking (frostbite), previous cold injury (frostbite or immersion foot), chronic disease (e.g., peripheral vascular disease, diabetes), and medications that impair compensatory responses (e.g., oral antihyperglycemics, beta-blockers, general anesthetic agents).[12–14,17–19] Situational factors that increase risk of immersion foot include immobility, wet socks, and constricting boots.[17,22]

Traditional measures to counter the dangers associated with cold environments include minimizing loss of body heat and protecting superficial tissues through such means as protective clothing, shelter, physical activity, and nutrition. However, military training or mission requirements in cold and wet weather may place service members in situations where they may be unable to be physically active, find warm shelter, or change wet or damp clothing.[2–4]

For the military, continuous surveillance of cold weather injuries is essential to inform steps to reduce their impact as well as to remind leaders of this predictable threat. Since 2004, the *MSMR* has published an annual update on the incidence of cold weather injuries that affected U.S. military members during the 5 most recent cold seasons.[23] The content of this 2020 report addresses the occurrence of such injuries during the cold seasons from July 2015 through June 2020. The timing of the annual updates is intended to call attention to the recurring risks of such injuries as winter approaches in the Northern Hemisphere, where most members of the U.S. Armed Forces are assigned..

METHODS

The surveillance period was 1 July 2015 through 30 June 2020. The surveillance population included all individuals who served in the active or reserve component of the U.S. Armed Forces at any time during the surveillance period. For analysis purposes, "cold years" or "cold seasons" were defined as 1 July through 30 June intervals so that complete cold weather seasons could be represented in year-to-year summaries and comparisons.

Because cold weather injuries represent a threat to the health of individual service members and to military training and operations, the U.S. Armed Forces require expeditious reporting of these reportable medical events (RMEs) via one of the service-specific electronic reporting systems; these reports are routinely incorporated into the Defense Medical Surveillance System (DMSS). For this analysis, the DMSS and the Theater Medical Data Store (which maintains electronic records of medical encounters of deployed service members) were searched for records of RMEs and inpatient and outpatient care for the diagnoses of interest (frostbite, immersion injury, and hypothermia). A case was defined by the presence of an RME or of any qualifying International Classification of Diseases, 9th or 10th revision (ICD-9 and ICD-10, respectively) code in the first diagnostic position of a record of a healthcare encounter **(Table 1)**. The Department of Defense guidelines for RMEs require the reporting of cases of hypothermia, freezing peripheral injuries (i.e., frostbite), and non-freezing peripheral injuries (i.e., immersion injuries, chilblains).[24] Cases of chilblains are not included in this report because the condition is common, infrequently diagnosed, usually mild in severity, and thought to have minimal medical, public health, or military impacts. Because of an update to the Disease Reporting System internet (DRSi) medical event reporting system in July 2017, the type of RMEs for cold injury (i.e., frostbite, immersion injury, hypothermia) could not be distinguished using RME records in DMSS data. Instead, information on the type of RME for cold injury between July 2017 and June 2020 were extracted from DRSi and then combined with DMSS data.

To estimate the number of unique individuals who suffered a cold injury each cold season and to avoid counting

TABLE 1. ICD-9/ICD-10 diagnostic codes for cold weather injuries

	ICD-9	ICD-10[a]
Frostbite	991.0, 991.1, 991.2, 991.3	T33.*, T34.*
Immersion hand and foot	991.4	T69.0*
Hypothermia	991.6	T68.*

[a]An asterisk (*) indicates that any subsequent digit/character is included.
ICD, International Classification of Diseases.

follow-up healthcare encounters after single episodes of cold injury, only 1 cold injury per individual per cold season was included. A slightly different approach was taken for summaries of the incidence of the different types of cold injury diagnoses. In counting types of diagnoses, 1 of each type of cold injury per individual per cold season was included. For example, if an individual was diagnosed with immersion foot at one point during a cold season and then with frostbite later during the same cold season, each of those different types of injury would be counted in the tally of injuries. If a service member had multiple medical encounters for cold injuries on the same day, only 1 encounter was used for analysis (hospitalizations were prioritized over ambulatory visits, which were prioritized over RMEs).

Annual incidence rates of cold injuries among active component service members were calculated as incident cold injury diagnoses per 100,000 person-years (p-yrs) of service. Annual rates of cold injuries among reservists were calculated as cases per 100,000 persons using the total number of reserve component service members for each year of the surveillance period. Counts of persons were used as the denominator in these calculations because information on the start and end dates of active duty service periods of reserve component members was not available.

The numbers of cold injuries were summarized by the locations at which service members were treated for these injuries as identified by the Defense Medical Information System Identifier (DMIS ID) recorded in the medical records of the cold injuries. Because such injuries may be sustained during field training exercises, temporary duty, or other instances for which a service member may not be located at his/her usual duty station, DMIS ID was used as a proxy for the location where the cold injury occurred.

The new electronic health record for the Military Health System, MHS GENESIS, was implemented at several military treatment facilities during 2017. Medical data from sites using MHS GENESIS are not available in the DMSS during the time period between 2017–1 October 2019. These sites include Naval Hospital Oak Harbor, Naval Hospital Bremerton, Air Force Medical Services Fairchild, and Madigan Army Medical Center. Therefore, medical encounter and person-time data for individuals seeking care at any of these facilities during 2017–1 October 2019 were not included in this analysis.

RESULTS

2019–2020 cold season

From July 2019 through June 2020, a total of 415 members of the active (n=363) and reserve (n=52) components had at least 1 medical encounter with a primary diagnosis of cold injury **(Table 2)**. The Army contributed more than five-eighths (63.6%; n=231) of all cold injury

TABLE 2. Any cold injury (1 per person per year), by service and component, July 2015–June 2020

	Army		Navy		Air Force		Marine Corps		All services	
Active component	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]
All years (2015–2020)	1,250	53.1	144	8.9	216	13.6	438	47.5	2,048	31.5
Jul 2015–Jun 2016	237	49.3	32	9.8	33	10.7	78	42.3	380	29.3
Jul 2016–Jun 2017	209	45.1	36	11.3	45	14.4	91	49.7	381	29.8
Jul 2017–Jun 2018	299	64.0	28	8.7	46	14.4	93	50.4	466	36.1
Jul 2018–Jun 2019	274	58.6	21	6.4	46	14.2	117	63.0	458	35.1
Jul 2019–Jun 2020	231	48.5	27	8.1	46	14.0	59	31.8	363	27.4
Reserve component										
All years (2015–2020)	205		9		33		55		302	
Jul 2015–Jun 2016	33	14.6	2	3.1	4	5.3	7	15.1	46	11.1
Jul 2016–Jun 2017	38	17.0	1	1.5	8	10.5	11	23.8	58	14.1
Jul 2017–Jun 2018	54	25.0	3	4.6	5	6.6	17	36.8	79	19.6
Jul 2018–Jun 2019	44	20.7	1	1.5	6	7.9	16	34.7	67	16.7
Jul 2019–Jun 2020	36	16.9	2	3.0	10	13.1	4	8.9	52	13.0
Overall, active and reserve components										
All years (2015–2020)	1,455		153		249		493		2,350	
Jul 2015–Jun 2016	270		34		37		85		426	
Jul 2016–Jun 2017	247		37		53		102		439	
Jul 2017–Jun 2018	353		31		51		110		545	
Jul 2018–Jun 2019	318		22		52		133		525	
Jul 2019–Jun 2020	267		29		56		63		415	

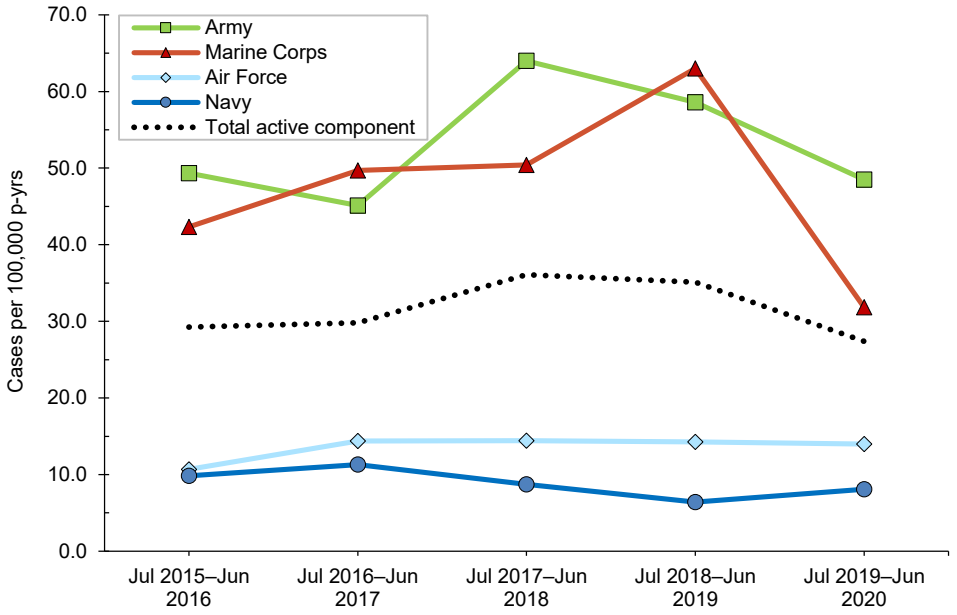
*For active component, rate is per 100,000 person-years. For reserve component, rate is per 100,000 persons.
No., number.

diagnoses in the active component during the 2019–2020 cold season; across the services during this period, active component Army members had the highest rate of cold injury diagnoses (48.5 per 100,000 p-yrs). Active component Marine Corps members had the second highest rate of cold injury diagnoses during the 2019–2020 cold season (31.8 per 100,000 p-yrs). Navy service members (n=27) had the lowest service-specific rate of cold injuries during the 2019–2020 cold season (8.1 per 100,000 p-yrs) **(Table 2, Figure 1)**.

This update for 2019–2020 represents the fourth time that annual rates of cold injuries for members of the reserve component were estimated. Army personnel (n=36) accounted for more than two-thirds (69.2%) of all reserve component service members (n=52) affected by cold injuries during 2019–2020 **(Table 2)**. As was true for the active component, service-specific annual rates of cold injuries among reserve component members were highest among those in the Army (16.9 per 100,000 persons) and lowest among those in the Navy (3.0 per 100,000 persons) **(Figure 2)**.

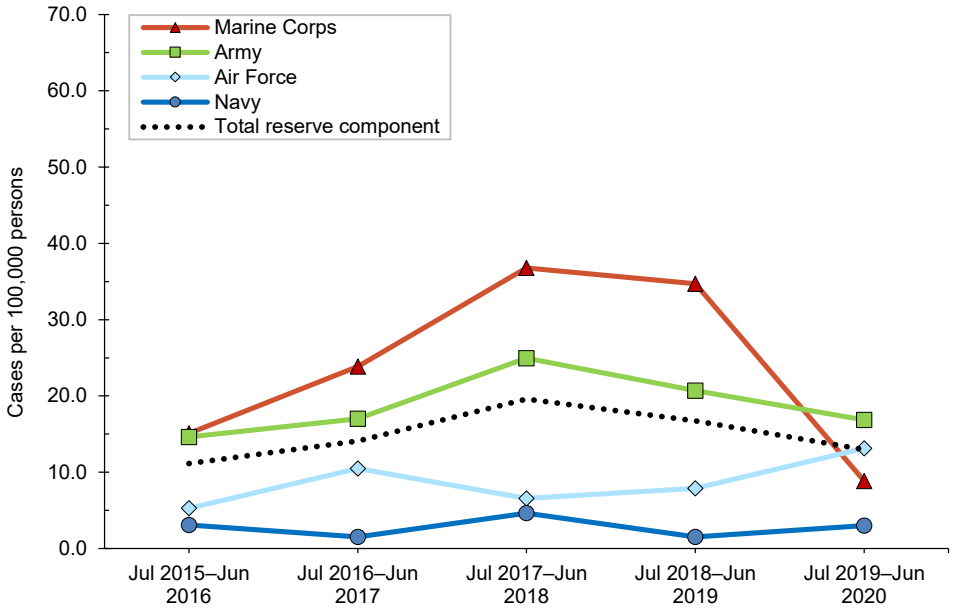
When all injuries were considered, not just the numbers of individuals affected, frostbite was the most common type of cold injury (n=192; 49.9% of all cold injuries) among active component service members in 2019–2020 **(Tables 3a–3d)**. In the Air Force and Navy respectively during the 2019–2020 season, 82.6% and 51.9% of all cold injuries were frostbite, whereas the proportions in the Army (45.1%) and Marine Corps (44.1%) were much lower. For all active component service members during 2019–2020, the proportions of total cold weather injuries that were hypothermia and immersion injuries were 19.7% and 30.4%, respectively **(Tables 3a–3d)**. Among active component Marine Corps members, the numbers and rates of frostbite, immersion, and hypothermia injuries in the 2019–2020 cold season were the lowest of the past 5 years **(Table 3d)**. Among active component Army members, the number and rate of frostbite injuries in the 2019–2020 cold season were the lowest during the 5-year period while the number and rate of hypothermia diagnoses were the highest during this period **(Table 3a)**.

FIGURE 1. Annual incidence rates of cold injuries (1 per person per year), by service, active component, U.S. Armed Forces, July 2015–June 2020



P-yrs, person-years.

FIGURE 2. Annual incidence rates of cold injuries (1 per person per year), by service, reserve component, U.S. Armed Forces, July 2015–June 2020



Five cold seasons: July 2015–June 2019

The crude overall incidence rate of cold injury for all active component service members in 2019–2020 (27.4 per 100,000 p-yrs) was 22.0% lower than the rate for the 2018–2019 cold season (35.1 per 100,000 p-yrs) and was the lowest rate during the 5-year period **(Table 2, Figure 1)**. Throughout the surveillance period, the cold injury rates were consistently higher among active component members of the

Army and the Marine Corps than among those in the Air Force and Navy **(Figure 1)**. In 2019–2020, the service-specific incidence rate for active component Army members (48.5 per 100,000 p-yrs) was lower than the 2018–2019 Army rate (58.6 per 100,000 p-yrs). For the Marine Corps, the active component rate for 2019–2020 was the lowest rate during the 5-year period having dropped 49.5% between the 2019–2020 season and the 2018–2019 season. Service-specific annual rates of cold injuries among reserve component members were consistently higher among those in the Army than among those in the Air Force or the Navy **(Figure 2)**. As was true for active component Marine Corps members, the 2019–2020 rate of cold injuries among reserve component Marine Corps members was considerably lower (74.5%) than the rate for the previous season.

During the 5-year surveillance period, the rates of cold injuries among members of the active components of all 4 of the services were higher among men than women **(Tables 3a–3d)**. Among active component members in the Navy, Air Force, and Marine Corps, the overall rates among men ranged from 1.5 to 2.8 times higher than those among women. In all of the services during 2015–2019, women had lower rates of immersion injury and hypothermia than did males. With the exception of the Army, women also had lower rates of frostbite **(Tables 3a–3d)**. For active component service members in all 4 services combined, the overall rate of cold injury was 46.2% higher among males (34.2 per 100,000 p-yrs) than among females (23.4 per 100,000 p-yrs) **(data not shown)**.

In all of the services, overall rates of cold injuries were higher among non-Hispanic black service members than among those of the other race/ethnicity groups. In particular, within the Marine Corps and Army and for all services combined, rates of cold injuries were more than twice as high among non-Hispanic black service members than among either non-Hispanic white service members or those in the "other/unknown" race/ethnicity group **(Tables 3a–3d)**. The major underlying factor in these differences is that rates

TABLE 3a. Counts and incidence rates of cold injuries (1 per type per person per year), active component, U.S. Army, July 2015–June 2020

	Frostbite		Immersion foot		Hypothermia		All cold injuries	
	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]
Total	696	29.6	397	16.9	208	8.8	1,301	55.2
Sex								
Male	574	28.6	361	18.0	180	9.0	1,115	55.6
Female	122	34.9	36	10.3	28	8.0	186	53.2
Race/ethnicity								
Non-Hispanic white	248	18.9	185	14.1	118	9.0	551	41.9
Non-Hispanic black	322	65.0	144	29.1	56	11.3	522	105.4
Other/unknown	126	23.2	68	12.5	34	6.3	228	41.9
Age group (years)								
<20	60	34.4	53	30.4	34	19.5	147	84.2
20–24	294	41.3	189	26.5	108	15.2	591	83.0
25–29	150	27.9	97	18.1	43	8.0	290	54.0
30–34	98	26.3	29	7.8	16	4.3	143	38.4
35–39	50	17.7	20	7.1	5	1.8	75	26.6
40–44	24	14.9	4	2.5	2	1.2	30	18.7
45+	20	17.3	5	4.3	0	0.0	25	21.7
Rank								
Enlisted	612	32.3	368	19.4	190	10.0	1,170	61.8
Officer	84	18.2	29	6.3	18	3.9	131	28.4
Military occupation								
Combat-specific[b]	241	41.3	186	31.9	99	17.0	526	90.1
Motor transport	27	36.8	12	16.4	7	9.5	46	62.7
Repair/engineering	101	20.9	60	12.4	25	5.2	186	38.4
Communications/intelligence	182	31.3	75	12.9	50	8.6	307	52.9
Healthcare	41	16.9	19	7.8	7	2.9	67	27.6
Other/unknown	104	26.6	45	11.5	20	5.1	169	43.3
Cold year (July–June)								
2015–2016	130	27.1	73	15.2	42	8.7	245	51.0
2016–2017	138	29.8	35	7.6	37	8.0	210	45.3
2017–2018	172	36.8	88	18.8	44	9.4	304	65.1
2018–2019	142	30.4	107	22.9	40	8.6	289	61.8
2019–2020	114	23.9	94	19.7	45	9.5	253	53.1

[a]Rate per 100,000 person-years.
[b]Infantry/artillery/combat engineering/armor.
No., number.

TABLE 3b. Counts and incidence rates of cold injuries (1 per type per person per year), active component, U.S. Navy, July 2015–June 2020

	Frostbite		Immersion foot		Hypothermia		All cold injuries	
	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]
Total	63	3.9	43	2.6	39	2.4	145	8.9
Sex								
Male	57	4.3	38	2.9	34	2.6	129	9.8
Female	6	1.9	5	1.6	5	1.6	16	5.1
Race/ethnicity								
Non-Hispanic white	31	3.8	16	1.9	22	2.7	69	8.4
Non-Hispanic black	15	6.0	10	4.0	8	3.2	33	13.2
Other/unknown	17	3.1	17	3.1	9	1.6	43	7.8
Age group (years)								
<20	4	4.3	5	5.3	8	8.5	17	18.1
20–24	11	2.2	16	3.3	12	2.5	39	8.0
25–29	26	6.4	11	2.7	14	3.4	51	12.5
30–34	9	3.3	6	2.2	2	0.7	17	6.2
35–39	7	3.6	3	1.6	3	1.6	13	6.7
40–44	1	1.0	2	2.0	0	0.0	3	3.0
45+	5	7.7	0	0.0	0	0.0	5	7.7
Rank								
Enlisted	50	3.7	41	3.0	38	2.8	129	9.5
Officer	13	4.8	2	0.7	1	0.4	16	5.9
Military occupation								
Combat-specific[b]	11	10.9	0	0.0	3	3.0	14	13.9
Motor transport	4	6.2	3	4.7	13	20.2	20	31.1
Repair/engineering	14	2.0	20	2.8	7	1.0	41	5.7
Communications/intelligence	6	2.3	4	1.6	3	1.2	13	5.0
Healthcare	15	8.3	3	1.7	3	1.7	21	11.6
Other/unknown	13	4.2	13	4.2	10	3.2	36	11.6
Cold year (July–June)								
2015–2016	11	3.4	12	3.7	10	3.1	33	10.2
2016–2017	8	2.5	15	4.7	13	4.1	36	11.3
2017–2018	15	4.7	9	2.8	4	1.2	28	8.7
2018–2019	15	4.6	1	0.3	5	1.5	21	6.4
2019–2020	14	4.2	6	1.8	7	2.1	27	8.1

[a]Rate per 100,000 person-years.
[b]Infantry/artillery/combat engineering/armor.
No., number.

of frostbite among non-Hispanic black members from all services combined was more than 3 times that of the other race/ethnicity groups, with the biggest differences apparent in the Marine Corps (more than 6 times) and the Army (more than 2.5 times) **(data not shown)**. Additionally, across the active components of all services during 2015–2020, non-Hispanic black service members had incidence rates of cold injuries greater than the rates of other race/ethnicity groups in nearly every military occupational category **(data not shown)**.

Across the services, rates of cold injuries were highest among the youngest service members (less than 20 years old) and tended to decrease with increasing age **(Tables 3a–3d)**. Enlisted members of all 4 services had higher rates than officers. In the Army, Navy, and Air Force, rates of all cold injuries combined were highest among service members in combat-specific (infantry/artillery/combat engineering/armor) and motor transport occupations **(Tables 3a–3c)**. For active component Marine Corps members, rates of cold injuries during the 5-year period were highest among those in combat-specific or other/unknown occupations **(Table 3d)**.

During the 5-year surveillance period, the 2,350 service members who were affected by any cold injury included 2,048 (87.1%) from the active component and 302 (12.9%) from the reserve component. Of all affected reserve component members, 67.9% (n=205) were members of the Army **(Table 2)**. Overall, soldiers accounted for slightly more than three-fifths (61.9%) of all cold injuries affecting active and reserve component service members **(Table 2, Figure 3)**.

Of all active component service members who were diagnosed with a cold injury (n=2,048), 124 (6.1% of the total) were affected during basic training. The Army (n=70) and Marine Corps (n=47) accounted for 94.4% of all basic trainees affected by cold injuries **(data not shown)**. Additionally, during the surveillance period, 65 service members who were diagnosed with cold injuries (3.2% of the total) were hospitalized, and the vast

majority (87.7%) of the hospitalized cases were members of either the Army (n=37) or Marine Corps (n=20) **(data not shown)**.

Cold injuries during deployments

During the 5-year surveillance period, a total of 73 cold injuries were diagnosed and treated in service members deployed outside of the U.S. **(data not shown).** Of these, 33 (45.2%) were frostbite, 31 (42.5%) were immersion injuries, and 9 (12.3%) were hypothermia. Of these 73 cold injuries, slightly more than one-eighth (13.7%) occurred in the most recent cold season. There were 10 cold injuries during the 2019–2020 cold season, 11 each during 2015–2016 and 2016–2017, 17 during 2017–2018, and 24 during 2018–2019 **(data not shown)**. Frostbite accounted for three-fifths (n=6; 60.0%) of the cold weather injuries diagnosed and treated in service members deployed outside of the U.S during the 2019–2020 cold season.

Cold injuries by location

During the 5-year surveillance period, 23 military locations had at least 25 incident cold injuries (1 per person per year) among active and reserve component service members **(Figure 4)**. Among these locations, those with the highest 5-year counts of incident injuries were Fort Wainwright, AK (n=182); Army Health Clinic Vilseck, Germany (n=135); Fort Campbell, KY (n=95); Naval Medical Center San Diego, CA (n=73); and Fort Drum, NY (n=68) **(data not shown)**. During the 2019–2020 cold season, the numbers of incident cases of cold injuries were higher than the counts for the previous 2018–2019 cold season at 10 of the 23 locations **(data not shown)**. The most noteworthy increases were observed at the Army's Fort Wainwright and Fort Benning, and the Army and Air Force's Joint Base Lewis-McChord where there were 39, 19, and 15 total cases diagnosed at each location in 2019–2020, respectively, compared to 27, 11, and 8, respectively, the year before **(data not shown)**. **Figure 4** shows the numbers of cold injuries during 2019–2020 and the median numbers of cases for the

TABLE 3c. Counts and incidence rates of cold injuries (1 per type per person per year), active component, U.S. Air Force, July 2015–June 2020

	Frostbite		Immersion foot		Hypothermia		All cold injuries	
	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]
Total	172	10.8	16	1.0	31	1.9	219	13.7
Sex								
Male	146	11.5	14	1.1	27	2.1	187	14.7
Female	26	8.2	2	0.6	4	1.3	32	10.1
Race/ethnicity								
Non-Hispanic white	90	9.2	11	1.1	19	1.9	120	12.2
Non-Hispanic black	41	19.1	3	1.4	6	2.8	50	23.3
Other/unknown	41	10.4	2	0.5	6	1.5	49	12.4
Age group (years)								
<20	14	17.0	2	2.4	6	7.3	22	26.7
20–24	82	18.6	4	0.9	12	2.7	98	22.2
25–29	36	8.9	5	1.2	6	1.5	47	11.7
30–34	20	6.7	4	1.3	1	0.3	25	8.3
35–39	9	4.2	1	0.5	4	1.9	14	6.5
40–44	4	4.0	0	0.0	1	1.0	5	4.9
45+	7	14.2	0	0.0	1	2.0	8	16.2
Rank								
Enlisted	152	11.8	15	1.2	27	2.1	194	15.1
Officer	20	6.5	1	0.3	4	1.3	25	8.1
Military occupation								
Combat-specific[b]	4	34.6	0	0.0	0	0.0	4	34.6
Motor transport	3	26.3	0	0.0	0	0.0	3	26.3
Repair/engineering	66	13.2	6	1.2	4	0.8	76	15.2
Communications/intelligence	29	8.3	1	0.3	6	1.7	36	10.4
Healthcare	11	7.3	1	0.7	1	0.7	13	8.7
Other/unknown	59	10.3	8	1.4	20	3.5	87	15.2
Cold year (July–June)								
2015–2016	21	6.8	4	1.3	8	2.6	33	10.7
2016–2017	34	10.9	6	1.9	7	2.2	47	15.0
2017–2018	39	12.2	2	0.6	5	1.6	46	14.4
2018–2019	40	12.4	2	0.6	5	1.5	47	14.6
2019–2020	38	11.5	2	0.6	6	1.8	46	14.0

[a]Rate per 100,000 person-years.
[b]Infantry/artillery/combat engineering/armor.
No., number.

TABLE 3d. Counts and incidence rates of cold injuries (1 per type per person per year), active component, U.S. Marine Corps, July 2015–June 2020

	Frostbite		Immersion foot		Hypothermia		All cold injuries	
	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]	No.	Rate[a]
Total	189	20.5	134	14.5	122	13.2	445	48.2
Sex								
Male	183	21.6	130	15.4	118	14.0	431	51.0
Female	6	7.7	4	5.2	4	5.2	14	18.0
Race/ethnicity								
Non-Hispanic white	73	13.2	93	16.8	58	10.5	224	40.4
Non-Hispanic black	78	84.8	10	10.9	27	29.3	115	125.0
Other/unknown	38	13.7	31	11.2	37	13.4	106	38.3
Age group (years)								
<20	23	17.7	69	53.0	43	33.0	135	103.8
20–24	112	25.4	49	11.1	62	14.1	223	50.6
25–29	30	18.9	12	7.6	14	8.8	56	35.3
30–34	12	13.5	3	3.4	2	2.2	17	19.1
35–39	9	15.1	1	1.7	1	1.7	11	18.4
40–44	2	6.8	0	0.0	0	0.0	2	6.8
45+	1	6.4	0	0.0	0	0.0	1	6.4
Rank								
Enlisted	165	20.2	126	15.4	115	14.1	406	49.7
Officer	24	22.6	8	7.5	7	6.6	39	36.8
Military occupation								
Combat-specific[b]	96	48.1	20	10.0	49	24.6	165	82.7
Motor transport	4	9.9	4	9.9	5	12.4	13	32.2
Repair/engineering	15	6.6	13	5.7	5	2.2	33	14.5
Communications/intelligence	36	17.2	8	3.8	7	3.3	51	24.4
Healthcare	0	0.0	0	0.0	0	0.0	0	0.0
Other/unknown	38	15.4	89	36.0	56	22.7	183	74.1
Cold year (July–June)								
2015–2016	26	14.1	22	11.9	30	16.3	78	42.3
2016–2017	48	26.2	25	13.7	19	10.4	92	50.3
2017–2018	36	19.5	36	19.5	25	13.6	97	52.6
2018–2019	53	28.5	36	19.4	30	16.2	119	64.1
2019–2020	26	14.0	15	8.1	18	9.7	59	31.8

[a]Rate per 100,000 person-years.
[b]Infantry/artillery/combat engineering/armor.
No., number.

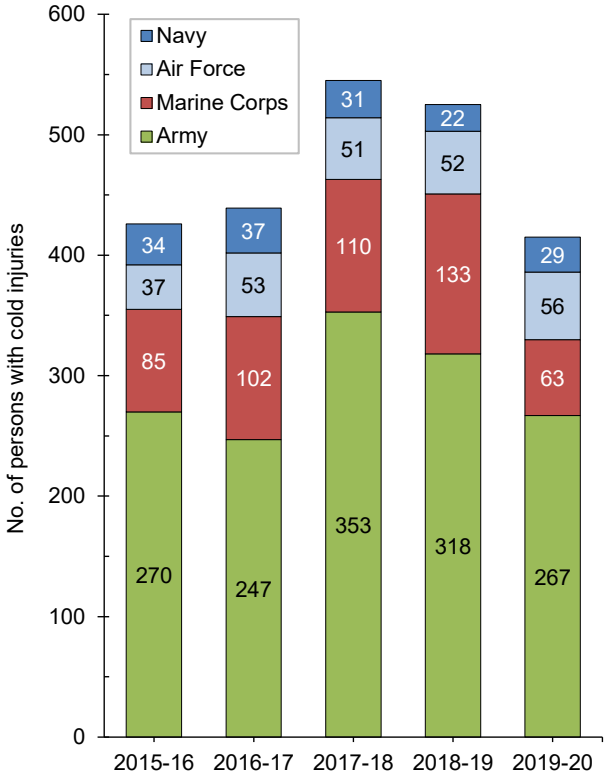
previous 4 years for those locations that had at least 25 cases during the surveillance period. For 11 of the 23 installations, the numbers of cases in 2019–2020 were less than the median counts for the previous 4 years.

EDITORIAL COMMENT

Between the 2018–2019 and 2019–2020 cold seasons, there was a moderate decrease in the crude overall incidence rate of cold injuries among U.S. active component service members; the overall rate among reserve component members also decreased during this period. For active component service members in the Marine Corps, the rate of all cold injuries in 2019–2020 was the lowest rate during the 5-year surveillance period.

In 2019–2020, frostbite was the most common type of cold injury among active component service members in all 4 of the services. Factors associated with increased risk of cold injury in previous years were again noted during the most recent cold season. Compared to their respective counterparts, overall rates of cold injuries were higher among males, non-Hispanic black service members, the youngest (less than 20 years old), and those who were enlisted. Increased rates of cold injuries affected nearly all enlisted and officer occupations among non-Hispanic black service members. Of note, rates of frostbite were markedly higher among non-Hispanic blacks compared to non-Hispanic whites and those in the other/unknown race/ethnicity group. These differences have been noted in prior *MSMR* updates, and the results of several studies suggest that other factors (e.g., physiologic differences and/or previous cold weather experience) are possible explanations for increased susceptibility.[9,14,25–27] The number of cold injuries associated with deployment during 2019–2020 was the lowest number during the 5-year surveillance period; frostbite accounted for the majority of the cold weather injuries in service members deployed outside of the U.S during the 2019–2020 cold season.

FIGURE 3. Numbers of service members who had a cold injury (1 per person per year), by service and cold season, active and reserve components, U.S. Armed Forces, July 2015–June 2020

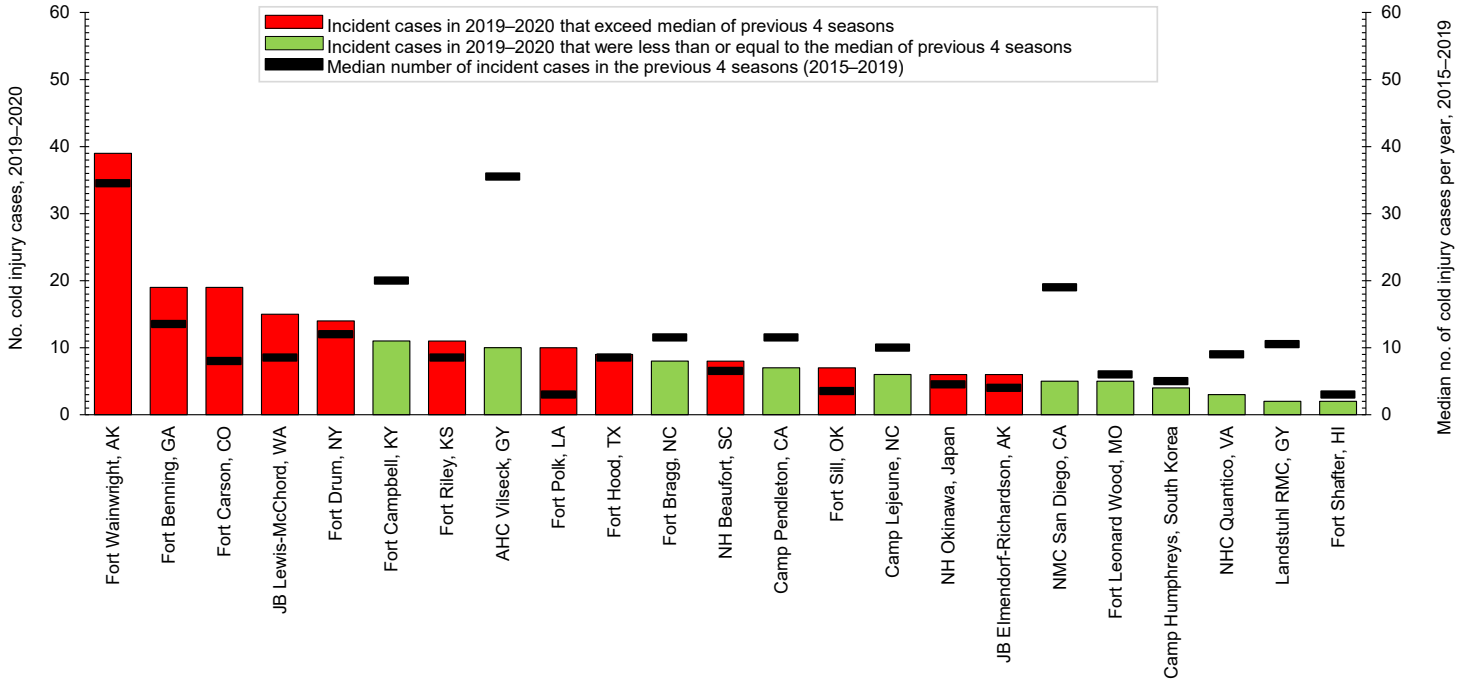


With the opening of sea lanes in the Arctic Ocean comes the increasing likelihood that U.S. military forces will be deployed in the cold, northern latitudes for peacekeeping and national security operations.[28–30] This shift will require renewed emphasis on effective cold weather injury prevention strategies and increased focus on adherence to the policies and procedures in place to protect service members against such injuries. It should be noted that this analysis of cold injuries was unable to distinguish between injuries sustained during official military duties (training or operations) and injuries associated with personal activities not related to official duties. RMEs for non-freezing peripheral injuries were excluded if "chilblains" was listed in the case comments; however, there may have been some RMEs for chilblains that were misclassified as immersion injury if chilblains was not listed in the case comments. To provide for all circumstances that pose the threat of cold weather injury, service members should know well the signs of cold injury and how to protect themselves against such injuries whether they are training, operating, fighting, or recreating under wet and freezing conditions.

The most current cold injury prevention materials are available at

https://phc.amedd.army.mil/topics/discond/cip/Pages/Cold-Weather-Casualties-and-Injuries.aspx

FIGURE 4. Annual numbers of cold injuries (cold season 2019–2020) and median numbers of cold injuries (cold seasons 2015–2019) at locations with at least 25 cold injuries during the surveillance period, active component, U.S. Armed Forces, July 2015–June 2020



No., number; JB, Joint Base; AHC, Army Health Clinic; NH, Naval Hospital; NMC, Naval Medical Center; NHC, Naval Health Clinic; GY, Germany.

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INVITATION TO READERS FOR MANUSCRIPTS ABOUT VECTOR-BORNE DISEASES FOR THE FEBRUARY 2021 *MSMR*

The February 2021 issue of the *MSMR* will feature its annual update on malaria incidence among active and reserve components of the U.S. Armed Forces. The *MSMR* editors invite readers to submit manuscripts for February publication about the surveillance, prevention, and control of malaria and other vector-borne diseases.

A February 2018 *MSMR* article reviewed the most common diagnoses of such diseases during the period 2010–2016 (*https://health.mil/Reference-Center/Reports/2018/01/01/Medical-Surveillance-Monthly-Report-Volume-25-Number-2*). The most common vector-borne infections were, in decreasing order of frequency, Lyme disease, malaria, dengue, chikungunya, Rocky Mountain spotted fever, Zika virus infection, various arbovirus infections, ehrlichiosis/anaplasmosis, leishmaniasis, and trypanosomiasis.

Article submissions about outbreak investigations and control measures, including vector control, would be of educational value. All manuscripts must be received by 1 January 2021 for consideration for this thematic issue. The *MSMR* is a peer-reviewed journal indexed in PubMed, MedLine, and SCOPUS (CiteScore 1.4).

Please refer to the *MSMR* author guidelines at *www.health.mil/MSMRInstructions* for information on preparing and submitting a manuscript. Authors should highlight that the submission is to be considered for this thematic issue. For rapid feedback on the potential suitability of an article for this thematic issue, please submit a pre-submission inquiry to *dha.ncr.health-surv.mbx.msmr@mail.mil*

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Medical Surveillance Monthly Report (MSMR)
Armed Forces Health Surveillance Division
11800 Tech Road, Suite 220
Silver Spring, MD 20904

MEDICAL SURVEILLANCE MONTHLY REPORT (MSMR), in continuous publication since 1995, is produced by the Armed Forces Health Surveillance Division (AFHSD). AFHSD is a designated public health authority within the Defense Health Agency. The *MSMR* provides evidence-based estimates of the incidence, distribution, impact, and trends of illness and injuries among U.S. military members and associated populations. Most reports in the *MSMR* are based on summaries of medical administrative data that are routinely provided to the AFHSD and integrated into the Defense Medical Surveillance System for health surveillance purposes.

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DoD HEALTH OF THE FORCE 2019

INTRODUCTION

The Department of Defense (DoD) Health of the Force report represents a coordinated effort by the Defense Health Agency and the Army, Navy, and Air Force public health centers to provide a snapshot of active component (AC) Service member health and well-being. It is meant to be a resource for military leaders and decision makers to help identify changes in the health status of AC Service members, emerging health problems, and gaps in prevention and treatment efforts. It may also be of interest to program planners, health practitioners, researchers, and others interested in the well-being of Service members.

The current report focuses on eight subject areas: injury, heat illness, behavioral health (BH), hazardous drinking, sexually transmitted infections (STIs), sleep disorders, acute respiratory illnesses, and obesity. It is based on data from calendar year 2019. Certainly, much has changed in the Military Health System (MHS) and in the world since the onset of coronavirus 2019 (COVID-19), a viral infection caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which became recognized as a global pandemic by the World Health Organization in March 2020. This report does not include any data related to COVID-19 because the surveillance period ended before the start of the COVID-19 pandemic; however, COVID-19-related data will be presented in future reports. The intent of the annual DoD Health of the Force report is to provide timely, concise, and useful information to generate ideas and drive progress toward enhancing the vitality and lethality of our fighting force.

ORGANIZATION OF THIS REPORT

This report is divided into two sections, Health Metrics and Service Profiles. The Health Metrics section provides health index measures for each of the eight subject areas; the Service Profiles section compares measures across Services.

Methodology is critical to understanding and using healthcare metrics, especially because of the growing number of sources of healthcare data. The appendices of this report present detailed information about the methods used to analyze data in each of the eight subject areas as well as specific limitations associated with the data analysis.

LIMITATIONS

There are many challenges associated with processing and interpreting healthcare data.[1, 2] Variability in the collection, collation, and processing of data; differences in study design and analytic methods; and the inherent intricacies of defining and measuring health itself contribute to complexity that cannot be fully resolved or explained in a summary report. Accordingly, this report is meant to be an adjunct to, rather than a substitute for, other reports related to Service member health, deployability, readiness, and total force fitness. Specific limitations include those associated with using electronic medical records for surveillance data (e.g., missing data, underrepresentation of conditions that do not come to the attention of the healthcare delivery system, miscoding) and failure to account for potentially important covariates such as age and sex when comparing Service populations.

This report is meant to evolve over time. It is anticipated that specific measures will change over time to account for data-related limitations and changing paradigms related to public health surveillance. Input related to improving this report is critical and welcomed.

HIGHLIGHTS

- There were 264 acute and 1,130 cumulative traumatic injuries per 1,000 active component (AC) Service members in 2019. Sprains and strains were the most common acute injuries, and the lower extremities were the most commonly affected body region. The rate of acute injuries decreased by 11.1% between 2016 and 2019, and the rate of cumulative traumatic injuries increased 2.9% between 2016 and 2019.

- A total of 2,716 AC Service members (0.2%) suffered from heat exhaustion in 2019, and 508 (0.04%) suffered from heat stroke. The percentage of AC Service members affected increased slightly from 2015 to 2019. Overall, heat illnesses were more common among younger Service members and those in the Marine Corps.

- In 2019, 8.4% of AC Service members had a behavioral health (BH) disorder. The prevalence of BH disorders remained stable between 2015 and 2019. Adjustment disorder was the most common BH disorder among both male and female AC Service members.

- Among AC Service members who completed a Periodic Health Assessment in 2019, 13.3% screened positive for hazardous drinking. Both male and female Service members under the age of 25 were more likely to screen positive compared to those aged 25 years or older.

- Approximately 28 per 1,000 AC Service members were diagnosed with or tested positive for a sexually transmitted infection (STI) (chlamydia, gonorrhea, or trichomoniasis) in 2019. Chlamydia was the most common STI (23.5 per 1,000), followed by gonorrhea (3.5 per 1,000), and trichomoniasis (0.7 per 1,000). The incidence of chlamydia and gonorrhea increased between 2015 and 2019. Younger Service members and females had higher rates compared to their respective counterparts.

- In 2019, 12.3% of AC Service members had a sleep disorder. The prevalence of sleep disorders remained stable between 2015 and 2019. The most common sleep disorder among male Service members was sleep apnea; the most common sleep disorder among female Service members was insomnia.

- The overall prevalence of obesity was 17.9% among AC Service members in 2019. The overall prevalence of obesity has increased steadily since 2015. Overall obesity prevalence was higher among males (18.8%) compared to females (14.3%) and in older compared to younger Service members.

- On average, 23 per 1,000 AC Service members were diagnosed with acute respiratory infections each month during 2019, with rates highest in January (31.2 per 1,000) and lowest in June (16.5 per 1,000). On average, females had higher monthly rates of acute respiratory infections and respiratory symptoms compared to males. Those in the youngest age group had the highest rates of acute respiratory infections, but those in the oldest age group had the highest rates of respiratory symptoms.

Acute and Cumulative Traumatic Injury

Injuries consistently rank among the top healthcare burdens in the DoD. In this report, non-battle injury was evaluated using two broad categories: acute injury (which includes musculoskeletal and other types of injury) and cumulative traumatic injury (musculoskeletal injury resulting from repeated microtrauma).

Acute injuries and *cumulative traumatic musculoskeletal injuries* were identified in inpatient and outpatient medical records using the International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) injury codes described in the Army Public Health Center's taxonomy of injuries for public health monitoring and reporting.[3] The taxonomy defines body regions and nature-of-injury groups (i.e., the type of anatomic or physiologic disruption that occurred to the body region, such as a fracture, dislocation, open wound, burn, internal organ injury, or poisoning).

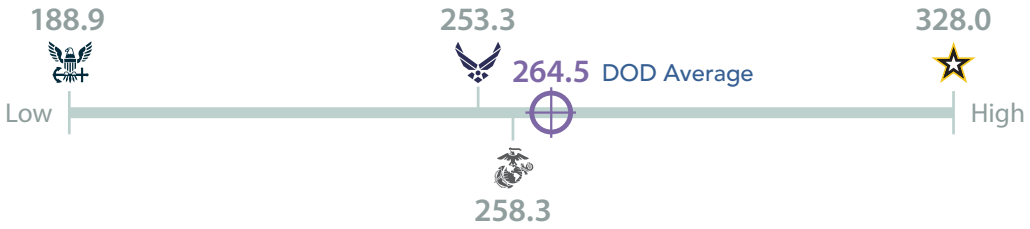
Both acute and cumulative traumatic injuries were described by body region and nature-of-injury groups (e.g., fracture, open wound, sprain, musculoskeletal tissue damage, etc).

In 2019, there were 347,484 acute and 1,484,449 cumulative traumatic injuries among AC Service members, with rates of 264.5 per 1,000 persons and 1,129.8 per 1,000 persons, respectively. Injury rates were higher in females as compared to males in all Services and in both injury categories. Acute and cumulative traumatic injury rates were highest in the oldest age group for both males and females. Cumulative traumatic injury rates were markedly higher among older Service members, especially males, where the rate among males aged 45 years or older was more than triple that of males less than 25 years.

During 2019, 3,509 (1.3%) of the acute injury cases were hospitalized, and 1,968 (0.3%) of the cumulative traumatic cases were hospitalized. These hospitalizations resulted in 15,889 total bed days for acute injury and 6,375 total bed days for cumulative traumatic injury.

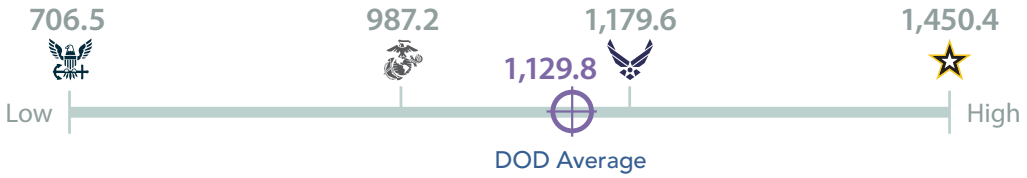
Among AC Service members who suffered **acute injuries,** the top five body regions and the top five nature-of-injury categories were similar for all Services and accounted for 96.7% and 80.9% of injuries, respectively. **The rate of acute injuries decreased by 11.1% between 2016 and 2019.**

Among AC Service members who suffered **cumulative traumatic injuries**, the most commonly injured body regions were the trunk (41.6%) and lower extremities (36.6%). Musculoskeletal tissue damage (including cervical disc disorders, pain in joints, tendonitis, bursitis, chondromalacia, etc.) was the most common nature-of-injury category, accounting for 89.1% of all cumulative traumatic injuries. **The rate of cumulative traumatic injuries increased slightly from 2016 through 2019, for an increase of 2.9%**



Overall, there were 264.5 acute injuries per 1,000 AC Service members in 2019.

Rates by service ranged from 189 to 328 per 1,000 AC Service members.



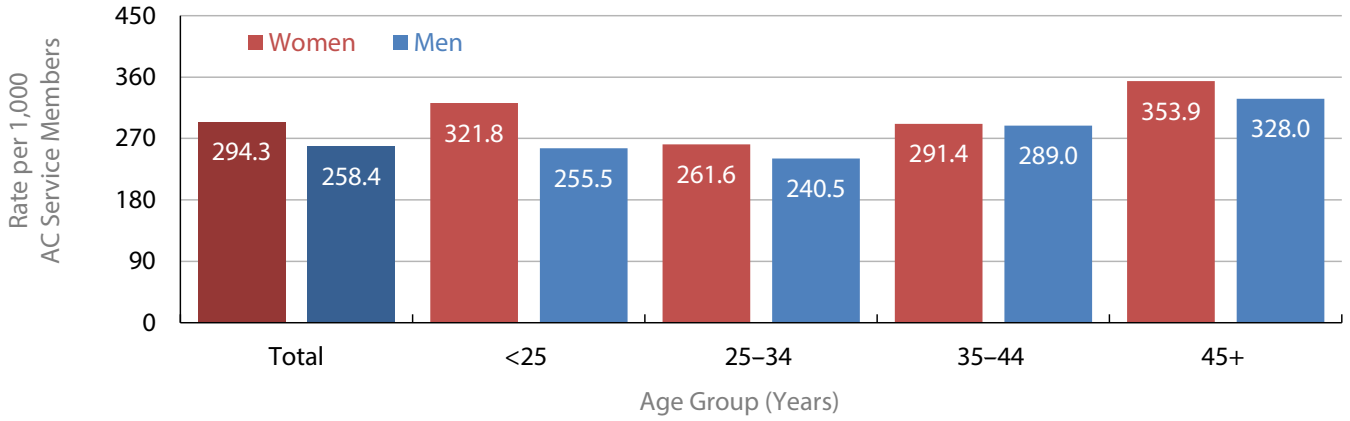
Overall, there were 1,129.8 cumulative traumatic injuries per 1,000 AC Service members in 2019.

Rates by service ranged from 707 to 1,450 per 1,000 AC Service members.

Army | Navy | Marine Corps | Air Force

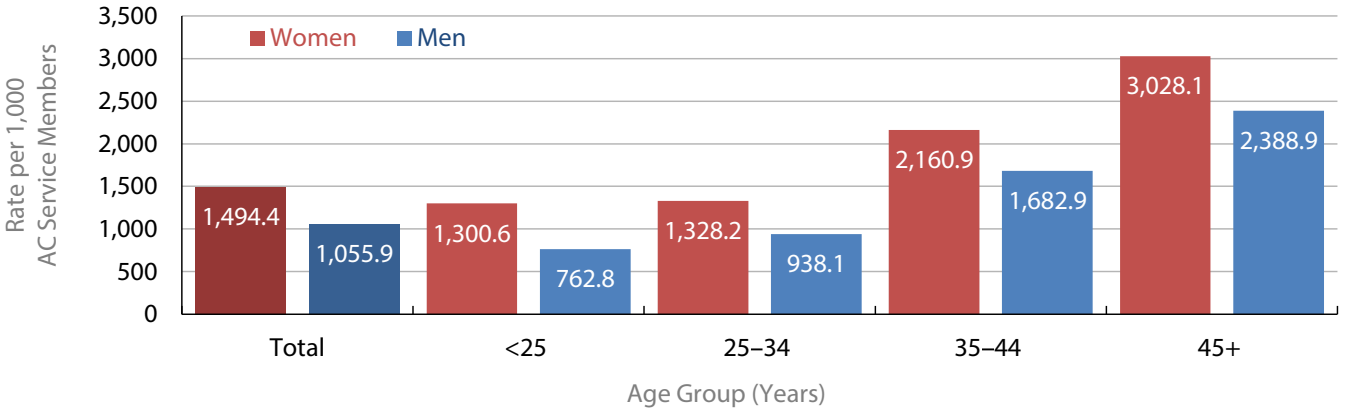
Incidence of Acute Injury by Sex and Age Group, AC Service Members, 2019

Overall, acute injury rates were higher for females (294.3 per 1,000) compared to males (258.4 per 1,000). Among both males and females, acute injury rates were highest in the oldest age group (45+ years).



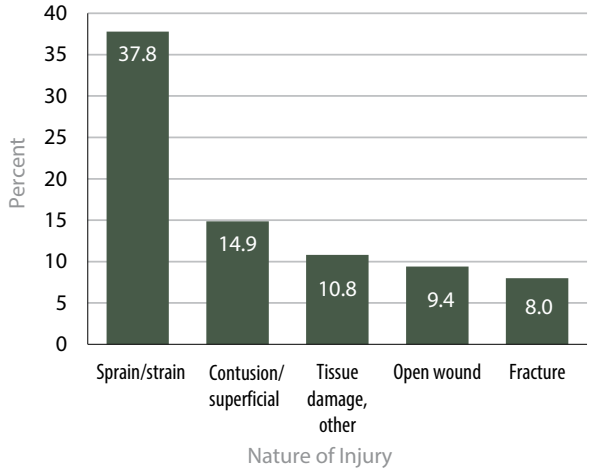
Incidence of Cumulative Traumatic Injury by Sex and Age Group, AC Service Members, 2019

Cumulative traumatic injury rates were higher for older compared to younger Service members and higher for females (1,494.4 per 1,000) compared to males (1,055.9 per 1,000).



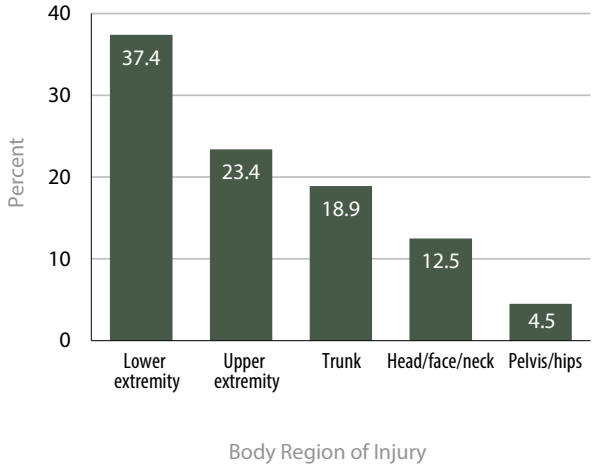
Nature of Acute Injury, Top 5 Categories, AC Service Members, 2019

Sprains and strains was the most common nature-of-injury category, accounting for 37.8% of all incident acute injuries.



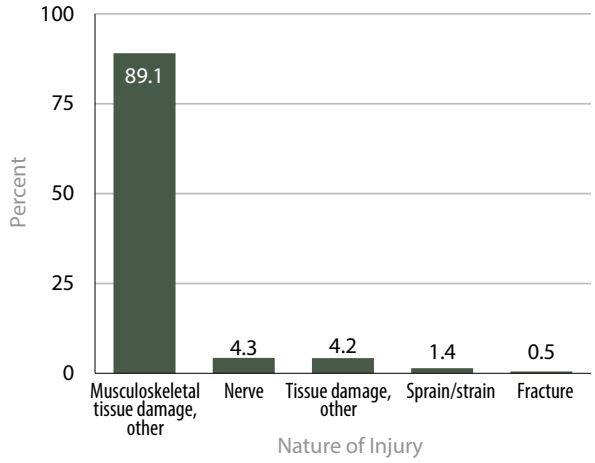
Body Region of Acute Injury, Top 5 Categories, AC Service Members, 2019

Lower extremity was the most common region affected by acute injury, accounting for 37.4% of all incident acute injuries.



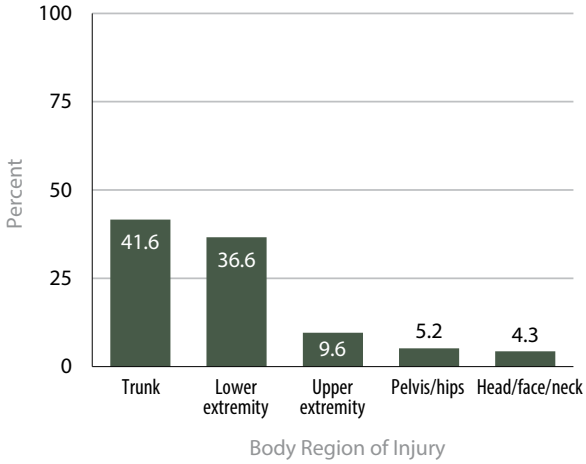
Nature of Cumulative Traumatic Injury, AC Service Members, 2019

Musculoskeletal tissue damage, other was the most common nature-of-injury category, accounting for 89.1% of all incident cumulative traumatic injuries.



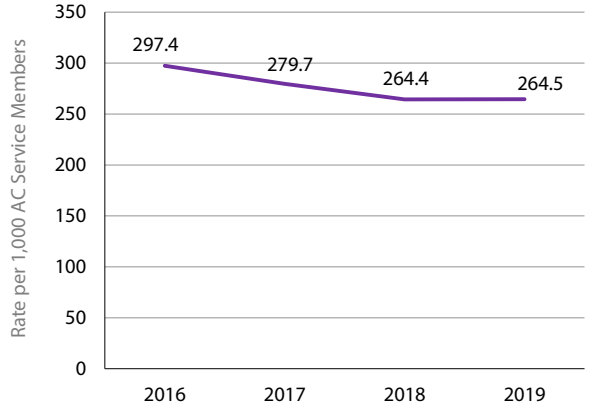
Body Region of Cumulative Traumatic Injury, Top 5 Categories, AC Service Members, 2019

The trunk (41.6%) and lower extremity (36.6%) were the most common regions affected by cumulative traumatic injury.



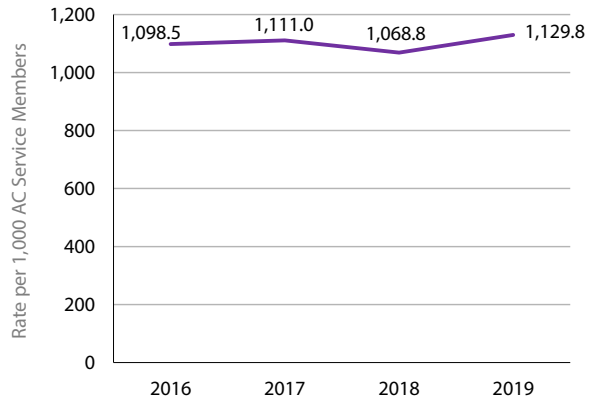
Incidence of Acute Injury, AC Service Members, 2016–2019

The rate of acute injuries decreased from 297.4 per 1,000 to 264.5 per 1,000 (11.1%) between 2016 and 2019.



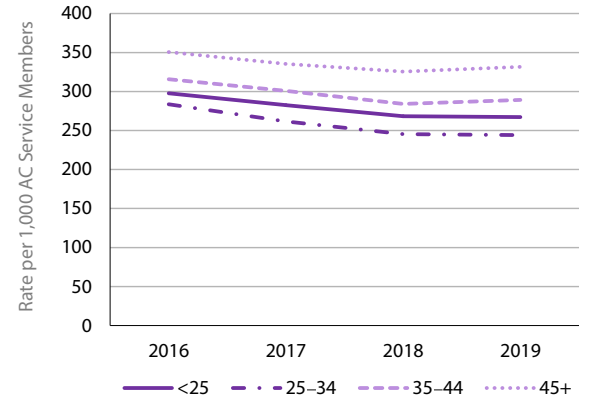
Incidence of Cumulative Traumatic Injury, AC Service Members, 2016–2019

The rate of cumulative traumatic injuries increased from 1098.5 per 1,000 to 1129.8 per 1,000 (2.9%) between 2016 and 2019.



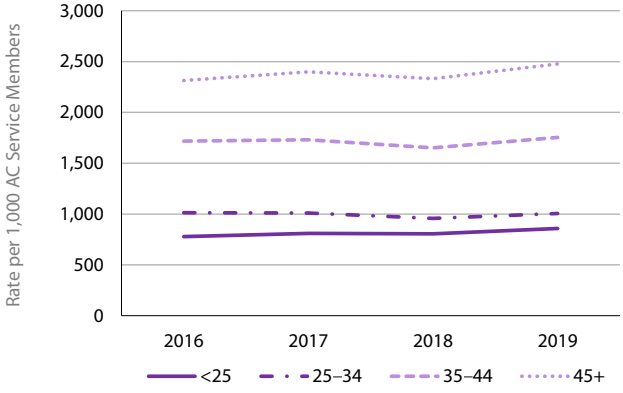
Incidence of Acute Injury by Age Group, AC Service Members, 2016–2019

The rate of acute injuries decreased among Service members in all age groups between 2016 and 2019.



Incidence of Cumulative Traumatic Injury by Age Group, AC Service Members, 2016–2019

The rate of cumulative traumatic injuries remained relatively stable among Service members in all age groups between 2016 and 2019, except for a slight increase among those in the youngest and oldest age groups.



Heat Illness

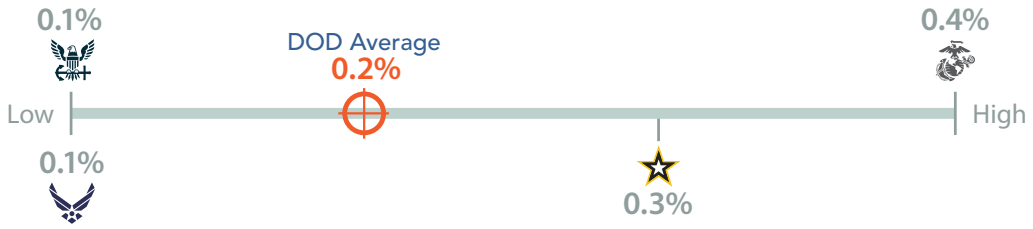
Heat illness refers to a group of disorders that occur when the elevation of core body temperature surpasses the compensatory limits of thermoregulation. The Armed Forces Health Surveillance Division (AFHSD) routinely perform surveillance for the most common of these disorders, namely heat exhaustion and heat stroke. Heat exhaustion is caused by the inability to maintain adequate cardiac output because of strenuous physical exertion and environmental heat stress and is often accompanied by acute dehydration. Heat stroke is a debilitating illness characterized clinically by severe hyperthermia (i.e., a core body temperature of 104°F/40°C or greater), profound central nervous system dysfunction (e.g., delirium, seizures, or coma), and additional organ and tissue damage. The onset of heat stroke requires aggressive clinical treatments including rapid cooling and supportive therapies such as fluid resuscitation to stabilize organ function and prevent multiorgan system failure, which is the ultimate case of mortality due to heat stroke.

This summary identified cases of heat illness among AC Service members during the period from 2015 through 2019.

In 2019, A total of 2,176 AC Service members (0.2%) were diagnosed with heat exhaustion, and 508 (0.04%) were diagnosed with heat stroke. Overall, heat illnesses were more common among Service members under 25 years old, who accounted for 70% of all cases. Similar percentages of males (0.21%) and females (0.19%) were affected by heat illnesses. **The percentages of AC Service members affected by heat exhaustion rose slightly during the first four years of the period but leveled off in 2019.**

During 2019, 112 (22.1%) heat stroke cases were hospitalized and 32 (1.5%) heat exhaustion cases were hospitalized. These hospitalizations resulted in 321 total bed days for heat stroke and 70 total bed days for heat exhaustion.

Rates of heat illness have previously been found to be highest among recruit trainees and those serving in combat specific occupational fields.[4] Efforts at preventing heat illnesses need to focus especially on these groups of Service members, who may engage in higher levels of demanding physical exertion during warm weather. In particular, trainees at basic training installations may not be acclimated to the heat or may not be physically fit.



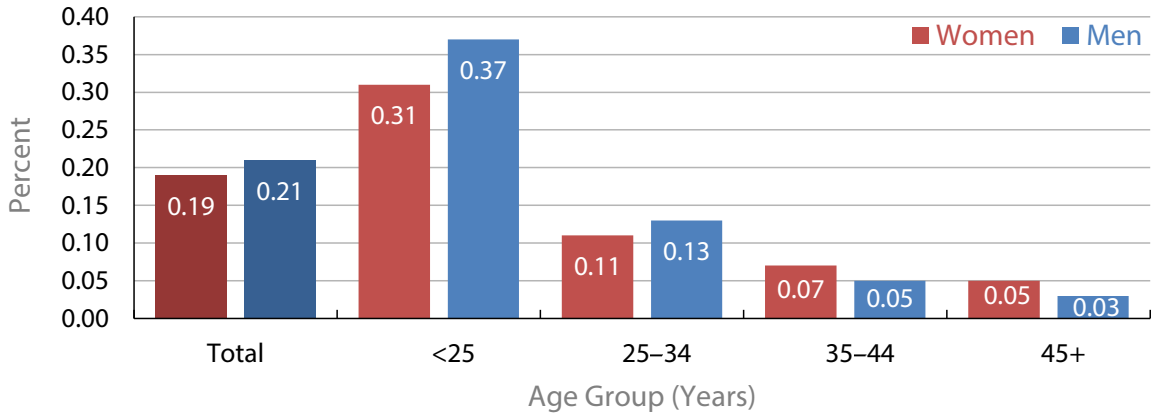
Overall, 0.2% of AC Service members had a heat illness in 2019.

Rates ranged from 0.05% to 0.4% across Services.

Army | Navy | Marine Corps | Air Force

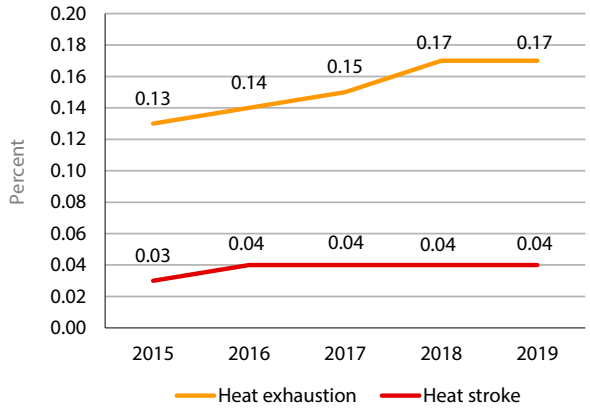
Incidence of Heat Illness by Sex and Age Group, AC Service Members, 2019

Younger Service members had the highest incidence of heat illness during the period from 2015 through 2019.



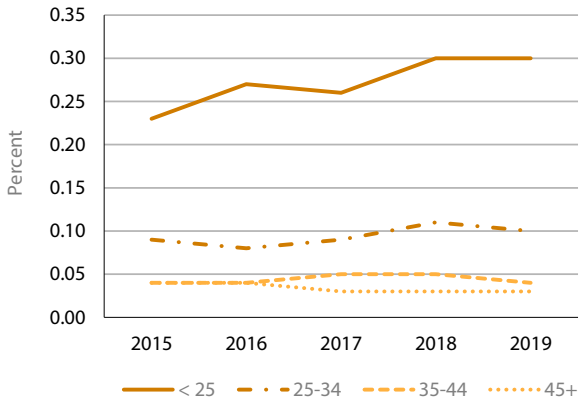
Incidence of Heat Stroke and Heat Exhaustion, AC Service Members, 2015–2019

The percentage of heat illnesses increased from 0.03% to 0.04% between 2015 and 2019. The percentages of AC Service members affected by heat exhaustion rose slightly during the first four years of the period but leveled off in 2019.



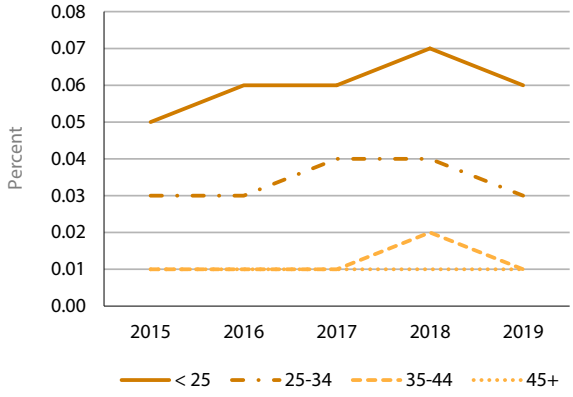
Incidence of Heat Exhaustion by Age Group, AC Service Members, 2015–2019

The percentage of Service members under 25 years old who experienced heat exhaustion increased between 2015 and 2019.



Incidence of Heat Stroke by Age Group, AC Service Members, 2015–2019

The percentage of Service members under 25 years old who experienced heat stroke increased between 2015 and 2019.



Behavioral Health

Like injury, behavioral health (BH) conditions are a leading cause of morbidity among AC Service members, accounting for 1.9 million (16.2%) outpatient encounters in 2019.[5]

To determine the proportion of AC Service members (including those who were deployed) with a BH diagnosis during a given 12-month period, the annual prevalence of BH conditions was calculated. A Service member was identified as having a BH disorder if they had at least two inpatient, outpatient, or in-theater encounters for a BH condition of any type within 365 days with at least one of the diagnoses occurring during 2019.[6]

Prevalence estimates of specific BH conditions (adjustment disorders, alcohol-related disorders, substance-related disorders, anxiety disorders, bipolar disorders, depressive disorders, psychoses, and posttraumatic stress disorder (PTSD) during 2019 were also calculated.[7] To be considered a case, two encounters for the same BH condition within a 365-day period were required.

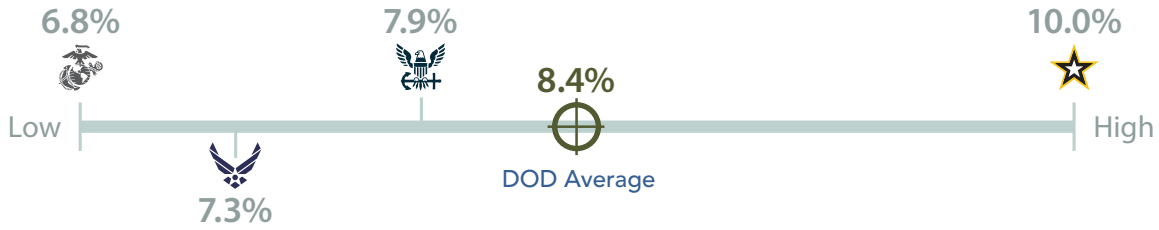
To determine the proportion of AC Service members that had ever been diagnosed with a BH condition, the "lifetime" prevalence of BH disorders was calculated. Service members on active duty during December 2019 were used for this analysis and were considered to have a lifetime history of a BH condition if they had two BH disorder diagnoses within 365 days at any time between 2002 and 2019.

Overall, 8.4% of AC Service members were diagnosed with a BH disorder in 2019. The annual prevalence of BH disorders remained relatively stable during 2015–2019, fluctuating between 8.1% and 8.4%. Women were more likely to be diagnosed with a BH disorder (13.3%) when compared to men (7.4%). Service members in the youngest age category (less than 25 years) had the highest prevalence of BH disorders among both males and females.

Slightly more than one-eighth (13.0%) of service members with any BH disorder were hospitalized, resulting in a total of 171,254 bed days in 2019. Cases of psychoses had the highest hospitalization rate (26.2%), followed by bipolar disorders (20.9%). However, cases of depressive disorders had the highest total number of bed days (52,784), followed by alcohol-related disorders (38,907).

Among both male and female AC Service members, adjustment disorder was the leading BH diagnosis in 2019 followed by depressive disorder and anxiety disorder.

Among AC Service members on active duty during December 2019, 25.4% of women and 15.7% of men (17.3% overall) had a history (lifetime prevalence) of a BH disorder. The lifetime prevalence of BH disorders ranged from 10.5% to 20.6% across Services.

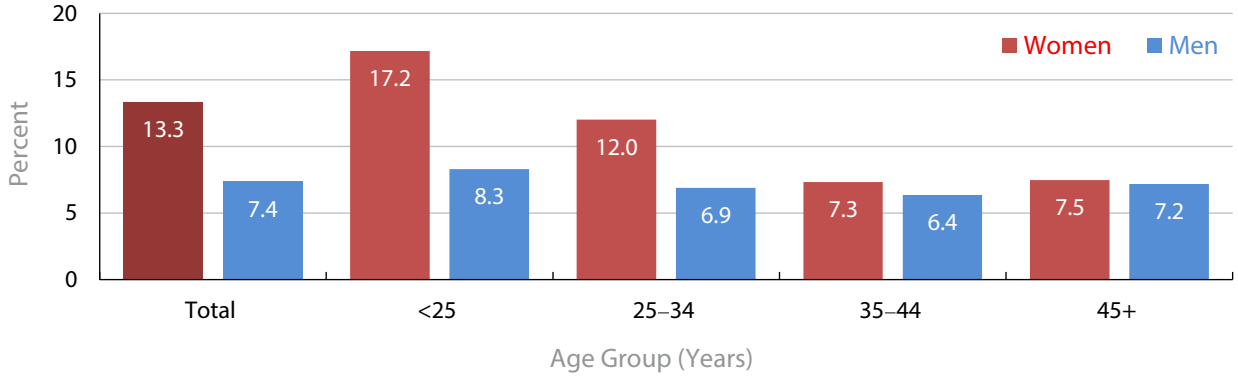


Overall, 8.4% of AC Service members had a BH disorder in 2019.
Rates ranged from 6.8% to 10.0% across Services.

Army | Navy | Marine Corps | Air Force

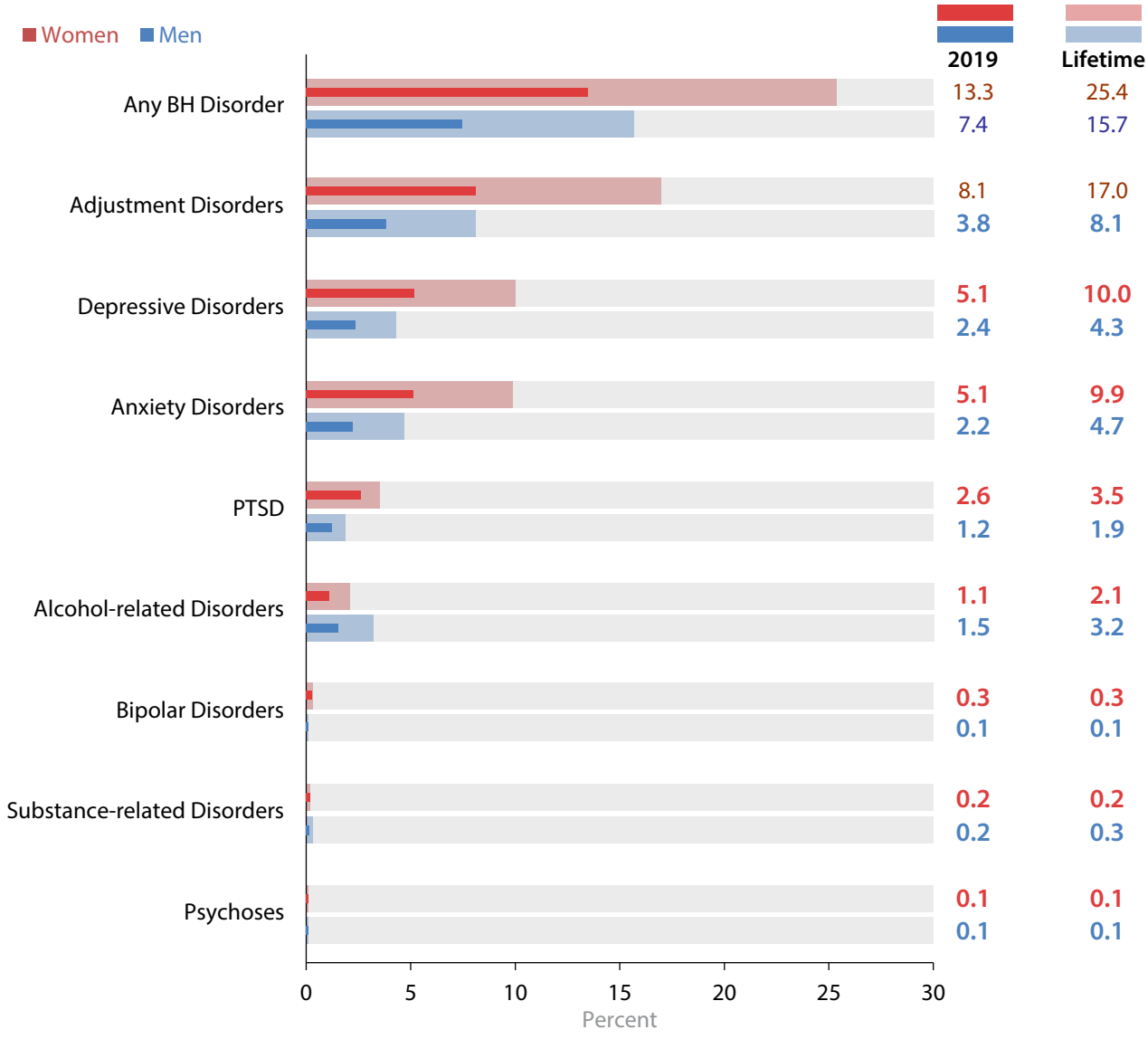
Prevalence of BH Disorders by Sex and Age Group, AC Service Members, 2019

Females were more likely to be diagnosed with a BH disorder compared to males, and those in the youngest age category were more likely to be diagnosed compared to older Service members.



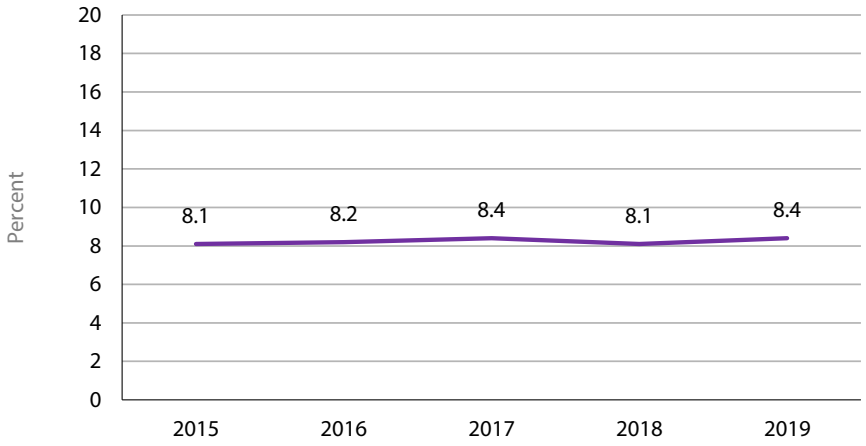
Annual and Lifetime Prevalence of BH Disorders by Sex and Condition, AC Service Members, 2019

Overall, 17.3% of Service members (25.4% of women and 15.7% of men) received a diagnosis of a BH disorder between 2002 and 2019. The percentage was higher for females compared to males for most BH disorders.



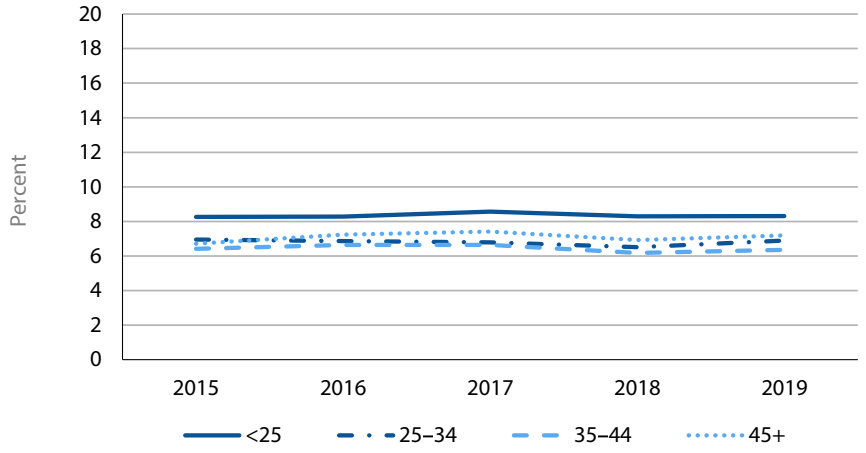
Prevalence of BH Disorders, AC Service Members, 2015–2019

The prevalence of BH disorders remained relatively stable between 2015 and 2019, with fluctuation from a low of 8.1% in 2015 and 2018 to a high of 8.4% in 2017 and 2019.



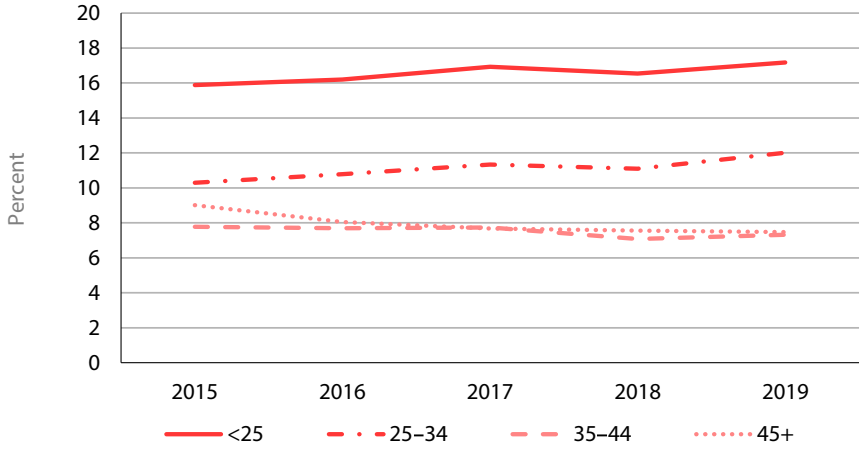
Prevalence of BH Disorders by Age Group, Male AC Service Members, 2015–2019

The prevalence of BH disorders remained relatively stable between 2015 and 2019 among males in all age groups.



Prevalence of BH Disorders by Age Group, Female AC Service Members, 2015–2019

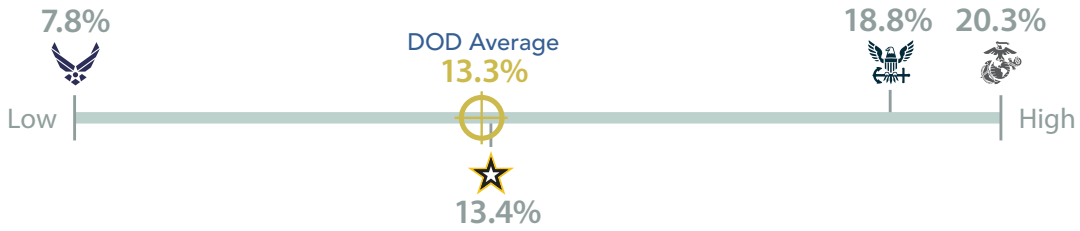
The prevalence of BH disorders increased slightly between 2015 and 2019 among females aged <25 years and 25–34 years, remained relatively stable for females aged 35–44 years, and decreased for those 45 years of age or older.



Hazardous Drinking

Excessive alcohol use is a threat to the health of military members and to military readiness. Screening for alcohol misuse on a periodic basis provides an opportunity for early identification of hazardous drinking behavior and for referral for further assessment and/or treatment, if needed. Screening for alcohol misuse is implemented in the Periodic Health Assessment (PHA) through the use of a three-item tool, the Alcohol Use Disorders Identification Test-Consumption (AUDIT-C).[8] The AUDIT-C questions ask about the frequency and amount of alcohol consumption and their combined score has been validated as a reliable scale for detecting hazardous drinking behavior.[8] The overall prevalence of positive AUDIT-C screens among AC Service members who completed a PHA in 2019 are reported here.

In 2019, a total of 116,234 (13.3%) AC Service members screened positive on the AUDIT-C. This is compared to 19,109 (1.5%) AC Service members who were diagnosed with an alcohol-related disorder in 2019, of whom 11.8% were hospitalized, resulting in a total of 38,907 bed days. Proportions were similar for males and females overall (13.3% and 13.2%, respectively). **Both male and female Service members under the age of 25 had a higher proportion of positive AUDIT-C screens compared to their counterparts aged 25 years or older.** A greater percentage of male Service members screened positive on the AUDIT-C compared to similarly aged females in every age group except for those aged 25–34 years (12.2% and 13.0%, respectively).

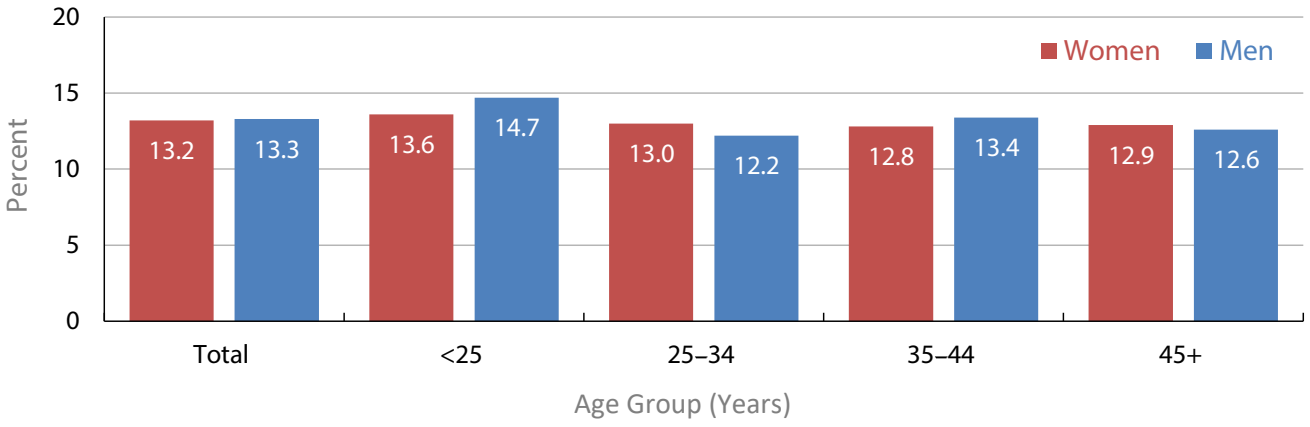


Overall, 13.3% of AC Service members had a positive AUDIT-C screen in 2019. Rates ranged from 7.8% to 20.3% across Services.

Army | Navy | Marine Corps | Air Force

Prevalence of Positive AUDIT-C Screens by Sex and Age Group, AC Service Members, 2019

Rates of positive AUDIT-C screens were slightly higher among males (13.3) than females (13.2). The prevalence of positive AUDIT-C screens was higher in Service members less than 25 years of age as compared to their counterparts aged 25 years or older.



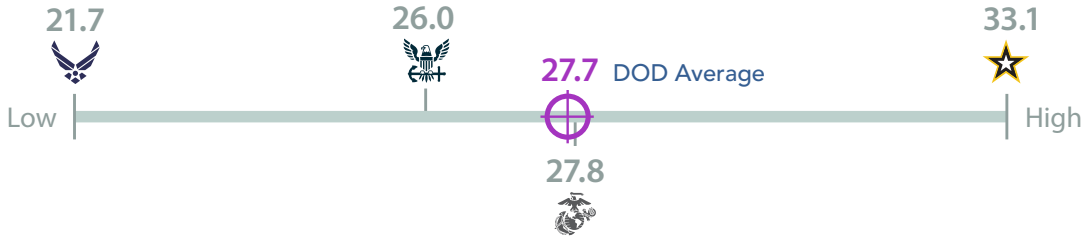
Sexually Transmitted Infections

Sexually transmitted infections (STIs) are relevant to Service members because of their relatively high incidence, adverse impact on individual readiness, and potential for serious medical sequelae if left untreated.[9] Two of the most common bacterial STIs are caused by *Chlamydia trachomatis* (chlamydia) and *Neisseria gonorrhoeae* (gonorrhea). Trichomoniasis, caused by the parasite *Trichomonas vaginalis,* is another common STI.

The overall incidence and time trends related to these three STIs (chlamydia, gonorrhea, and trichomoniasis) among AC Service members in 2019 are reported here.

In 2019, 27.7 per 1,000 AC Service members were diagnosed with or tested positive for one of the 3 STIs. Women had higher rates of STIs compared to men, particularly among the younger age groups. **Chlamydia was most common (23.5 per 1,000), followed by gonorrhea (3.5 per 1,000) and trichomoniasis (0.7 per 1,000).** Among both men and women, STIs were most common in the youngest age groups. AC Service members less than 25 years of age were almost three times more likely to have an STI compared to those aged 25–34 years.

The annual incidence rates of chlamydia and gonorrhea among AC Service members increased during 2015–2019. This was primarily attributed to increases among those less than 25 years of age. However, rates of trichomoniasis decreased between 2015 and 2017 and remained steady between 2017 and 2019. Previous studies have demonstrated increases in the incidence rates of chlamydia and gonorrhea among AC Service members in the past 5 years,[9] with consistently higher rates among women. Higher rates of most STIs among women compared to men can likely be attributed to implementation of the Services' screening programs. Continued behavioral risk reduction interventions are needed to counter the increasing incidence of some STIs and maintain any decreases.



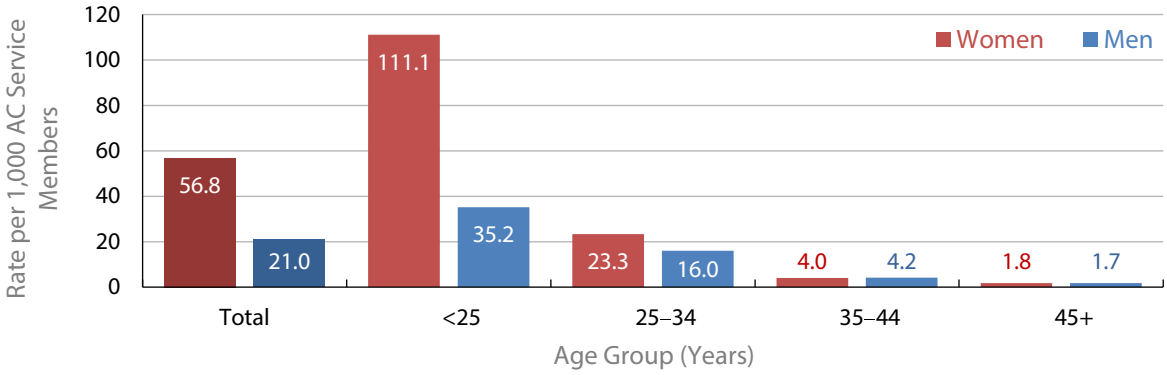
Overall, there were 27.7 cases of chlamydia, gonorrhea, or trichomoniasis per 1,000 AC Service members in 2019.

Rates ranged from 21.7 per 1,000 to 33.1 per 1,000 across Services.

Army | Navy | Marine Corps | Air Force

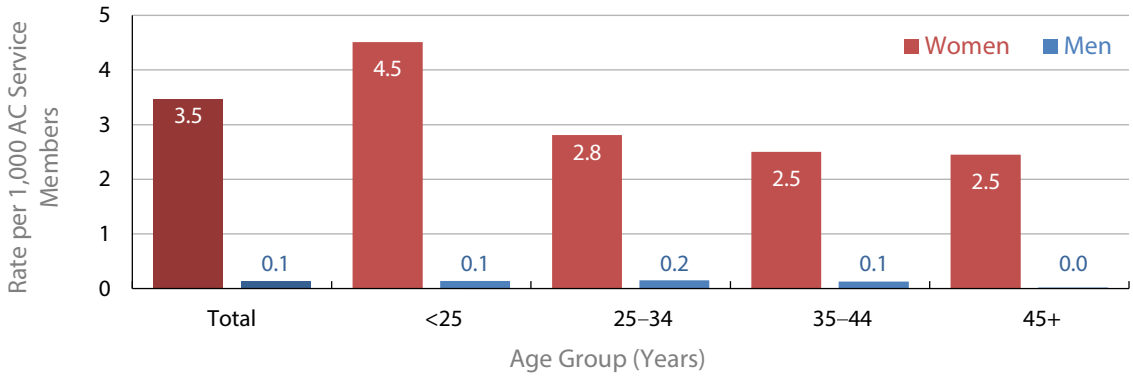
Incidence of Chlamydia and Gonorrhea by Sex and Age Group, AC Service Members, 2019

Women had higher rates of chlamydia and gonorrhea compared to men, particularly among those in the younger age groups.



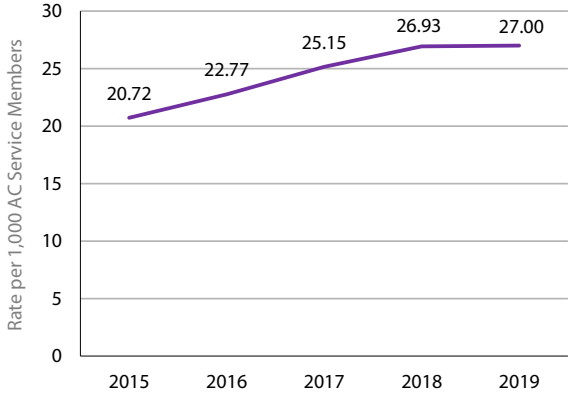
Incidence of Trichomoniasis by Sex and Age Group, AC Service Members, 2019

Overall, women had a higher rates of trichomoniasis compared to men.



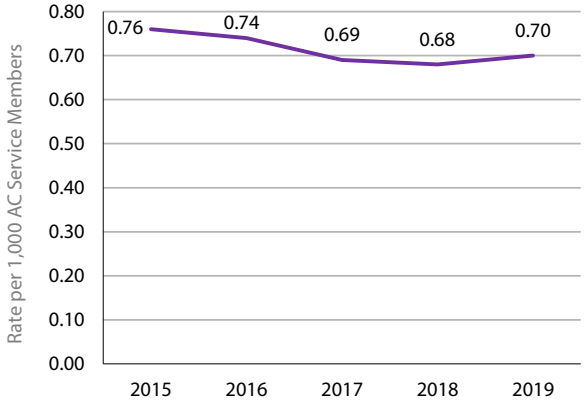
Incidence of Chlamydia and Gonorrhea, AC Service Members, 2015–2019

The incidence of chlamydia and gonorrhea increased from 2015 to 2018, and remained steady between 2018 and 2019.



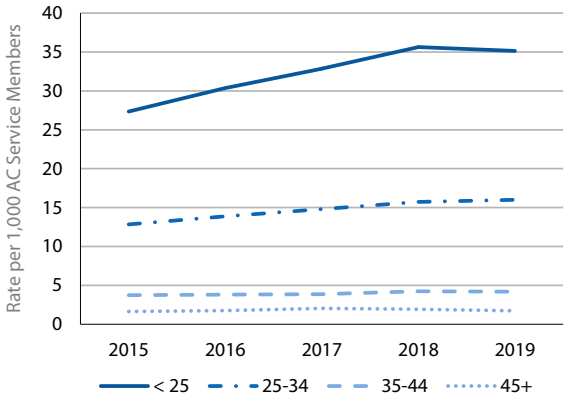
Incidence of Trichomoniasis, AC Service Members, 2015–2019

The incidence of trichomoniasis decreased between 2015 and 2017, and remained steady between 2017 and 2019.



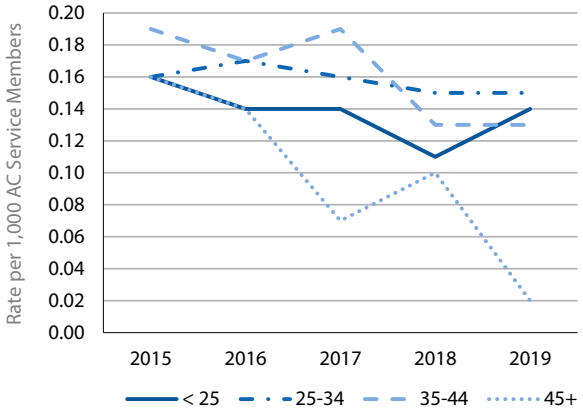
Incidence of Chlamydia and Gonorrhea by Age Group and Sex, AC Male Service Members, 2015–2019

The incidence of chlamydia and gonorrhea increased between 2015 and 2019 among service men in the youngest age groups.



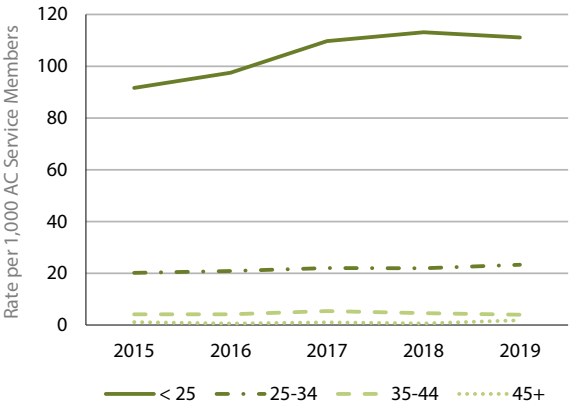
Incidence of Trichomoniasis by Age Group, AC Male Service Members, 2016–2019

The incidence of trichomoniasis decreased between 2015 and 2019 among male service members less than 25 years of age.



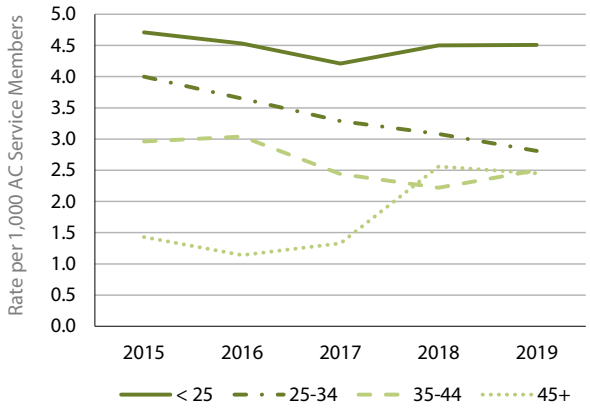
Incidence of Chlamydia and Gonorrhea by Age Group and Sex, AC Female Service Members, 2015–2019

The incidence of chlamydia and gonorrhea increased between 2015 and 2019 among service women less than 25 years of age.



Incidence of Trichomoniasis by Age Group, AC Female Service Members, 2016–2019

The incidence of trichomoniasis increased among service women aged 45 years or older between 2015 and 2019.



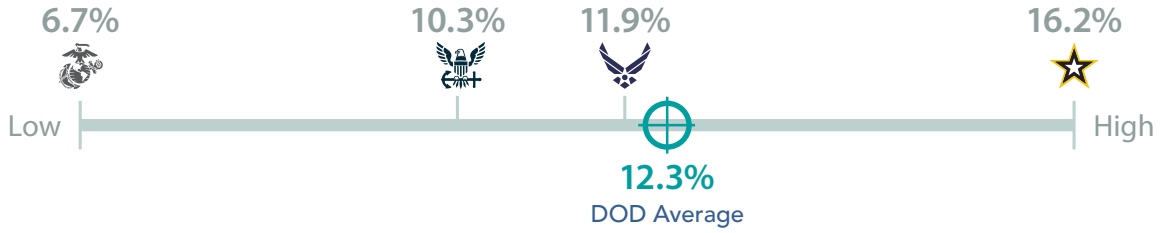
Sleep Disorders

The American Academy of Sleep Medicine recommends at least 7 hours of sleep per night for adults aged 18–60 years.[10] Lack of sleep can impair cognitive function, decreasing performance and increasing the risk for injury and accidents. Insufficient sleep is also associated with a number of chronic diseases including diabetes, heart disease, obesity, and depression.[11]

The overall prevalence and time trends related to sleep disorders (including sleep apnea, insomnia, hypersomnia, circadian rhythm disorders, narcolepsy, parasomnia, and sleep-related movement disorders) among AC Service members in 2019 are reported here, along with the prevalence of the most commonly diagnosed sleep disorders.

In 2019, 12.3% of AC Service members were diagnosed with at least one sleep disorder. Proportions were similar for males and females (12.5% and 11.4%, respectively). **The most commonly diagnosed sleep disorders were sleep apnea and insomnia (6.9% and 4.7%, respectively).** Male Service members were far more likely to be diagnosed with sleep apnea than females (7.6% and 3.3%, respectively), while a greater percentage of female Service members were diagnosed with insomnia compared to males (6.5% and 4.4%, respectively).

The prevalence of sleep disorders among AC Service members remained relatively stable during 2015–2019. However, the prevalence of sleep disorders among males and females in the 45 years or older age group increased from 41.9% in 2015 to 49.0% in 2019 and 32.6% in 2015 to 36.2% in 2019, respectively. Previous studies have demonstrated increases in the incidence rates of some conditions, including sleep disorders, when comparing rates during the early, middle, and last phases of a Service member's career.[12] These increases were independent of age and thought to be due in part to increased reporting during separation and retirement physicals.[12] The impact of career phase was not evaluated here and may be important to consider in the future.

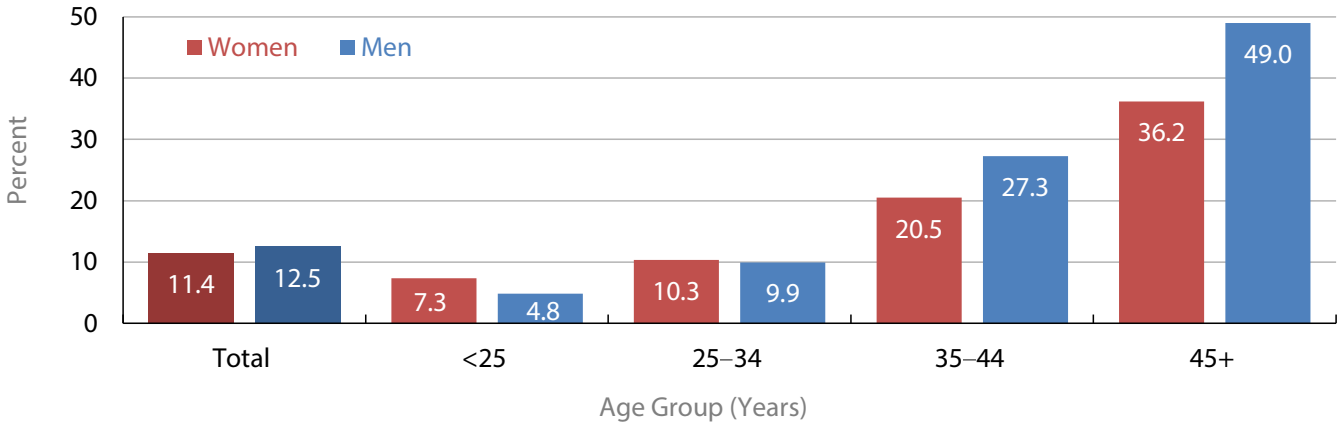


Overall, 12.3% of AC Service members had a sleep disorder in 2019.

Rates ranged from 6.7% to 16.2% across Services.

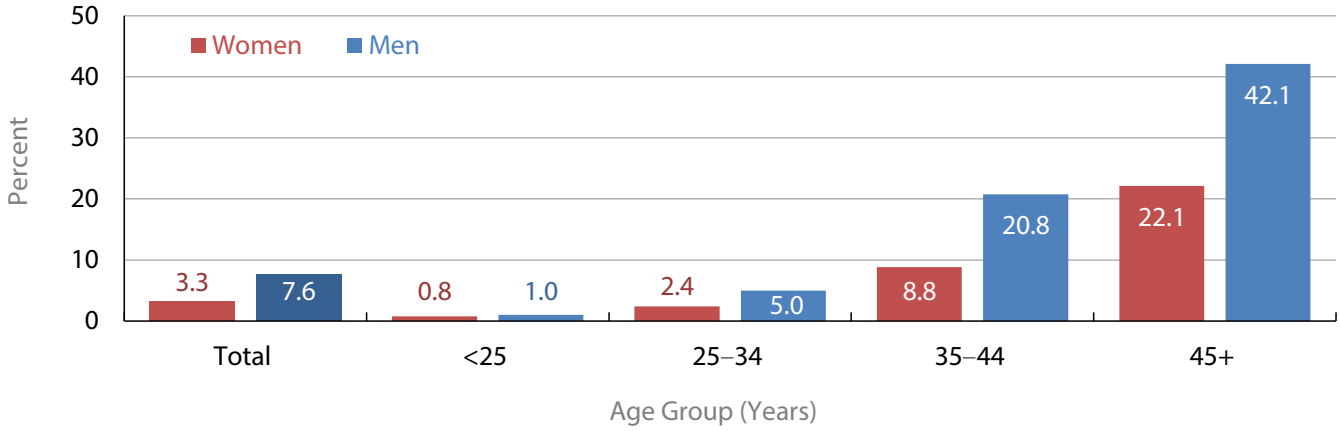
Prevalence of Sleep Disorders by Sex and Age Group, AC Service Members, 2019

The prevalence of sleep disorders was similar for males (12.5%) and females (11.4%) and increased with increasing age group for both sexes.



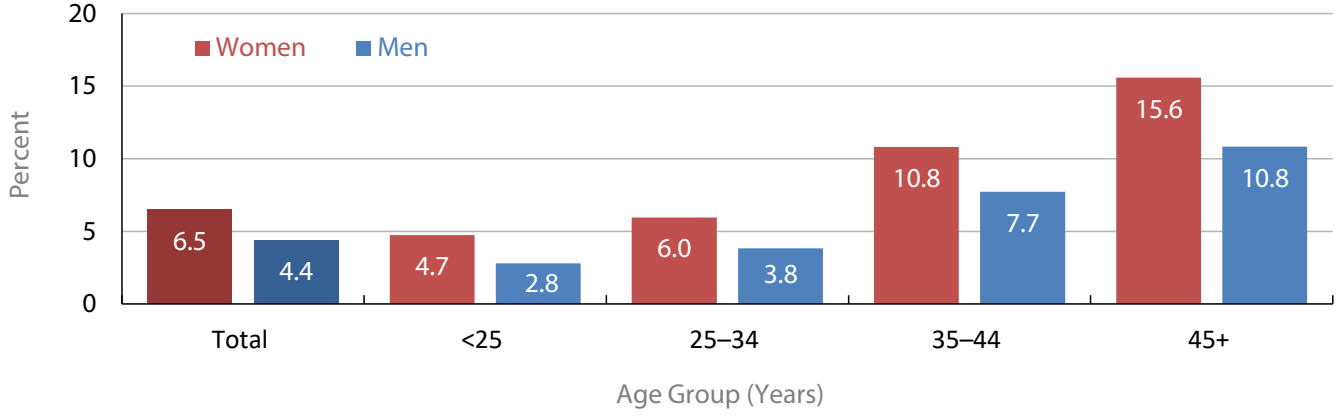
Prevalence of Sleep Apnea by Sex and Age Group, AC Service Members, 2019

The prevalence of sleep apnea was higher for males (7.6%) compared to females (3.3%), but the prevalence increased with increasing age group for both sexes.



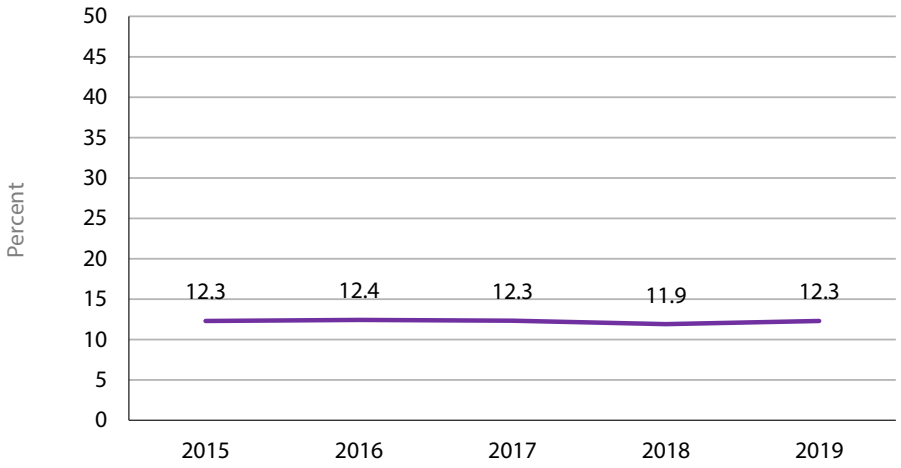
Prevalence of Insomnia by Sex and Age Group, AC Service Members, 2019

The prevalence of insomnia was higher for females (6.5%) compared to males (4.4%), and prevalence increased with increasing age group.



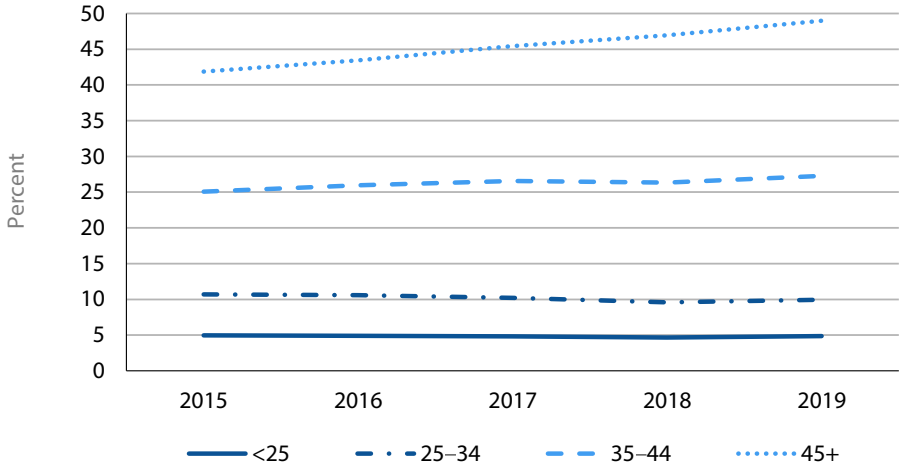
Prevalence of Sleep Disorders, AC Service Members, 2015–2019

The prevalence of sleep disorders remained relatively stable between 2015 and 2019.



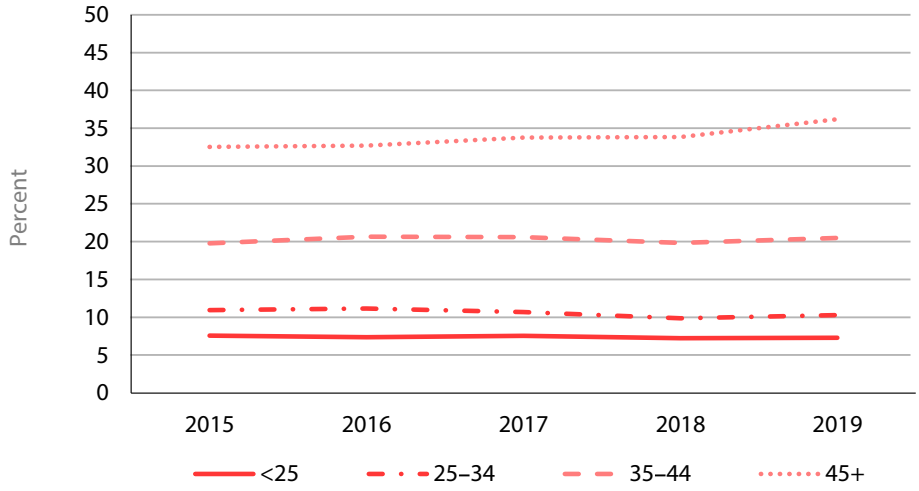
Prevalence of Sleep Disorders by Age Group, Male AC Service Members, 2015–2019

The prevalence of sleep disorders remained relatively stable among males ≤44 years between 2015 and 2019. The prevalence of sleep disorders among male Service members in the 45 years and older age group increased from 41.9% in 2015 to 49.0% in 2019.



Prevalence of Sleep Disorders by Age Group, Female AC Service Members, 2015–2019

The prevalence of sleep disorders remained relatively stable among female service members 44 years and younger between 2015 and 2019. The prevalence among female Service members in the 45 years and older age group rose slightly from 32.6% in 2015 to 36.2%

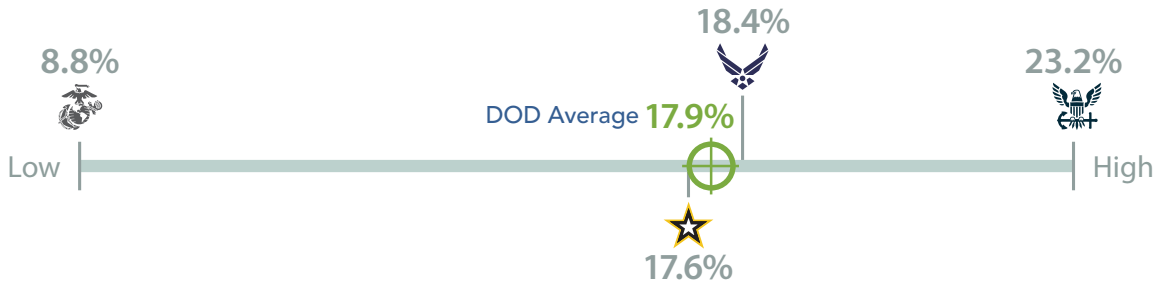


Obesity

Obesity negatively impacts physical performance and military readiness and is associated with long-term health problems such as hypertension, diabetes, coronary heart disease, stroke, cancer, and risk for all-cause mortality. Studies also suggest that healthcare utilization is higher among obese Service members than their normal-weight counterparts.[13]

The Clinical Data Repository (CDR) vital sign table within the MHS Data Repository (MDR) was used to identify all records for AC Service members with a height and weight measurement available on the same day; pregnant Service members were excluded. Body mass index (BMI) was calculated utilizing the latest height and weight record in a given year. In accordance with the Centers for Disease Control and Prevention (CDC), a BMI ≥30 was considered obese.[14]

The overall prevalence of obesity among AC Service members was 17.9% in 2019. Obesity rates were higher among males (18.8%) compared to females (14.3%). The lowest prevalence of obesity was in Service members less than 25 years of age (10.2%) and the highest was among those in the 35–44 year age group (28.9%). **The overall prevalence of obesity has increased steadily since 2015.**



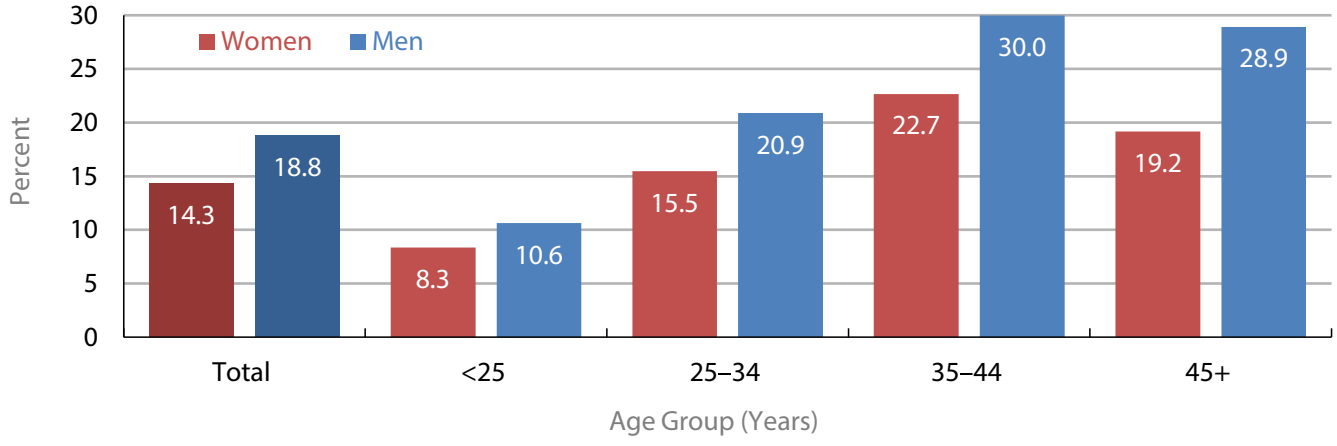
Overall, 17.9% of AC Service members were classified as obese in 2019.

Rates ranged from 8.8% to 23.2% across Services.

Army | Navy | Marine Corps | Air Force

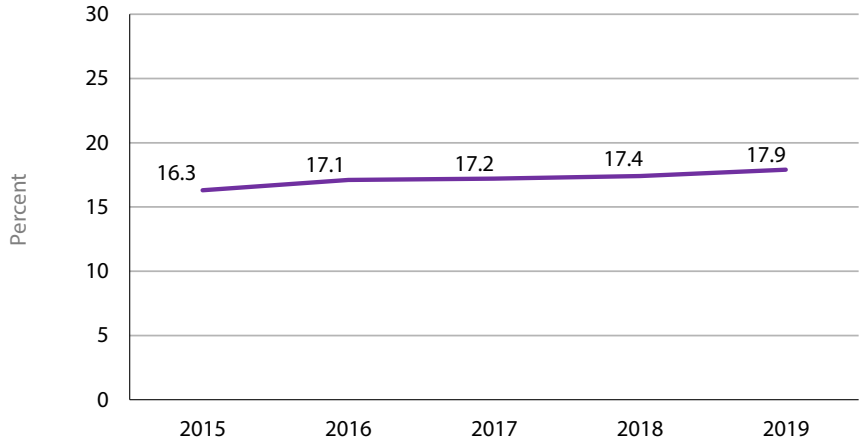
Prevalence of Obesity by Sex and Age Group, AC Service Members, 2019

Obesity rates were higher among males (18.8%) compared to females (14.3%). The prevalence of obesity increased with increasing age group through 35–40 years then decreased in the 45+ age group.



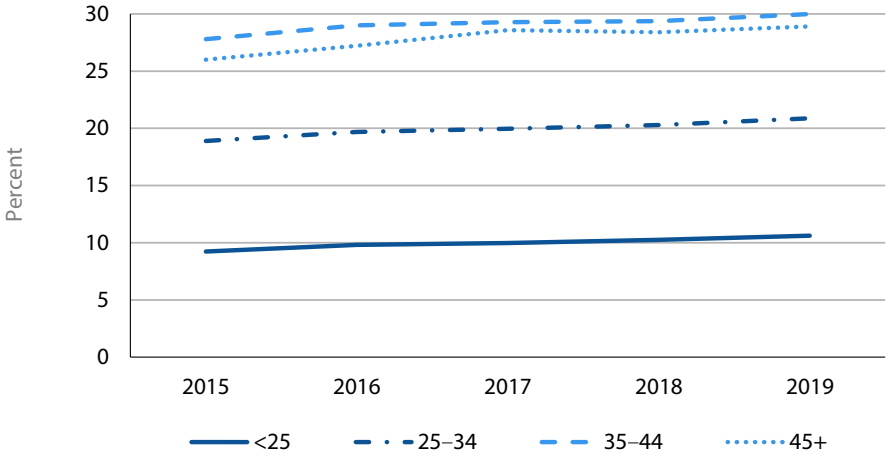
Prevalence of Obesity, AC Service Members, 2015–2019

The prevalence of obesity increased slightly from 16.3% in 2015 to 17.9% in 2019.



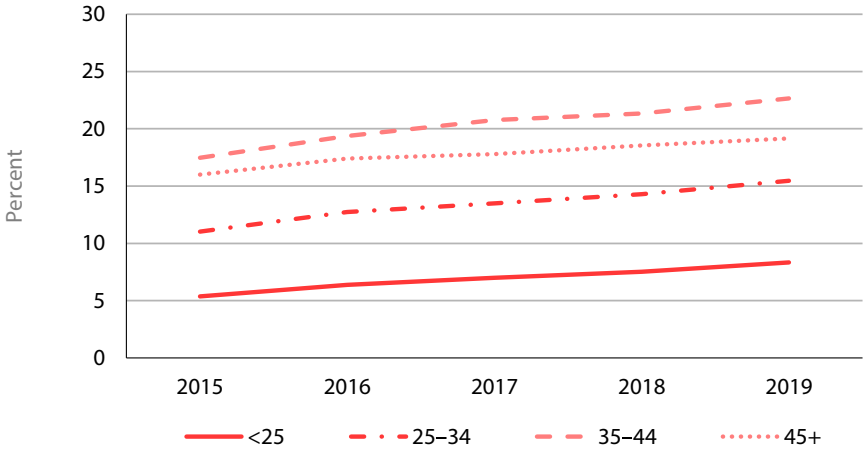
Prevalence of Obesity by Age Group, Male AC Service Members, 2015–2019

The prevalence of obesity increased slightly among males for all age groups between 2015 and 2019.



Prevalence of Obesity by Age Group, Female AC Service Members, 2014-2018

The prevalence of obesity increased slightly among females for all age groups between 2015 and 2019.



Acute Respiratory Illnesses

Outbreaks and epidemics of acute respiratory illnesses can have adverse effects on individual and military unit readiness. The Armed Forces have long recognized the special risks of respiratory illnesses among Service members who live in congregate settings, mix with Service members from other geographic regions, undergo the stresses of military training and operations, and travel to foreign countries. To counter the threat of such illnesses, the Armed Forces have for many years emphasized both preventive measures as well as continuous surveillance for respiratory infections. Vaccines are given to new Service members to prevent a variety of respiratory diseases caused by bacteria (diphtheria, pertussis, and meningococcal infections) and viruses (adenovirus, influenza, measles, mumps, rubella, and varicella). This report summarizes temporal trends of specific respiratory infections and syndromes as well as specific symptoms of respiratory illness. For this metric, data are also presented separately for recruits.

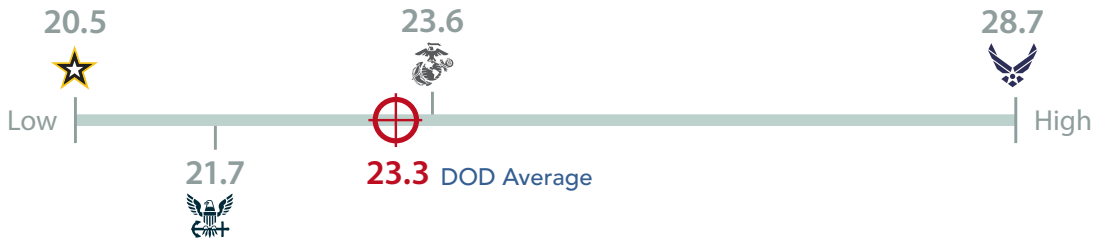
On average, 23.3 per 1,000 AC Service members were diagnosed with an acute respiratory infections each month during 2019, with rates highest in January (31.2 per 1,000) and lowest in June (16.5 per 1,000). Females had higher monthly rates of acute respiratory infections and respiratory symptoms compared to males. Those in the youngest age category (less than 25 years old) had the highest rates of acute respiratory infections, but those in the oldest age group had the highest rate of respiratory symptoms. **Compared to AC Service members overall, recruits had higher average monthly rates of acute respiratory infections (101.9 per 1,000) and respiratory symptoms (9.8 per 1,000)**.

Rates of acute respiratory infections and respiratory symptoms remained relatively stable between 2015 and 2019; however, **there were noteworthy patterns of seasonal increases (in winter) and declines (in summer) for both AC Service members overall and for recruits**.

A total of 296,091 Service members had at least one acute respiratory infection diagnosis in 2019. Of these Service members, 1,139 (0.4%) were hospitalized, resulting in 3,755 total bed days.

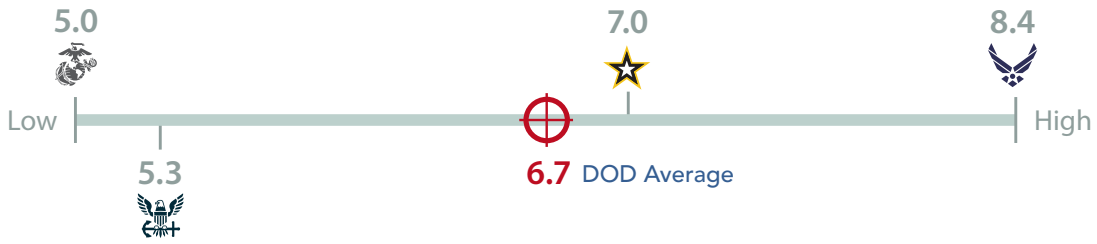
Rates among trainees were likely higher because of their relative youth, the spread of infections among trainees in congregate settings during basic training, strict requirements for sick trainees to receive medical care, and more thorough surveillance of trainees, including collection of specimens to identify etiologic pathogens. For both the trainees and AC service members, the rates of diagnoses of respiratory symptoms were considerably lower than the rates of specific acute respiratory illnesses. This observation indicates that healthcare providers recorded specific diagnoses much more often than nonspecific symptom diagnoses during encounters for acute respiratory illnesses.

The relatively steady incidence among recruit trainees contrasts with data from 1999–2011, a period during which the unavailability of the highly efficacious adenovirus vaccine allowed a doubling of the rates of acute respiratory disease among basic trainees.[15] For 2020, it will be of interest to document the impact of the SARS-CoV-2 virus on the rates of acute respiratory illness among recruit trainees and among the AC as a whole. These surveillance data can be used to inform decisions about instituting additional preventive measures (e.g., isolation, quarantine, social distancing, protective clothing and masks, prophylactic antibiotics, and vaccine boosters).



On average, 23.3 per 1,000 AC Service member per month were diagnosed with acute respiratory infections in 2019.

Average monthly rates varied by Service and ranged from 21.7 to 28.7 per 1,000 AC Service members.



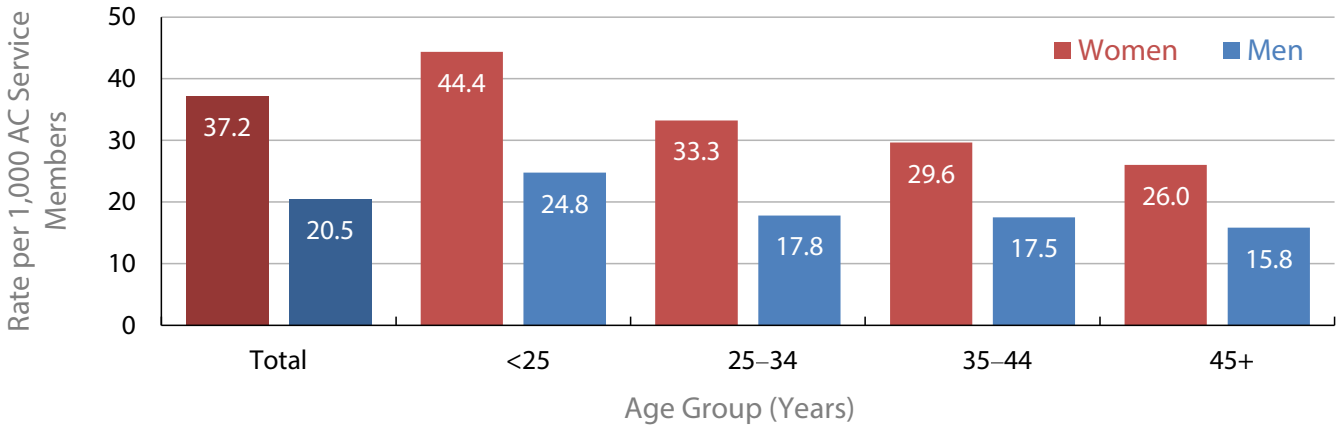
On average, 6.7 per 1,000 AC Service members per month were diagnosed with respiratory symptoms in 2019.

Average monthly rates varied by Service and ranged from 5.0 to 8.4 per 1,000 AC Service members.

Army | Navy | Marine Corps | Air Force

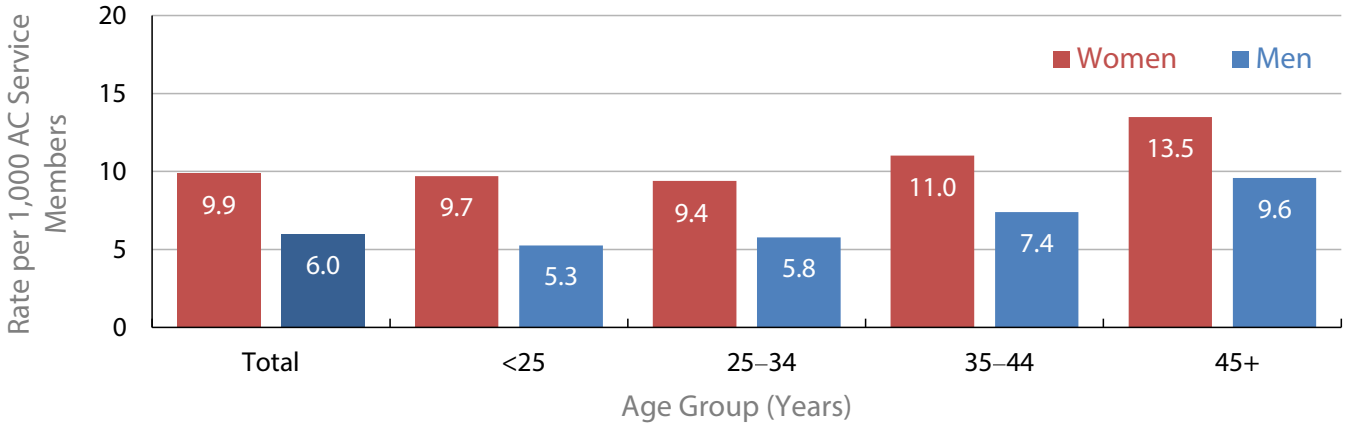
Average Monthly Incidence of Acute Respiratory Infections by Sex and Age Group, AC Service Members, 2019

Service members in the younger age groups had higher average monthly rates of acute respiratory infections than those in the older groups. Compared to males, females had higher rates within each age group.



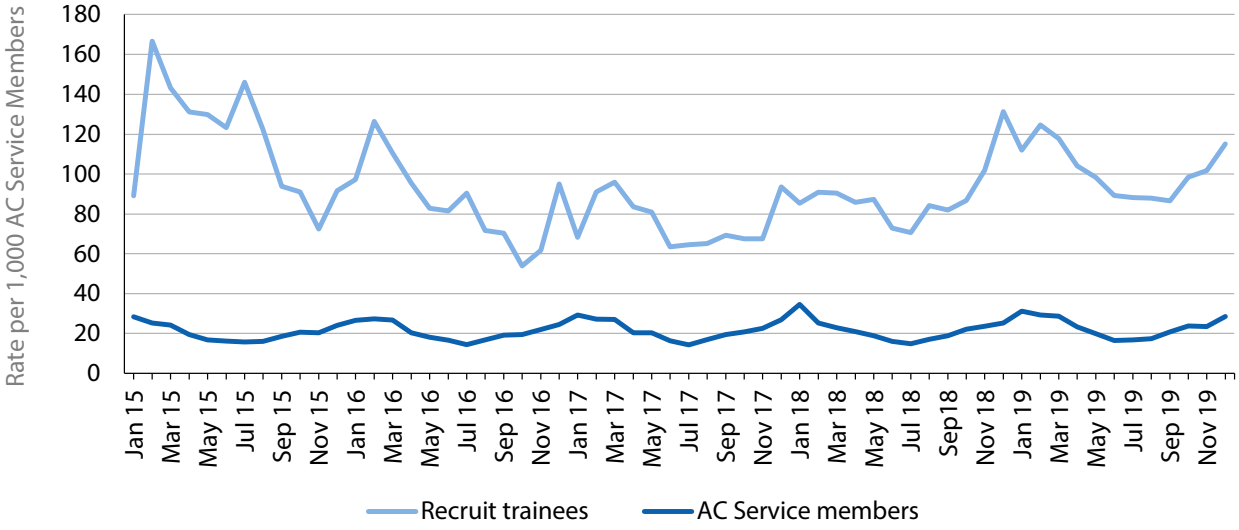
Average Monthly Incidence of Respiratory Symptoms by Sex and Age Group, AC Service Members, 2019

Females had higher rates of respiratory symptoms compared to males. Rates were highest among Service members aged 45 years or older.



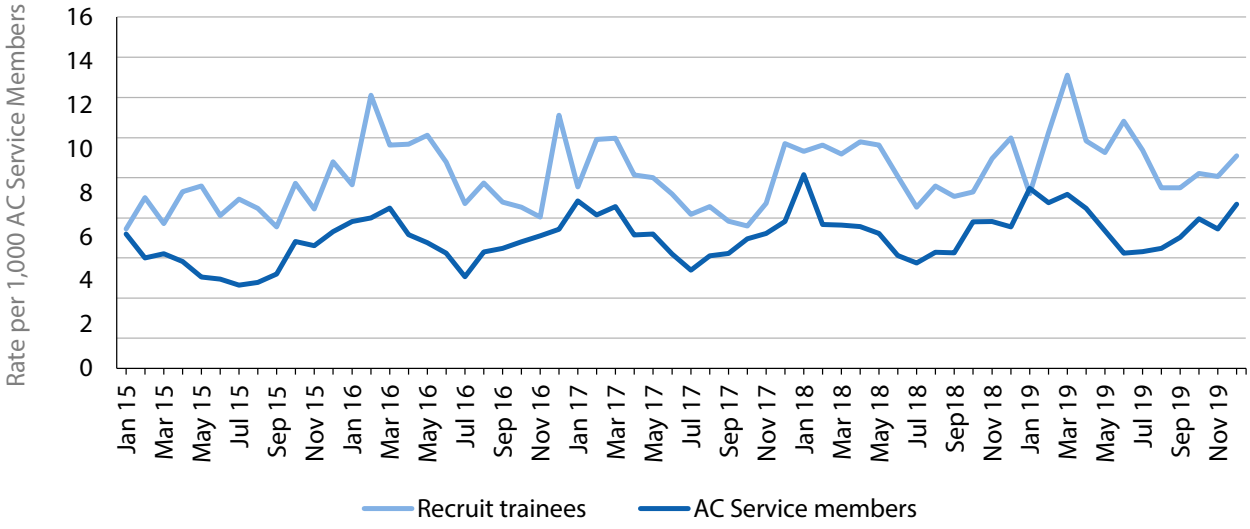
Incidence of Acute Respiratory Infections, AC Service Members and Recruit Trainees, 2015–2019

Rates of acute respiratory infections had seasonal increases in winter months and declines in summer months. The overall rate of respiratory infections remained relatively stable between 2015 and 2019. Recruits had consistently higher rates compared to AC Service members overall.



Incidence of Respiratory Symptoms, AC Service Members and Recruit Trainees, 2015–2019

Similar to acute respiratory infections, rates of respiratory symptoms displayed seasonal increases in winter months and declines in summer months, but the overall rate remained relatively stable between 2015 and 2019. Recruits had higher rates compared to AC Service members overall.



Army

Service Profile (2019):*

Population: Approximately 469,000 Army Service members
77.1% under 35 years old, 15.2% female

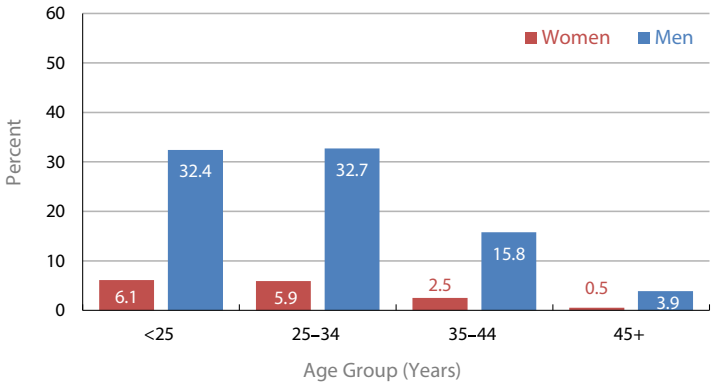
HEALTH INDEX MEASURES**

MEASURE	ARMY VALUE	DOD AVERAGE	DOD RANGE
Acute Injury (rate per 1,000)	**328.0**	264.5	188.9–328.0
Cumulative Traumatic Injury (rate per 1,000)	**1,450.4**	1,129.8	706.5–1,450.4
Heat Illness (%)	**0.3**	0.2	0.05–0.40
BH Disorder 1-Year (%)	**10.0**	8.4	6.8–10.0
BH Disorder Lifetime (%)	**20.6**	17.3	10.5–20.6
Hazardous Drinking (%)	**13.4**	13.3	7.8–20.3
STIs (rate per 1,000)	**33.1**	27.7	21.7–33.1
Sleep Disorders (%)	**16.2**	12.3	6.7–16.2
Obesity (%)	17.6	17.9	8.8–23.2
Acute Respiratory Infections (average rate per 1,000 per month)	20.5	23.3	20.5–28.7
Respiratory Symptoms (average rate per 1,000 per month)	**7.0**	6.7	5.0–8.4

ADDITIONAL INFORMATION

Injury rates in the Army were found to be higher than rates in the Navy, Air Force, and Marine Corps. Mission-specific training and operational requirements likely contribute to the risk for injury among Soldiers. Rates of BH, STIs, and sleep disorders were also higher among Soldiers than Sailors, Airmen, and Marines. Given the potential for each of these conditions to contribute to decreased performance, disability, and separation, further exploration of potential causes and interventions is warranted.

DEMOGRAPHICS



* Number of AC Service members, June 2019; see Appendix for details.

** See Appendix for details regarding measure computations. Bold values represent Service values above the DoD average.

Navy

Service Profile (2019):*

Population: Approximately 330,000 Navy Service members
77.6% under 35 years old, 20.0% female

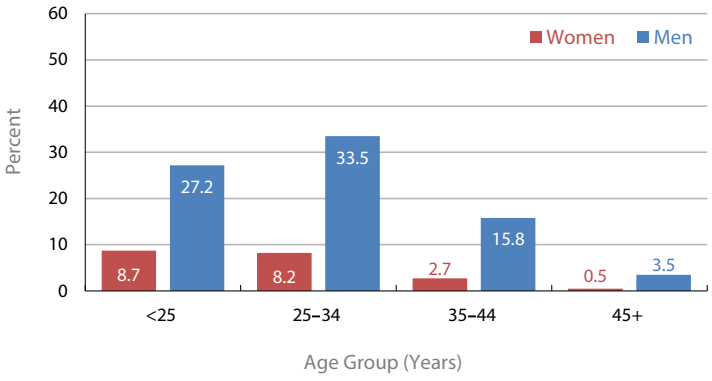
HEALTH INDEX MEASURES**

MEASURE	NAVY VALUE	DOD AVERAGE	DOD RANGE
Acute Injury (rate per 1,000)	188.9	264.5	188.9–328.0
Cumulative Traumatic Injury (rate per 1,000)	706.5	1,129.8	706.5–1,450.4
Heat Illness (%)	0.05	0.2	0.05–0.40
BH Disorder 1-Year (%)	7.9	8.4	6.8–10.0
BH Disorder Lifetime (%)	16.3	17.3	10.5–20.6
Hazardous Drinking (%)	**18.8**	13.3	7.8–20.3
STIs (rate per 1,000)	26.0	27.7	21.7–33.1
Sleep Disorders (%)	10.3	12.3	6.7–16.2
Obesity (%)	**23.2**	17.9	8.8–23.2
Acute Respiratory Infections (average rate per 1,000 per month)	21.7	23.3	20.5–28.7
Respiratory Symptoms (average rate per 1,000 per month)	5.3	6.7	5.0–8.4

ADDITIONAL INFORMATION

While injury, sleep disorders, and BH conditions remain important threats to Navy readiness, this report highlights obesity and hazardous drinking as important health concern among Sailors. Obesity contributes to hypertension, diabetes, coronary heart disease, stroke, cancer, all-cause mortality, and increased healthcare costs. It also contributes to failure of Sailors to meet physical fitness standards. Hazardous drinking can increase risk for adverse health events like stroke, damage to the liver, and cancer.

DEMOGRAPHICS



* Number of AC Service members, June 2019; see Appendix for details.

** See Appendix for details regarding measure computations. Bold values represent Service values above the DoD average.

Air Force

Service Profile (2019):*

Population: Approximately 327,000 Air Force Service members
77.3% under 35 years old, 20.6% female

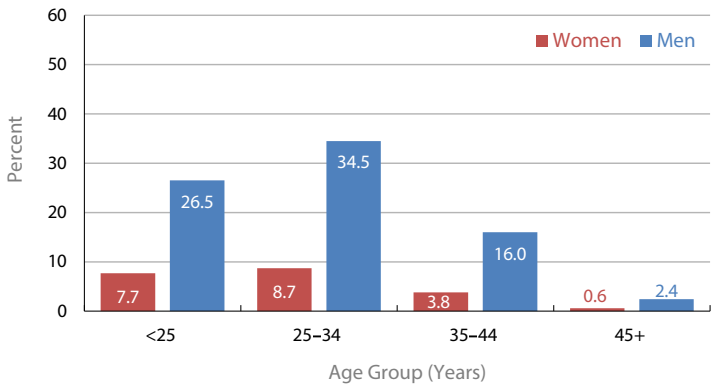
HEALTH INDEX MEASURES**

MEASURE	AIR FORCE VALUE	DOD AVERAGE	DOD RANGE
Acute Injury (rate per 1,000)	253.3	264.5	188.9–328.0
Cumulative Traumatic Injury (rate per 1,000)	**1,179.6**	1,129.8	706.5–1,450.4
Heat Illness (%)	0.06	0.2	0.05–0.40
BH Disorder 1-Year (%)	7.3	8.4	6.8–10.0
BH Disorder Lifetime (%)	**17.6**	17.3	10.5–20.6
Hazardous Drinking (%)	7.8	13.3	7.8–20.3
STIs (rate per 1,000)	21.7	27.7	21.7–33.1
Sleep Disorders (%)	11.9	12.3	6.7–16.2
Obesity (%)	**18.4**	17.9	8.8–23.2
Acute Respiratory Infections (average rate per 1,000 per month)	**28.7**	23.3	20.5–28.7
Respiratory Symptoms (average rate per 1,000 per month)	**8.4**	6.7	5.0–8.4

ADDITIONAL INFORMATION

In this analysis, acute respiratory infections, respiratory symptoms, cumulative traumatic injuries and obesity were found to affect Airmen at higher than average rates. Airmen should continue to take preventive measures to protect against respiratory infections, including social distancing and use of protective clothing and masks, particularly in the era of COVID-19. Future efforts to address obesity and repetitive microtrauma as separate conditions as well as efforts to better understand the interplay of these conditions also have the potential to improve the readiness of Airmen.

DEMOGRAPHICS



* Number of AC Service members, June 2019; see Appendix for details.

** See Appendix for details regarding measure computations. Bold values represent Service values above the DoD average.

Marine Corps

Service Profile (2019):*

Population: Approximately 186,000 Marine Corps Service members
88.7% under 35 years old, 8.9% female

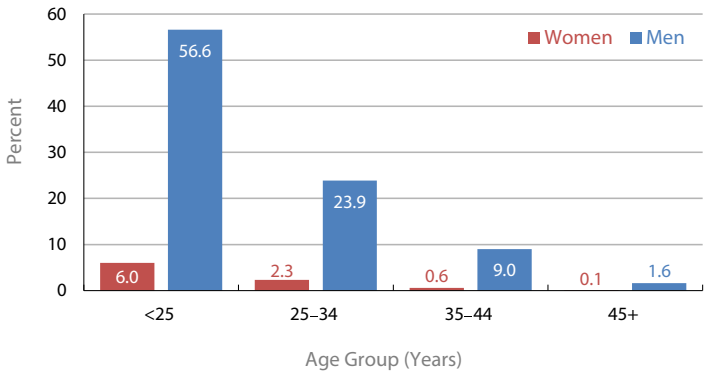
HEALTH INDEX MEASURES**

MEASURE	MARINE CORPS VALUE	DOD AVERAGE	DOD RANGE
Acute Injury (rate per 1,000)	258.3	264.5	188.9–328.0
Cumulative Traumatic Injury (rate per 1,000)	987.2	1,129.8	706.5–1,450.4
Heat Illness (%)	**0.4**	0.2	0.05–0.40
BH Disorder 1-Year (%)	6.8	8.4	6.8–10.0
BH Disorder Lifetime (%)	10.5	17.3	10.5–20.6
Hazardous Drinking (%)	**20.3**	13.3	7.8–20.3
STIs (rate per 1,000)	**27.8**	27.7	21.7–33.1
Sleep Disorders (%)	6.7	12.3	6.7–16.2
Obesity (%)	8.8	17.9	8.8–23.2
Acute Respiratory Infections (average rate per 1,000 per month)	**23.6**	23.3	20.5–28.7
Respiratory Symptoms (average rate per 1,000 per month)	5.0	6.7	5.0–8.4

ADDITIONAL INFORMATION

Marines have relatively low rates of BH diagnoses, sleep disorders, and obesity compared to the other Services. Heat illnesses, however, emerge as an important area of focus for prevention efforts. In addition, Marines had higher rates of hazardous drinking compared to Soldiers, Airmen, and Sailors. Attention to reducing heat illnesses as well as hazardous drinking could increase the mission readiness among Marines.

DEMOGRAPHICS



* Number of AC Service members, June 2019; see Appendix for details.

** See Appendix for details regarding measure computations. Bold values represent Service values above the DoD average.

METHODS

Injury

Data were derived from records routinely maintained in the DMSS. These records document ambulatory encounters and hospitalizations of AC Service members in fixed military and civilian (if reimbursed through the MHS) treatment facilities worldwide. Acute and cumulative traumatic injuries were identified using ICD-10-CM diagnosis codes from the U.S. Army Public Health Center's (APHC) 2020 Injury Taxonomy.[3] Service members were identified as having an injury if they had a qualifying injury diagnosis in any position of an inpatient or outpatient medical encounter. A 60-day gap rule was used to identify incident injuries. To be counted as a new case, at least 60 days must have passed since the last qualifying injury for the same nature of injury and body region affected, as defined by the injury taxonomy. Encounters with a documented "war"- or "battle"-related cause of injury were excluded from the analysis. Causes of injuries were assessed based on North Atlantic Treaty Organization Standard Agreement (STANAG) 2050 and ICD-10-CM "external cause of injury" codes. The denominator was all AC Service members during June of the year of interest.

Among those who were identified as an incident injury case in 2019, hospitalization status and total number of hospital bed days were determined. An individual was counted as being hospitalized for an acute or cumulative traumatic injury if they had an inpatient encounter in 2019 with an injury diagnosis in the primary diagnostic position. Bed days were calculated among all inpatient encounters with an injury diagnosis in the primary diagnostic position in 2019. In addition, for all incident injuries, the frequency and percentage of the nature of injury and body region affected were described.

Limitations:

1. The transition from International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) to ICD-10-CM in October 2015 presented a significant artifact for acute injury surveillance. ICD-10-CM has more than 15 times the number of acute injury codes than ICD-9-CM, and they are far more specific. It is not possible to directly compare rates of highly specific acute injuries captured in ICD-10-CM to the non-specific injuries captured in ICD-9-CM. For this reason, rates of acute injuries captured under ICD-9-CM were not reported here.
2. This report is meant to describe nondeployment-related injuries; however, some deployment-related injuries may have been captured if the war- or battle-related cause of injury was not documented.
3. Diagnosing an acute injury is subjective and provider-dependent. Incident and subsequent diagnoses rendered by different providers introduces error that can result in both undercounting and overcounting of injuries.
4. It is not always possible to differentiate incident injuries from reinjuries using surveillance data. The 60-day gap rule is sufficient for the vast majority of injuries, which are generally not severe, but may lead to overcounting of severe injuries if the subsequent encounters are erroneously coded as incident injuries.

Heat Illness

Data were derived from records routinely maintained in the DMSS. A case of heat illness was defined as having an inpatient or outpatient medical encounter with a diagnosis for heat stroke (ICD-9: 992.0; ICD-10: T67.0*) or heat exhaustion (ICD-9: 992.3–992.5; ICD-10: T67.3*–T67.5*) in the first or second diagnostic position or by having a reportable medical event report for heat illness. A service member could be counted as a case of heat illness once per calendar year. Heat stroke was prioritized over heat exhaustion if the individual had indication of both occurring in the same year. These methods are consistent with those applied in the annual *MSMR* reports on heat illness.[4] The denominator was all AC Service members during June of the year of interest.

Among those who were identified as a heat illness case in 2019, hospitalization status and total number of hospital bed days were determined. An individual was counted as being hospitalized for a heat illness if they had an inpatient encounter in 2019 with a heat illness diagnosis in the primary diagnostic position. Bed days were calculated among all inpatient encounters with a heat illness diagnosis in the primary diagnostic position in 2019.

Limitations:

1. Similar heat-related clinical illnesses are likely managed and reported differently at different locations and in different clinical settings.
2. Heat illness during deployment was not ascertained.
3. Reporting guidelines for heat illnesses were modified in the 2017 and 2020 revisions of the Armed Forces guidelines. In these updated guidelines, the heat injury category was removed, leaving only case classifications for heat stroke and heat exhaustion. This may cause some variations in reporting.

BH Disorders

Data were derived from records routinely maintained in the DMSS. Healthcare encounters of deployed Service members are documented in records that are maintained in the Theater Medical Data Store (TMDS), which is included in the DMSS. It is important to note that because the TMDS has not fully transitioned to ICD-10-CM, ICD-9-CM codes appear in this analysis.

Service members were identified as having a BH disorder if they had at least two BH disorder diagnoses (ICD-9-CM: 290–319; ICD-10-CM: F01-F99) within 365 days in any diagnostic position. However, diagnoses for post-concussion syndrome, intellectual disabilities, nicotine dependence, and pervasive and specific developmental disorders were excluded (ICD-9: 299*, 305.1, 310.2, 315*, 317* –319*; ICD-10-CM: F07.81, F70–F79, F17*, F80*–F82*, F84*, F88–F89).[6] Diagnoses could occur in inpatient, outpatient, or in-theater medical encounters. At least one of these diagnoses had to occur during of the year of interest. The denominator was all AC Service members during June of the year of interest.

For specific BH conditions (adjustment disorders, alcohol-related disorders, anxiety disorders, bipolar disorders, depressive disorders, psychoses, PTSD, and substance-related disorders), ICD-9-CM and ICD-10-CM codes from the AFHSD surveillance case definitions were used.[7] A Service member was considered to have a specific BH condition if they had two diagnoses for the same condition within 365 days of each other. At least one of these diagnoses had to occur during of the year of interest. The denominator was all AC Service members during June of the year of interest.

History ("lifetime" prevalence) of a BH disorder was also measured. Service members were considered to have a history of BH disorder if they had two BH disorder diagnoses within 365 days at any time between 2002 and 2019 and were in service during December 2019 (the last month of the surveillance period). The denominator was all AC Service members during December 2019.

Among those who were identified as a BH disorder case in 2019, hospitalization status and total number of hospital bed days were determined. An individual was counted as being hospitalized for a BH disorder if they had an inpatient encounter in 2019 with a BH disorder diagnosis in the primary diagnostic position. Bed days were calculated among all inpatient encounters with a BH disorder diagnosis in the primary diagnostic position in 2019.

Limitations:

1. Service members do not always seek or receive care for a BH condition within the MHS, and BH disorders may be underestimated here.
2. Some diagnoses may be miscoded or incorrectly transcribed on centrally transmitted records.
3. Some encounters (e.g., screening visits) may have been erroneously diagnosed or miscoded as BH disorders.

Hazardous Drinking

Screening for alcohol misuse is implemented in the Mental Health Assessment (MHA) portion of the PHA through the use of the Alcohol Use Disorders Identification Test-Consumption (AUDIT-C).[8] The AUDIT-C is a three-item alcohol screen that asks about frequency and amount of drinking. The AUDIT-C can help identify people with hazardous drinking behaviors or who have alcohol dependence or abuse.[16] The AUDIT-C is composed of the first three questions of the longer (10-item) AUDIT that ask about the frequency and amount of alcohol consumption. The response items for each of the three questions are scored from 0–4 points. The total AUDIT-C score is the sum of the responses to the three questions; possible AUDIT-C scores range from 0–12 points.

How often do you have a drink containing alcohol?

Never (0 points); Monthly or less (1); 2–4 times a month (2); 2 –3 times a week (3); 4 or more times a week (4)

How many drinks containing alcohol do you have on a typical day when you are drinking?

0 (0); 1 or 2 (0); 3 or 4 (1); 5 or 6 (2); 7 to 9 (3); 10 or more (4)

How often do you have six or more drinks on one occasion?

Never (0); Less than monthly (1); Monthly (2); Weekly (3); Daily or almost daily (4)

Adapted from: Bush K, Kivlahan DR, McDonell MB, Fihn SD, Bradley KA.[8]; Bradley KA, DeBenedetti AF, Volk RJ, Williams EC, Frank D, Kivlahan DR.[16]

A positive screen on the AUDIT-C was defined as a score of greater than or equal to 4 for men and a score of greater than or equal to 3 for women. Percentages of positive screens on the AUDIT-C were calculated among those who completed a PHA during the year of interest. If a service member completed more than one PHA in a given calendar year, the last PHA of the year was selected. Diagnoses for alcohol-related disorders, as well as hospitalizations and bed days for alcohol-related disorders, were assessed separately as part of the BH disorders analysis.

AUDIT-C information was obtained from the electronic PHA data housed in the DMSS. Service members are required to complete the PHA approximately annually in order to assess their health status and assist healthcare providers in making determinations about deployment readiness and recommendations for present or future care.

Limitations:

1. PHA data became available in DMSS beginning in calendar year 2018; however, completeness varies by Service and component.
2. Data are self-reported by the Service member, which may underestimate the true prevalence of hazardous drinking.

STIs

Diagnoses of STIs were ascertained from medical administrative data and reports of notifiable medical events routinely maintained in the DMSS for surveillance purposes. STI cases were also derived from positive laboratory test results recorded in the Health Level 7 (HL7) chemistry and microbiology databases maintained by the Navy and Marine Corps Public Health Center at the EpiData Center.

An incident case of chlamydia or trichomoniasis was defined by any of the following: 1) a case defining diagnosis of chlamydia (ICD-9: 099.41, 099.5*; ICD-10: A56*) or trichomoniasis (ICD-9: 131*; ICD-10: A59*) in the first or second diagnostic position of a record of an outpatient or in-theater medical encounter, 2) a confirmed notifiable disease report (for chlamydia only), or 3) a positive laboratory test for chlamydia or trichomoniasis (any specimen source or test type). An incident case of gonorrhea was similarly defined by 1) a case-defining diagnosis (ICD-9: 098*; ICD-10: A54*) in the first or second diagnostic position of a record of an inpatient, outpatient, or in-theater encounter, 2) a confirmed notifiable disease report for gonorrhea, or 3) a positive laboratory test for gonorrhea (any specimen source or test type). For each type of STI, an individual could be counted as having a subsequent case only if there were more than 30 days between the dates on which the case-defining diagnoses were recorded. These case definitions were derived from those used in the *MSMR* annual STI report.[9]

The denominator was all AC Service members during June of the year of interest.

Limitations:

1. STI cases may not be captured if coded in the medical record using symptom codes (e.g., urethritis) rather than STI-specific codes.
2. Cases may be underestimated because some affected Service members may be diagnosed and treated through nonreimbursed, non-military care providers (e.g., county health departments or family planning centers). In addition, laboratory tests that are performed in a purchased care setting, a shipboard facility, a battalion aid station, or an in-theater facility are not captured.
3. Differences in rates between Services may be at least partially due to different practices regarding screening, testing, treatment, and reporting.

Sleep Disorders

Data were derived from records routinely maintained in the DMSS; TMDS data were included. Service members were identified as having a sleep disorder if they had a diagnosis (Table 1) in any diagnostic position during the year of interest. It is important to note that because the TMDS has not fully transitioned to ICD-10-CM, ICD-9-CM codes appear in this analysis. The denominator was all AC Service members during June of the year of interest.

Limitations:

1. Service members do not always seek care for sleep disorders, and sleep disorders may be underrepresented here.
2. Increased screening associated with required medical encounters such as retirement and separation physicals may result in an increased frequency of diagnoses of sleep disorders.

Table 1. ICD-9-CM/ICD-10-CM codes used to identify sleep disorders.

	ICD-9-CM	ICD-10-CM
Any sleep disorder	780.5*, 327.00–327.02, 327.09, 327.10–327.15, 327.19, 327.2*,327.3*, 327.4*, 327.5*, 327.8, 347.*, 307.4*	G47*, F51*
Insomnia	780.52, 327.00, 327.01, 327.09	G47.0*
Hypersomnia	327.10–327.14, 327.19, 780.54	G47.1*
Circadian rhythm sleep disorders	327.30–327.37, 327.39, 780.55	G47.2*
Sleep apnea	327.20–327.27, 327.29, 780.51, 780.53, 780.57	G47.3*
Narcolepsy	347.00, 347.01, 347.10, 347.11	G47.4*
Parasomnia	327.40–327.44, 327.49	G47.5*
Sleep-related movement disorders	327.51–327.53, 327.59	G47.6*

*Represents any subsequent digit/character.

Obesity

The CDR vital sign table within the MDR was used to identify all records for AC Service members with a height and weight measurement available on the same day. Female Service members with an ICD-9-CM or ICD-10-CM code for pregnancy during any inpatient or outpatient encounter in the same year were excluded. Height and weight data were then matched to the AFHSD DMSS to identify the date of birth, sex, and Service for all records. If the Service member could not be identified in the DMSS or any demographic information was missing from the DMSS, then the height and weight record was excluded. Only the latest height and weight record for each Service member per year was retained. BMI was then calculated from height and weight. Records with BMI measurements less than 12 and greater than 45 and records with erroneous heights or weights (e.g., a weight of 8 pounds) were excluded from the analysis. Cases of obesity were assigned using BMI greater than or equal to 30, according to the CDC definition of obesity.[14]

The CDR vital sign table was used to assess BMI because not all Services had complete height and weight records available from Service members' Physical Fitness Tests (PFTs). This method of estimating obesity is similar to the Defense Health Agency's Better Health Prevalence Measure of overweight and obesity.[17]

Limitations:

1. Service members with higher lean body mass may be misclassified as obese based on their BMI.
2. Not all Service members had a height or weight measurement available in the CDR Vital sign data each year.
3. BMI measures should be interpreted with caution, as some of them can be based on self-reported height and weight.

Respiratory Conditions

Data were derived from records routinely maintained in the DMSS. Service members were identified as having an acute respiratory infection if they had an inpatient, outpatient, or TMDS encounter with a qualifying diagnosis (Table 2) in the first diagnostic position. For cases of respiratory symptoms, an individual was required to have an inpatient, outpatient, or TMDS encounter with a qualifying diagnosis (Table 3) in any diagnostic position. For both acute respiratory infections and respiratory symptoms, at least 14 days had to have passed between encounters to count as a new case. The denominator was AC Service members in service during the month and year of interest. To calculate rates among recruits, the denominator was the number of people with a recruit training period overlapping with the month and year of interest. To qualify as a case for a recruit, the qualifying encounter also needed to have occurred within the recruit training period.

Among those who were identified with an acute respiratory infection in 2019, hospitalization status and total number of hospital bed days were determined. An individual was counted as being hospitalized for an acute respiratory infection if they had an inpatient encounter in 2019 with an acute respiratory infection in the primary diagnostic position. Bed days were calculated among all inpatient encounters with an acute respiratory infection diagnosis in the primary diagnostic position in 2019.

Limitations:

1. Laboratory confirmation of cases was not ascertained.
2. Rates could be overestimated if miscoded as screening encounters.
3. Rates could be underestimated because of service members not seeking care for mild illness.

Table 2. ICD-9-CM/ICD-10-CM codes used to identify acute respiratory infections.

	ICD-9-CM	ICD-10-CM
Nasopharyngitis	460*	J00*
Sinusitis	461*	J01*
Acute pharyngitis	462*	J02*
Acute laryngitis and tracheitis	464.0, 464.10, 464.20, 464.30, 464.50	J04*
Acute obstructive laryngitis and epiglottitis	464.01, 464.11, 464.21, 464.31, 464.4, 464.51	J05*
Acute upper respiratory infections of unspecified site	465*	J06*
Influenza due to certain identified flu viruses	488*	J09*
Influenza due to other identified flu virus	487*	J10*
Influenza due to unidentified flu virus	NA (new code)	J11*
Viral pneumonia not elsewhere classified	480*	J12*
Pneumonia due to *Streptococcus pneumoniae*	481*	J13*
Pneumonia due to *Haemophilus influenzae*	482.2	J14*
Bacterial pneumonia not elsewhere classified	482*	J15*
Pneumonia due to other infectious organisms	484*, 483.0, 483.1, 483.8	J16*
Pneumonia unspecified organism	486, 485	J18*
Acute bronchitis	466	J20*
Acute bronchiolitis	466.1*	J21*
Unspecified acute lower respiratory tract infection	519.8	J22*
Acute tonsillitis	463, 034.0	J03*
Peritonsillar abscess	475	J36
Retropharyngeal and parapharyngeal abscess	478.22, 478.24	J39.0
Other abscess of pharynx	478.21	J39.1
Diphtheria	032.0, 032.1, 032.3, 032.9	A36.0, A36.1, A36.2, A36.9
Scarlet fever	34.1	A38*
Whooping cough	033.0, 033.9, 033.8	A37*
Adenovirus	NA (new code)	B34.0
Measles	055.0, 055.1, 055.2, 055.8, 055.9	B05*
Rubella	056.00, 056.01, 056.09, 056.79, 056.9	B06*
***Streptococcus* group A**	41.01	B95.0
***Streptococcus pneumoniae* as the cause of disease classified elsewhere**	41.09	B95.3
Mycoplasma pneumoniae	41.81	B96.0
Klebsiella pneumoniae	41.3	B96.1
Haemophilus influenzae	41.5	B96.3
Adenovirus	79	B97.0
Coronavirus	NA (new code)	B97.2
Respiratory syncytial virus (RSV)	79.6	B97.4
Otitis media	381.0*, 382.00, 382.01	H65.0*, H65.1*, H66.00*. H66.01*

*Represents any subsequent digit/character.
NA, not applicable.

Table 3. ICD-9-CM/ICD-10-CM codes used to identify respiratory symptoms.

	ICD-9-CM	ICD-10-CM
Cough	786.2	R05
Acute respiratory distress	NA	R06.03
Wheezing	786.07	R06.2
Sneezing	NA	R06.7
Sore throat	784.1	R07.0
Pleurodynia	786.52	R07.81
Pleurisy	511*	R09.1
Abnormal sputum	786.4	R09.3
Nasal congestion	NA	R09.81
Postnasal drip	784.91	R09.82
Fever	780.60	R50.9

*Represents any subsequent digit/character.

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