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Update: Routine Screening for Antibodies to Human Immunodeficiency Virus, U.S. Armed Forces, Active and Reserve Components, January 2017–June 2022

This report provides an update through June 2022 of routine screening results for antibodies to the human immunodeficiency virus (HIV) among members of the active and reserve components of the U.S. Armed Forces. During the full 5 and 1/2-year surveillance period, the HIV seropositivity rates for active component service members were 0.21 positives per 1,000 members of the Army, 0.24 for the Navy, 0.16 for the Marine Corps, and 0.14 for the Air Force. Among reserve service members the rates were 0.34 per 1,000 members of the Army reserve, 0.26 for the Navy reserve, 0.19 for the Marine Corps reserve, and 0.19 for the Air Force reserve. For members of the National Guard, the rates were 0.28 per 1,000 members of the Army Guard and 0.09 for the Air Force Guard. Across active and reserve components of all services, seropositivity rates continued to be higher among male than female service members.

What are the new findings?

From January 2017 through June 2022, the rates of HIV test positivity among uniformed personnel (active component, Guard, and reserve) remained relatively stable. Rates among female service members have remained very low compared to those of male service members.

What is the impact on readiness and force health protection?

For over 30 years, the routine screening for antibodies to HIV has enabled the U.S. military to provide adequate and timely medical care to infected service members, counseling to prevent unwitting transmission, and protection of the battlefield blood supply.

Since acquired immunodeficiency syndrome (AIDS) was first recognized as a distinct clinical entity in 1981,[1] its spread has had major impacts on the health of populations and health care systems worldwide. Human immunodeficiency virus type 1 (HIV-1) was identified as the cause of AIDS in 1983. For more than 30 years, the U.S. military has conducted routine screening for antibodies to HIV-1 to enable adequate and timely medical evaluations, treatment, and counseling; to prevent unwitting transmission; and to protect the battlefield blood supply.[2,3]

As part of the U.S. military's total-force HIV screening program, civilian applicants for military service are screened for antibodies to HIV during pre-accession medical examinations. Since 1986, all members of the active and reserve components of the U.S. Armed Forces have been periodically screened to detect newly acquired HIV infections. In 2004, the Department of Defense (DOD) set a standard testing interval of 2 years for all service members.[4,5] In addition, all military personnel are typically screened for HIV infection before deployment, upon return from deployment, and after having received a diagnosis of various other conditions, such as a sexually transmitted infection.[5] Routine HIV screenings are usually performed during the periodic health assessment, an annual evaluation of a service member's medical readiness status. Service members who are infected with HIV receive clinical assessments, treatments, and counseling.[2,3]

Before 2009, all of the aforementioned screening programs used laboratory techniques that detected only HIV-1-type infections. Starting in 2009, all programs adopted methods that allowed the detection of antibodies to both major HIV types (i.e., HIV-1 and HIV-2). Although HIV-2 infection is rare in the U.S., it is much more prevalent in other parts of the world where service members may be required to serve. To provide for the change in laboratory methods in the past and for the prospect of future detections of HIV-2 infection in the services' screening programs, this report will hereafter refer to the target of the screening programs as simply "HIV" without specifying the types.

Infection with HIV has historically been medically disqualifying for entry into U.S. military service. Additionally, active service members were restricted from deploying and were unable to be commissioned as officers if they tested positive for HIV.[6,7] However, in light of significant advances in the diagnosis, treatment, and prevention of HIV, the DOD changed its policy in June 2022 such that individuals living with HIV who are symptomatic and have an undetectable viral load will not have restrictions applied to their deployability or ability to be commissioned.[8]

This report summarizes numbers and trends of newly identified HIV-antibody seropositive cases among members of the active and reserve components of the U.S. Armed Forces from 1 January 2017 through 30 June 2022. Summaries of the results of routine screening for antibodies to HIV among civilian applicants before 2021 and active and reserve component members of the U.S. military since 1990 are available at www.health.mil/MSMRArchives.

Methods

The surveillance period was 1 January 2017 through 30 June 2022. The surveillance population included all individuals

who were screened for antibodies to HIV while serving in the active or reserve component of the Army, Navy, Air Force, or Marine Corps during the surveillance period.

All individuals who were tested and all first-time detections of antibodies to HIV through U.S. military medical testing programs were ascertained by matching specimen numbers and serologic test results using unique personal identifiers. All results were accessed from records routinely maintained in the Defense Medical Surveillance System (DMSS). Previous *Medical Surveillance Monthly Reports* (*MSMR)* presented HIV screening results for civilian applicants for military service. However, these data are no longer available in the DMSS, as the U.S. Military Entrance Processing Command (MEPCOM) stopped providing data to the DMSS after calendar year 2020.

An incident case of HIV-antibody seropositivity was defined as an individual with positive HIV test results on 2 different, serial specimens. For the sake of this report, individuals who had just 1 positive result but had not yet been tested a second time were counted as positive. Annual rates of HIV seropositivity among service members were calculated by dividing the number of incident cases of HIV-antibody seropositivity during each calendar year by the number of individuals in each component of each service branch who were tested at least once during the relevant calendar year.

Results

Overall

From January 2021 through June 2022, almost 2 million service members (active component, Guard, and reserve) were tested for antibodies to HIV, and 433 were identified as HIV-antibody position (seropositivity: 0.22 per 1,000 tested) (**data not shown**). Between 2017 and 2021, annual seropositivity rates fluctuated between a low of 0.19 per 1,000 tested in 2020 and 2022 and a high of 0.23 per 1,000 tested in 2017, 2019, and 2021. Of the 1,581 service members diagnosed with HIV infections since 2017, a total of 981 (62.0%) were still in military service in 2022.

U.S. Army

Active component: From January 2021 through June 2022, a total of 485,412 soldiers in the active component of the U.S. Army were tested for antibodies to HIV, and 119 soldiers were identified as HIV-antibody positive (seropositivity: 0.25 per 1,000 soldiers tested) **(Table 1)**. During the surveillance period, annual seropositivity rates fluctuated between a low of 0.17 per 1,000 tested in 2017 and a high of 0.28 per 1,000 tested in 2021 **(Table 1, Figure 1)**. Annual seropositivity rates for male active component soldiers were considerably higher than those of female active component soldiers **(Figure 1)**. During 2021, on average, 1 new HIV infection was detected among active component soldiers per 4,536 screening tests **(Table 1)**. Of the 390 active component soldiers diagnosed with HIV infections since 2017, a total of 250 (64.1%) were still in military service in 2022.

Army National Guard: From January 2021 through June 2022, a total of 293,580 members of the U.S. Army National Guard were tested for antibodies to HIV, and 71 soldiers were identified as HIV-antibody positive (seropositivity: 0.24 per 1,000 soldiers tested) **(Table 2)**. Among Army National Guard soldiers, annual seropositivity rates decreased from 2017 to 2018 (seropositivity rates: 0.32 and 0.24 per 1,000 soldiers tested, respectively), increased in 2019 (0.30 per 1,000 tested) and 2020 (0.32 per 1,000 tested), and then decreased in 2021 (0.27 per 1,000 tested) and during the first 6 months of 2022 (0.19 per 1,000 tested). On average, during 2021, 1 new HIV infection was detected among Army National Guard soldiers per 4,276 screening tests. Of the 307 National Guard soldiers who tested positive for HIV since 2017, a total of 180 (58.6%) were still in military service in 2022.

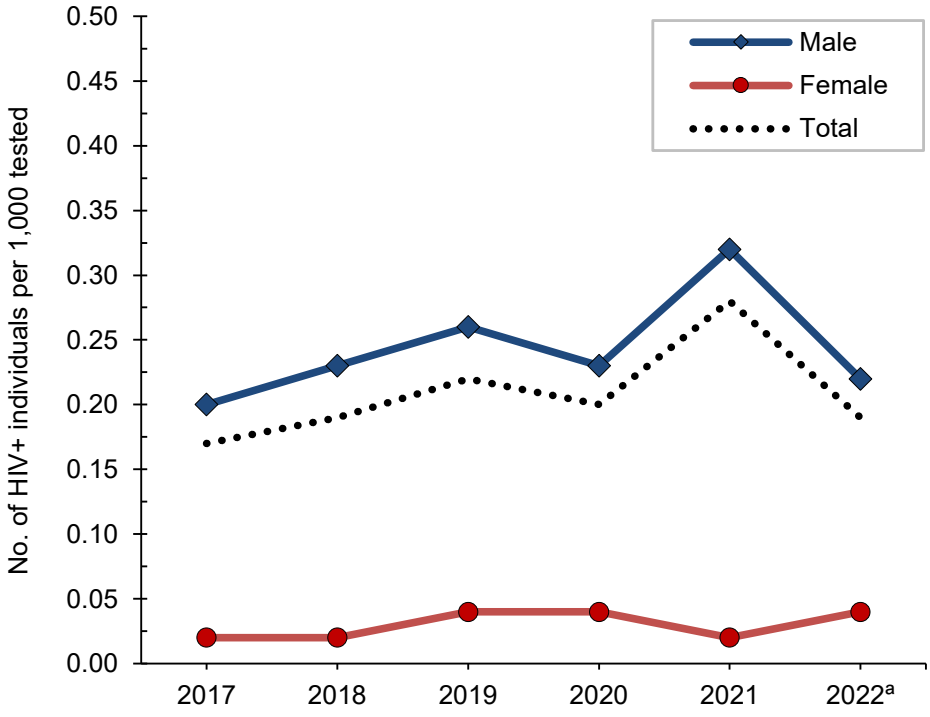
Army Reserve: From January 2021 through June 2022, a total of 150,607 members of the U.S. Army Reserve were tested for antibodies to HIV, and 47 soldiers were identified as HIV-antibody positive (seropositivity: 0.31 per 1,000 soldiers tested) **(Table 3)**. Among Army reservists during the surveillance period, seropositivity rates remained stable between 2017 and 2019 at 0.38 per 1,000 tested. This was followed by a considerable decrease in seropositivity rates in 2020 (0.24 per 1,000 tested), and an

TABLE 1. New diagnoses of HIV infections, by sex, active component, U.S. Army, January 2017–June 2022

Year	Total HIV tests	Total persons tested	Males tested	Females tested	Total new HIV(+)	New HIV(+) male	New HIV(+) female	Overall rate per 1,000 tested	Male rate per 1,000 tested	Female rate per 1,000 tested	HIV(+) still in military service in 2022
2017	435,663	351,106	297,034	54,072	**61**	60	1	**0.17**	0.20	0.02	27
2018	450,608	351,344	296,744	54,600	**68**	67	1	**0.19**	0.23	0.02	30
2019	439,663	345,697	289,764	55,933	**77**	75	2	**0.22**	0.26	0.04	41
2020	398,394	322,408	270,040	52,368	**65**	63	2	**0.20**	0.23	0.04	47
2021	403,695	323,494	270,863	52,631	**89**	88	1	**0.28**	0.32	0.02	75
2022[a]	179,824	161,918	134,854	27,064	**30**	29	1	**0.19**	0.22	0.04	30
Total	2,307,847	1,855,967	1,559,299	296,668	**390**	382	8	**0.21**	0.24	0.03	250

[a]Through 30 June 2022.
HIV, human immunodeficiency virus.

FIGURE 1. HIV-antibody seropositivity rates by sex, active component, U.S. Army, January 2017–June 2022



[a]Through 30 June 2022.
HIV, human immunodeficiency virus; No., number.

increase in 2021 (0.28 per 1,000 tested) and in the first 6 months of 2022 (0.39 per 1,000 tested). During 2021, on average, 1 new HIV infection was detected among Army reservists per 4,255 screening tests **(Table 3)**. Of the 193 Army reservists diagnosed with HIV infections since 2017, a total of 116 (60.1%) were still in military service in 2022.

U.S. Navy

Active component: From January 2021 through June 2022, a total of 319,005 active component members of the U.S. Navy were tested for antibodies to HIV, and 78 sailors were identified as HIV-antibody positive (seropositivity: 0.24 per 1,000 sailors tested) **(Table 4)**. Among tested male active component sailors, full-year annual HIV-antibody seropositivity rates decreased 47.4% between 2017 and 2020 **(Figure 2)**. Annual seropositivity rates increased in 2021 and decreased again in the first 6 months of 2022. During each year of the surveillance period, only 0 to 3 female sailors tested positive. During 2021, on average, 1 new HIV infection was detected among active component sailors per 4,490 screening tests **(Table 4)**. Of the 278 active component sailors who tested positive for HIV since 2017, a total of 181 (65.1%) were still in military service in 2022.

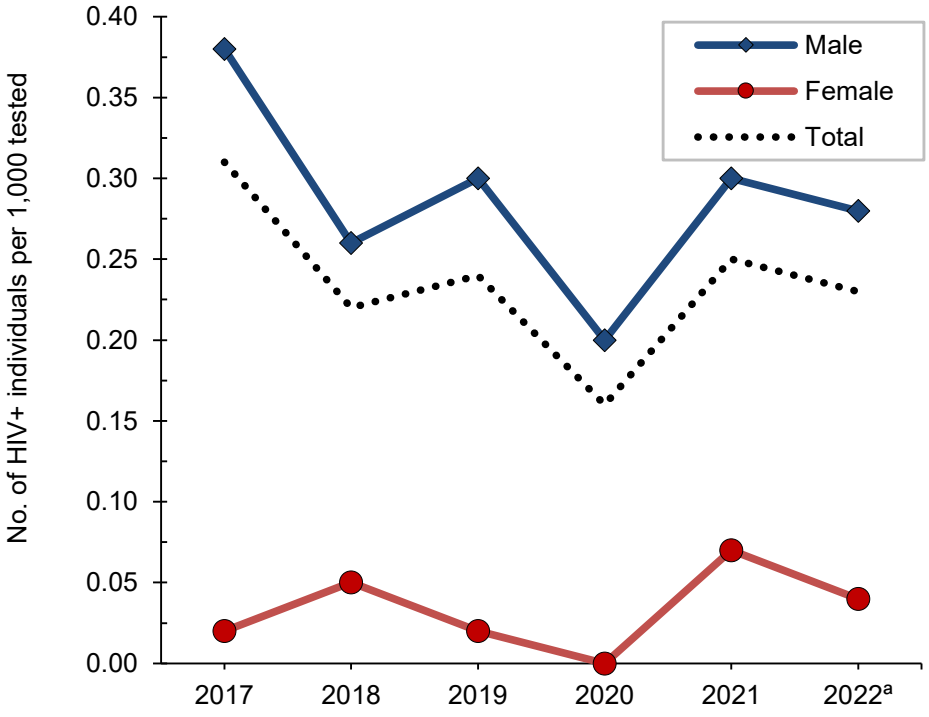
Navy Reserve: From January 2021 through June 2022, a total of 48,271 members of the U.S. Navy Reserve were tested for antibodies to HIV, and 14 sailors were identified as HIV-antibody positive (seropositivity: 0.29 per 1,000 sailors tested) **(Table 5)**. The HIV-antibody seropositivity rates among Navy reservists since 2017 peaked in 2021 (seropositivity rates: 0.36 per 1,000 sailors tested). Between 2008 and 2020, no female Navy reservist was detected with antibodies to HIV during routine testing **(data not shown)**. However, 2 female Navy reservists tested positive in 2021 and 1 tested positive in the first 6 months of 2022. On average, during 2021, 1 new HIV infection was detected among Navy reservists per 3,042 screening tests **(Table 5)**. Of the 47 reserve component sailors diagnosed with HIV infections since 2017, a total of 38 (80.9%) were still in military service in 2022.

TABLE 2. New diagnoses of HIV infections, by sex, U.S. Army National Guard, January 2017–June 2022

Year	Total HIV tests	Total persons tested	Males tested	Females tested	Total new HIV(+)	New HIV(+) male	New HIV(+) female	Overall rate per 1,000 tested	Male rate per 1,000 tested	Female rate per 1,000 tested	HIV(+) still in military service in 2022
2017	235,671	205,401	170,180	35,221	**65**	63	2	**0.32**	0.37	0.06	20
2018	235,505	205,455	168,553	36,902	**50**	49	1	**0.24**	0.29	0.03	22
2019	235,066	202,964	165,338	37,626	**60**	60	0	**0.30**	0.36	0.00	31
2020	215,750	189,980	153,437	36,543	**61**	58	3	**0.32**	0.38	0.08	41
2021	218,090	190,149	154,022	36,127	**51**	49	2	**0.27**	0.32	0.06	46
2022[a]	111,804	103,431	82,733	20,698	**20**	18	2	**0.19**	0.22	0.10	20
Total	1,251,886	1,097,380	894,263	203,117	**307**	297	10	**0.28**	0.33	0.05	180

[a]Through 30 June 2022.
HIV, human immunodeficiency virus.

FIGURE 2. HIV-antibody seropositivity rates by sex, active component, U.S. Navy, January 2017–June 2022



[a]Through 30 June 2022.
HIV, human immunodeficiency virus; No., number.

U.S. Marine Corps

Active component: From January 2021 through June 2022, a total of 181,113 members of the active component of the U.S. Marine Corps were tested for antibodies to HIV, and 26 Marines were identified as HIV-antibody positive (seropositivity: 0.14 per 1,000 Marines tested) **(Table 6)**. From January 2017 through June 2022, seropositivity rates of antibodies to HIV remained relatively low and stable among routinely tested Marines **(Figure 3)**. During 2021, on average, 1 new HIV infection was detected among active component Marines per 9,870 screening tests **(Table 6)**. Of the 114 active component Marines diagnosed with HIV infections since 2017, a total of 52 (45.6%) were still in military service in 2022.

Marine Corps Reserve: From January 2021 through June 2022, a total of 32,554 members of the U.S. Marine Corps Reserve were tested for antibodies to HIV, and 7 Marine Corps reservists were identified as HIV-antibody positive (seropositivity: 0.22 per 1,000 Marines tested) **(Table 7)**. During the surveillance period, seropositivity rates among Marine Corps were highest at 0.32 per 1,000 tested in 2017 and at 0.26 per 1,000 tested in 2021. Seropositivity rates reached a low in 2020 at 0.11 per 1,000 tested. Of note, only 1 female Marine Corps reservist tested positive for antibodies to HIV during routine screening in 2015; none were detected during 1990–2014 or during 2016–2022 (through June) **(data not shown)**. During 2021, on average, 1 new HIV infection was detected among Marine Corps reservists per 4,349 screening tests **(Table 7)**. Of the 24 Marine Corps reservists diagnosed with HIV infection since 2017, a total of 11 (45.8%) were still in military service in 2022.

U.S. Air Force

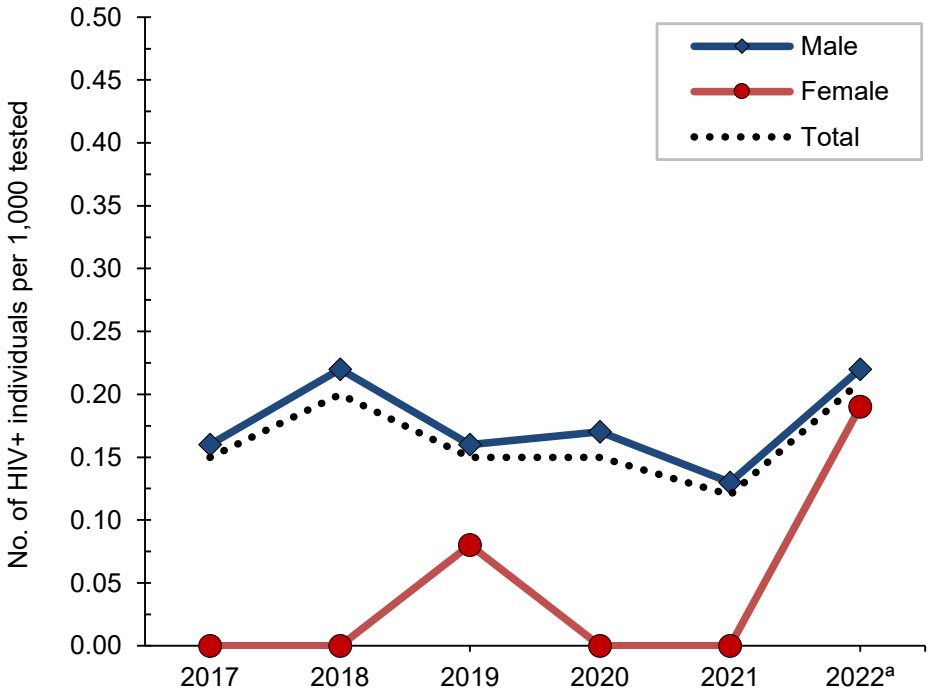
Active component: From January 2021 through June 2022, a total of 313,607 active component members of the U.S. Air Force were tested for antibodies to HIV, and 47 Air Force members were diagnosed with HIV infections (seropositivity: 0.15 per 1,000 Air Force members tested) **(Table 8)**. During the surveillance period, seropositivity rates

TABLE 3. New diagnoses of HIV infections, by sex, U.S. Army Reserve, January 2017–June 2022

Year	Total HIV tests	Total persons tested	Males tested	Females tested	Total new HIV(+)	New HIV(+) male	New HIV(+) female	Overall rate per 1,000 tested	Male rate per 1,000 tested	Female rate per 1,000 tested	HIV(+) still in military service in 2022
2017	119,373	108,249	82,689	25,560	**41**	40	1	**0.38**	0.48	0.04	12
2018	122,472	106,001	79,890	26,111	**39**	37	2	**0.37**	0.46	0.08	19
2019	125,894	109,318	81,954	27,364	**42**	40	2	**0.38**	0.49	0.07	28
2020	115,558	101,282	75,349	25,933	**24**	23	1	**0.24**	0.31	0.04	16
2021	119,126	101,450	75,575	25,875	**28**	28	0	**0.28**	0.37	0.00	22
2022[a]	52,925	49,157	36,589	12,568	**19**	19	0	**0.39**	0.52	0.00	19
Total	655,348	575,457	432,046	143,411	**193**	187	6	**0.34**	0.43	0.04	116

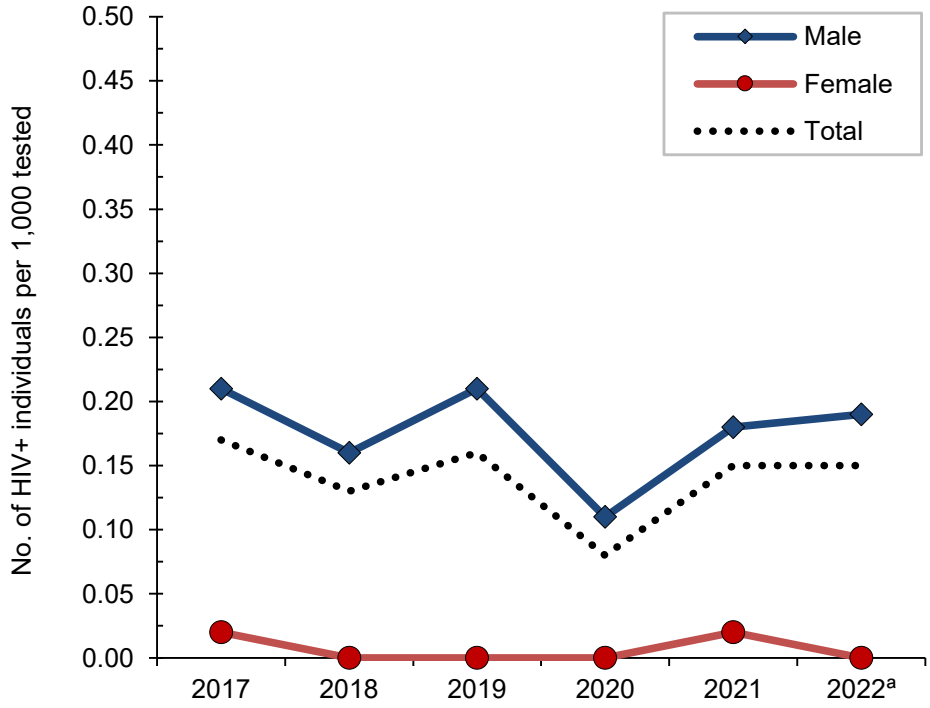
[a]Through 30 June 2022.
HIV, human immunodeficiency virus.

FIGURE 3. HIV-antibody seropositivity rates by sex, active component, U.S. Marine Corps, January 2017–June 2022



[a]Through 30 June 2022.
HIV, human immunodeficiency virus; No., number.

FIGURE 4. HIV-antibody seropositivity rates by sex, active component, U.S. Air Force, January 2017–June 2022



[a]Through 30 June 2022.
HIV, human immunodeficiency virus; No., number.

among male members ranged from a high of 0.21 per 1,000 tested in 2017 and 2019 to a low of 0.11 per 1,000 tested in 2020. **(Figure 4)**. Among female Air Force members during the surveillance period, annual seropositivity rates remained relatively low and stable. During 2021, on average, 1 new HIV infection was detected among active component Air Force members per 8,283 screening tests **(Table 8)**. Of the 159 active component Air Force members diagnosed with HIV infections since 2017, 99 (62.3%) were still in military service in 2022.

Air National Guard: From January 2021 through June 2022, a total of 89,774 members of the Air National Guard were tested for antibodies to HIV, and 9 Air National Guard members were diagnosed with HIV infections (seropositivity: 0.10 per 1,000 Air National Guard members tested) **(Table 9)**. In 2020, 1 female Air National Guard member was detected with antibodies to HIV, the first since 2010 **(data not shown)**. During 2021, on average, 1 new HIV infection was detected among Air National Guard members per 8,516 screening tests **(Table 9)**. Of the 31 Air National Guard members diagnosed with HIV infections since 2017, 26 (83.9%) were still in military service in 2022.

Air Force Reserve: From January 2021 through June 2022, a total of 55,104 members of the Air Force Reserve were tested for antibodies to HIV, and 15 Air Force reservists were diagnosed with HIV infections (seropositivity: 0.27 per 1,000 airmen tested) **(Table 10)**. During 2021, on average, 1 new HIV infection was detected among Air Force reservists per 2,774 screening tests **(Table 10)**. Of the 38 Air Force reservists diagnosed with HIV infections since 2017, 28 (73.7%) were still in military service in 2022.

Editorial Comment

The U.S. military has conducted routine screening for antibodies to HIV among all civilian applicants for service and all active and reserve component members of the services for more than 30 years.[2-5] Results of U.S. military HIV-antibody testing programs have been summarized in the *MSMR* for more than 2 decades.[9] Results of HIV screening among civilian applicants

TABLE 4. New diagnoses of HIV infections, by sex, active component, U.S. Navy, January 2017–June 2022

Year	Total HIV tests	Total persons tested	Males tested	Females tested	Total new HIV(+)	New HIV(+) male	New HIV(+) female	Overall rate per 1,000 tested	Male rate per 1,000 tested	Female rate per 1,000 tested	HIV(+) still in military service in 2022
2017	249,270	219,408	174,720	44,688	**67**	66	1	**0.31**	0.38	0.02	29
2018	252,551	216,850	172,712	44,138	**47**	45	2	**0.22**	0.26	0.05	24
2019	258,388	223,012	176,056	46,956	**54**	53	1	**0.24**	0.30	0.02	36
2020	224,636	199,516	156,114	43,402	**32**	32	0	**0.16**	0.20	0.00	23
2021	242,447	215,087	169,001	46,086	**54**	51	3	**0.25**	0.30	0.07	45
2022[a]	115,280	103,918	81,368	22,550	**24**	23	1	**0.23**	0.28	0.04	24
Total	1,342,572	1,177,791	929,971	247,820	**278**	270	8	**0.24**	0.29	0.03	181

[a]Through 30 June 2022.
HIV, human immunodeficiency virus.

TABLE 5. New diagnoses of HIV infections, by sex, U.S. Navy Reserve, January 2017–June 2022

Year	Total HIV tests	Total persons tested	Males tested	Females tested	Total new HIV(+)	New HIV(+) male	New HIV(+) female	Overall rate per 1,000 tested	Male rate per 1,000 tested	Female rate per 1,000 tested	HIV(+) still in military service in 2022
2017	40,532	34,769	27,260	7,509	**8**	8	0	**0.23**	0.29	0.00	4
2018	37,855	33,385	25,745	7,640	**10**	10	0	**0.30**	0.39	0.00	9
2019	38,728	34,390	26,478	7,912	**9**	9	0	**0.26**	0.34	0.00	7
2020	30,255	27,849	21,141	6,708	**6**	6	0	**0.22**	0.28	0.00	5
2021	36,508	33,193	25,057	8,136	**12**	10	2	**0.36**	0.40	0.25	11
2022[a]	16,159	15,078	11,420	3,658	**2**	1	1	**0.13**	0.09	0.27	2
Total	200,037	178,664	137,101	41,563	**47**	44	3	**0.26**	0.32	0.07	38

[a]Through 30 June 2022.
HIV, human immunodeficiency virus.

TABLE 6. New diagnoses of HIV infections, by sex, active component, U.S. Marine Corps, January 2017–June 2022

Year	Total HIV tests	Total persons tested	Males tested	Females tested	Total new HIV(+)	New HIV(+) male	New HIV(+) female	Overall rate per 1,000 tested	Male rate per 1,000 tested	Female rate per 1,000 tested	HIV(+) still in military service in 2022
2017	164,599	140,973	129,139	11,834	**21**	21	0	**0.15**	0.16	0.00	3
2018	157,613	135,989	123,707	12,282	**27**	27	0	**0.20**	0.22	0.00	8
2019	160,073	138,215	125,693	12,522	**21**	20	1	**0.15**	0.16	0.08	7
2020	140,684	123,777	112,651	11,126	**19**	19	0	**0.15**	0.17	0.00	12
2021	148,052	129,780	117,807	11,973	**15**	15	0	**0.12**	0.13	0.00	11
2022[a]	57,538	51,333	46,043	5,290	**11**	10	1	**0.21**	0.22	0.19	11
Total	828,559	720,067	655,040	65,027	**114**	112	2	**0.16**	0.17	0.03	52

[a]Through 30 June 2022.
HIV, human immunodeficiency virus.

TABLE 7. New diagnoses of HIV infections, by sex, U.S. Marine Corps Reserve, January 2017–June 2022

Year	Total HIV tests	Total persons tested	Males tested	Females tested	Total new HIV(+)	New HIV(+) male	New HIV(+) female	Overall rate per 1,000 tested	Male rate per 1,000 tested	Female rate per 1,000 tested	HIV(+) still in military service in 2022
2017	28,809	25,364	24,470	894	**8**	8	0	**0.32**	0.33	0.00	0
2018	27,009	22,987	22,214	773	**4**	4	0	**0.17**	0.18	0.00	1
2019	28,200	24,835	23,935	900	**3**	3	0	**0.12**	0.13	0.00	2
2020	19,372	17,875	17,143	732	**2**	2	0	**0.11**	0.12	0.00	2
2021	26,095	22,700	21,841	859	**6**	6	0	**0.26**	0.27	0.00	5
2022[a]	10,295	9,854	9,427	427	**1**	1	0	**0.10**	0.11	0.00	1
Total	139,780	123,615	119,030	4,585	**24**	24	0	**0.19**	0.20	0.00	11

[a]Through 30 June 2022.
HIV, human immunodeficiency virus.

TABLE 8. New diagnoses of HIV infections, by sex, active component, U.S. Air Force, January 2017–June 2022

Year	Total HIV tests	Total persons tested	Males tested	Females tested	Total new HIV(+)	New HIV(+) male	New HIV(+) female	Overall rate per 1,000 tested	Male rate per 1,000 tested	Female rate per 1,000 tested	HIV(+) still in military service in 2022
2017	254,725	202,787	161,718	41,069	**35**	34	1	**0.17**	0.21	0.02	12
2018	258,664	207,702	164,671	43,031	**27**	27	0	**0.13**	0.16	0.00	12
2019	262,909	209,420	164,487	44,933	**34**	34	0	**0.16**	0.21	0.00	20
2020	243,733	194,493	152,341	42,152	**16**	16	0	**0.08**	0.11	0.00	14
2021	256,777	208,357	162,350	46,007	**31**	30	1	**0.15**	0.18	0.02	25
2022[a]	118,853	105,250	82,212	23,038	**16**	16	0	**0.15**	0.19	0.00	16
Total	1,395,661	1,128,009	887,779	240,230	**159**	157	2	**0.14**	0.18	0.01	99

[a]Through 30 June 2022.
HIV, human immunodeficiency virus.

TABLE 9. New diagnoses of HIV infections, by sex, U.S. Air National Guard, January 2017–June 2022

Year	Total HIV tests	Total persons tested	Males tested	Females tested	Total new HIV(+)	New HIV(+) male	New HIV(+) female	Overall rate per 1,000 tested	Male rate per 1,000 tested	Female rate per 1,000 tested	HIV(+) still in military service in 2022
2017	67,843	58,819	46,913	11,906	**5**	5	0	**0.09**	0.11	0.00	4
2018	71,244	61,315	48,880	12,435	**4**	4	0	**0.07**	0.08	0.00	3
2019	67,339	58,867	46,279	12,588	**7**	7	0	**0.12**	0.15	0.00	5
2020	67,957	58,982	46,182	12,800	**6**	5	1	**0.10**	0.11	0.08	5
2021	68,124	60,321	47,175	13,146	**8**	8	0	**0.13**	0.17	0.00	8
2022[a]	31,228	29,453	23,027	6,426	**1**	1	0	**0.03**	0.04	0.00	1
Total	373,735	327,757	258,456	69,301	**31**	30	1	**0.09**	0.12	0.01	26

[a]Through 30 June 2022.
HIV, human immunodeficiency virus.

TABLE 10. New diagnoses of HIV infections, by sex, U.S. Air Force Reserve, January 2017–June 2022

Year	Total HIV tests	Total persons tested	Males tested	Females tested	Total new HIV(+)	New HIV(+) male	New HIV(+) female	Overall rate per 1,000 tested	Male rate per 1,000 tested	Female rate per 1,000 tested	HIV(+) still in military service in 2022
2017	39,788	35,252	25,970	9,282	**6**	6	0	**0.17**	0.23	0.00	3
2018	41,402	36,816	26,975	9,841	**4**	4	0	**0.11**	0.15	0.00	1
2019	42,220	37,056	26,859	10,197	**7**	7	0	**0.19**	0.26	0.00	5
2020	38,952	33,955	24,611	9,344	**6**	6	0	**0.18**	0.24	0.00	4
2021	41,604	37,443	27,033	10,410	**15**	14	1	**0.40**	0.52	0.10	15
2022[a]	18,932	17,661	12,709	4,952	**0**	0	0	**0.00**	0.00	0.00	0
Total	222,898	198,183	144,157	54,026	**38**	37	1	**0.19**	0.26	0.02	28

[a]Through 30 June 2022.
HIV, human immunodeficiency virus.

for service were last summarized in the September 2021 issue of the MSMR.[10]

This report documents that full-year HIV-antibody seropositivity rates among members of the active components ranged from 0.08 per 1,000 tested (Air Force, 2020) to 0.31 per 1,000 tested (Navy, 2017). Full-year seropositivity rates among the reserve/Guard components fluctuated between 0.07 per 1,000 tested (Air National Guard, 2018) and 0.40 per 1,000 tested (Air Force Reserve, 2021); the greatest variations in full-year seropositivity rates were observed among Marine Corps reservists. Full-year seropositivity rates peaked in 2021 for active component service members of the Army, in 2017 for the Navy, in 2018 for the Marine Corps, and in 2017 for the Air Force. Among reserve and National Guard members, full-year seropositivity peaked in 2021 for the Air Force National Guard, in 2021 for the Air Force reserve, in 2017 for the Marine Corps reserve, in 2021 for the Navy reserve, in 2017 and 2019 for the Army reserve, and in 2017 and 2020 for the Army National Guard. Overall (January 2017–June 2022) HIV-antibody seropositivity rates were highest among Army reservists, Army National Guard members, and Navy reservists and lowest among Air National Guard members, Marine Corps active component members, and Air Force active component members. Across active and reserve components of all services, seropositivity rates continued to be higher among male than female service members.

There are several limitations that should be considered when interpreting the results of the current analysis. For example, because of the frequency of screening in the military (as an applicant, routinely every 2 years, and before and after overseas deployments), routine screening now detects relatively recently acquired HIV infections (i.e., infections acquired since the most recent negative test of each affected individual). As such, annual HIV-antibody seropositivity rates obtained during routine screening of military populations are reflective of, but are not direct unbiased estimates of, incidence rates and acquisition trends of HIV infections among military members.

In summary, the U.S. military has conducted comprehensive HIV prevention, education, counseling, and treatment programs for more than 30 years. Since the beginning of these programs, routine screening of all civilian applicants for service and routine periodic testing of all active and reserve component members of the services have been fundamental components of the military's HIV control and clinical management efforts.[11] Summaries of results of screening programs such as those in this report provide insights into the current status and trends of the impact of HIV in various U.S. military populations.

Given the consistently low detection rates associated with routine screening of the entire military force, future studies may be undertaken to describe healthcare seeking behaviors among those service members most at risk of subsequent infection. Results of such studies might identify opportunities for indications-based testing in lieu of universal testing.

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Evaluation of the *MSMR* Surveillance Case Definition for Incident Cases of Hepatitis C

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The validity of military hepatitis C virus (HCV) surveillance data is uncertain due to the potential for misclassification introduced when using administrative databases for surveillance purposes. The objectives of this study were to assess the validity of the surveillance case definition used by the *Medical Surveillance Monthly Report (MSMR)* for HCV, the over and underestimation of cases from surveillance data, and the true burden of HCV disease in the U.S. military. This was a validation study of all potential HCV cases in the active component U.S. military from calendar year 2019 obtained using several different data sources: 1) outpatient, inpatient, and reportable medical event (RME) records in the Defense Medical Surveillance System, 2) Health Level 7 (HL7) laboratory data obtained from the Navy Marine Corps Public Health Center, and 3) chart review of the electronic medical records of all potential HCV cases, to include those from privately-sourced care. The sensitivity of the *MSMR* case definition was 83.6% and the positive predictive value (PPV) was 60.0%. This study suggests that the U.S. military should have confidence that the previous estimates derived using the *MSMR* surveillance case definition were moderately close to the true burden of incident chronic HCV infection (the true incidence of chronic disease being about 27% lower), but these reports likely dramatically overestimate the incidence of acute HCV. Since HCV was selected as an RME to guide public health action, it is most suitable to invest public health efforts in strengthening the use of confirmed RMEs as the surveillance case definition.

What are the new findings?

A total of 61 active component U.S. military service members were confirmed as cases of active HCV infection in 2019, which was 28% lower than the number of individuals who met the *MSMR* case definition for HCV in the same year (n=85).

What is the impact on readiness and force health protection?

This study suggests that the U.S. military should have confidence that the previous estimates derived using the *MSMR* surveillance case definition were moderately close to the true burden of incident chronic HCV infection, but these reports likely dramatically overestimate the incidence of acute HCV.

Untreated hepatitis C virus (HCV) infection not only poses risks to the health and readiness of those military service members who have already been infected, but it also poses a risk of transmission to previously uninfected service members when utilizing the walking blood bank where whole blood transfusions are given during emergency situations in combat.[1] U.S. military force health protection posture to counter these risks is informed by accurate and timely surveillance reporting. However, the validity of the HCV surveillance data presented in previous issues of the *MSMR*[2] is uncertain due to the potential for misclassification introduced when using administrative databases for surveillance purposes. This uncertainty arises because of the complexity and difficulty in extracting the necessary data to accurately and completely identify confirmed cases from administrative data according to criteria established by either the Department of Defense (DOD) reportable medical event (RME) surveillance[3] or the Centers for Disease Control and Prevention (CDC) notifiable diseases.[4,5] Specifically, national HCV guidelines state that "A test to detect HCV viremia is therefore necessary to confirm active HCV infection and guide clinical management, including initiation of HCV treatment."[6] However, ascertainment and use of laboratory data from the military health system (MHS) electronic medical records (EMR) systems to confirm HCV poses challenges for health surveillance. Laboratory results may be entered as free text fields and are not standardized across facilities or over time. Extractions from laboratory databases are computationally and labor intensive, and the potential cases that are identified still require validation to ensure they are correctly classified, as noted in a previous *MSMR* report.[7] Further difficulty arises in that approximately one-fifth of medical encounters for active component service members in 2021 occurred in privately-sourced care outside of MHS direct care facilities (Dr. S. Stahlman, written communication, 2 September 2022). For those patients, the data available for surveillance purposes are often restricted to documentation required for medical billing, including diagnostic codes from outpatient and inpatient visits and prescriptions

for HCV medications. Records from privately-sourced care may be uploaded into the EMR's Health Artifact and Imaging Management Solution (HAIMS); however, even when available these records are only available in portable document format (PDF), making the data they contain even more difficult to extract for surveillance purposes.

For these reasons, the HCV surveillance case definition used by the Armed Forces Health Surveillance Division (AFHSD) has excluded laboratory data. The current *MSMR* HCV surveillance case definition includes any of the following: 1) one reportable medical event of a confirmed case of HCV, 2) one hospitalization for HCV in any diagnostic position, or 3) two outpatient visits for HCV within 90 days of each other in any diagnostic position.[8] Nevertheless, the aforementioned data limitations contribute to uncertainty about the validity of this HCV surveillance case definition, hindering the application of surveillance findings towards public health action. For example, HCV estimates from a previous report published in the *MSMR*[2] were compared to estimates obtained from other unpublished military data sources, and discrepancies were observed. The objective of this study was therefore to assess the validity of the *MSMR*'s surveillance case definition for HCV, the over and underestimation of cases from surveillance data, and the true burden of HCV disease in the U.S. military. This information will also be used to update the surveillance case definition for HCV used in *MSMR* reports.

Methods

This was a validation study of all potential HCV cases in the active component U.S. military from calendar year 2019 obtained using the following data sources: 1) the Defense Medical Surveillance System (DMSS) using the *MSMR* surveillance case definition for HCV, 2) Health Level 7 (HL7) laboratory data obtained from the Navy Marine Corps Public Health Center (NMCPHC) case-finding algorithm designed to identify all tests which were HCV RNA positive, and 3) chart review for all potential HCV cases of all outpatient and inpatient records in the EMR, to include those from privately-sourced care in HAIMS. This project was reviewed and approved by the Uniformed Services University Institutional Review Board. Data from the DMSS included HCV type (acute, chronic), dates of diagnoses, demographics (race, gender, service, age at diagnosis), report type (inpatient, outpatient, RME), number of visits by HCV type, and HCV diagnostic position for each visit. Laboratory surveillance data obtained from the NMCPHC case-finding algorithm included laboratory test type, dates, and results, as described previously.[7]

Cases were validated by the two physician authors through chart review of military electronic medical records, with an emphasis on laboratory confirmation; reason for testing and type of HCV (acute or chronic) were also assessed. Cases were assessed as valid if they met the CDC case definition for notifiable diseases as a confirmed case of chronic or acute HCV. The CDC and DOD case definitions for confirmatory evidence of HCV both include a positive nucleic acid test (NAT) for HCV RNA, which includes qualitative, quantitative, or genotype testing. Cases may also be confirmed (uncommonly) by either a positive HCV antigen test or anti-HCV test conversion (from negative to positive within a 12 month period).[3-5] Active cases were defined as those with confirmed acute or chronic HCV.

The PPV and sensitivity of the *MSMR* case definition were assessed using the definitions established by CDC for the evaluation of surveillance systems.[9] The PPV was defined as the proportion of individuals with confirmed HCV disease among the total number identified by the case finding method (e.g., the MSMR case definition). The sensitivity was defined as the proportion of individuals identified by the case finding method (e.g., the MSMR case definition) among the total number of confirmed cases identified by either the *MSMR* case definition or the laboratory algorithm. PPV and sensitivity were assessed overall and according to the type of record (or combination of record types), position of the HCV diagnosis code, and number of HCV encounters. Correction factors were obtained from the assessment of confirmed cases identified using the *MSMR* case definition and false negative individuals identified only by the laboratory case-finding algorithm. These correction factors were then applied to the total population of cases identified using the *MSMR* surveillance case definition to obtain weighted estimates of the true burden of HCV.[10]

Results

There were 85 unique individuals from 2019 who met the *MSMR* case definition for HCV, all of whom were selected for chart review **(Table 1)**. Of these, 8 were classified as both acute and chronic HCV cases, as the *MSMR* case definition allows for these both to be counted if the acute diagnosis comes first.[8] If tabulated as in previous reports,[2] this would have resulted in 83 possible chronic and 10 possible acute cases, for a total of 93 possible cases **(data not shown).** All 85 individuals who met the *MSMR* case definition were asymptomatic, although two were discovered as part of a workup for elevated liver function tests. However, for these 2 individuals, their total bilirubin remained <3 and alanine transaminase (ALT) < 100; therefore, none of the individuals were found to have confirmed acute HCV. Thus, a total of 51 confirmed chronic cases and no confirmed acute cases were identified among those individuals who met the *MSMR* case definition in 2019 **(Table 1)**. All 34 unique individuals who were identified by the *MSMR* case definition but not confirmed from chart review had a positive HCV antibody test and a negative RNA confirmatory test, indicating cured infection or possibly a false positive antibody test.

Of the 51 confirmed cases identified by the *MSMR* case definition, 49 (96%) were provided direct care in MHS facilities, the other 2 received privately-sourced care. Twenty-eight of the 51 confirmed cases were immediately discharged from military service: 17 who were identified in basic training, 4 at retirement, and 7 during discharge for illegal substance use. Of the 19 confirmed HCV cases which were not reported as RMEs, 5 were found as

TABLE 1. Assessment of *MSMR* case definition validity, active component U.S. military service members, 2019

Case finding method	Active HCV, confirmed by chart review	No evidence of active HCV from chart review	Total
Identified by the *MSMR* case definition	51	34	85
Not identified by the *MSMR* case definition[a]	10	13	23
Total	61	47	108

[a]Not identified by the *MSMR* case definition but from the NMCPHC laboratory HCV case-finding algorithm

part of a substance use workup, 4 as part of a blood donation in Army or Air Force basic training, 2 during other blood donation screening, four at time of retirement or medical discharge from service, 2 as part of a screening for sexually transmitted infections, and two had no relevant characteristics **(data not shown)**.

There were also 51 individuals from the same year who were found to be possible HCV cases based on NMCPHC laboratory case-finding algorithm; all of these were chart-reviewed as well. Thirty-eight (75%) of these individuals were found to have confirmed HCV, and all were chronic HCV. Of the 38 individuals with confirmed chronic HCV identified by the laboratory case-finding algorithm, 28 were also identified using the *MSMR* case definition **(data not shown)**.

The total number of individuals with confirmed HCV among the active component U.S. military in 2019 was thus 61, of which 10 (16%) were not identified by the *MSMR* case definition; these data are summarized in **Table 1**. The sensitivity of the *MSMR* case definition was 83.6% (51 of 61 total confirmed individuals were identified by the *MSMR* case definition) and the PPV was 60.0% (51 of 85 individuals meeting the *MSMR* case definition were confirmed). In contrast, the NMCPHC laboratory case-finding algorithm resulted in a sensitivity of 62.3% (38 of 61 confirmed individuals were identified by the laboratory algorithm) and a PPV of 74.5% (38 of 51 individuals identified by the laboratory algorithm were confirmed).

The *MSMR* case correction factor was 60.0% (95% CI: 49-70%), and the *MSMR* non-case correction factor was 43.5% (95% CI: 23-66%). These are the proportions of confirmed cases from the total number of potential HCV cases which were and were not identified by the *MSMR*'s HCV case definition, respectively. After applying the correction factors, the ratio of individuals with confirmed HCV (n=61) to those meeting the *MSMR* case definition (n=85) was 0.72 (95% CI: 0.60-0.84), meaning that the number of unique individuals with incident HCV in the active component military was 28% lower than that suggested by the number identified using the *MSMR* case definition. Equivalently, the *MSMR* case definition resulted in 39% overreporting of individuals with active HCV compared to the true estimate of confirmed cases.

Since previous *MSMR* reports presented HCV surveillance data separately for acute and chronic HCV rather than active infection,[2] this analysis estimated the amount of misclassification for each type. Since none of the acute HCV cases were confirmed, the *MSMR* case definition used in previous reports overestimated acute HCV incidence by 100%. In contrast, the number of confirmed cases of chronic HCV (n=61) was 27% lower than that identified by the *MSMR* case definition (n=83).

The distribution of records by inclusion criteria for the *MSMR* HCV case definition are shown in **Table 2**. All record types were seen to have significant limitations in validity of diagnosis, with RMEs having the highest PPV (74.4%) for confirmed cases and inpatient records having the lowest (33.3%). Various combinations of record types resulted in increased sensitivity but reduced PPV compared to RME records. For example, of the 80 individuals who had an RME or an outpatient HCV record, 50 were confirmed, with a PPV of 62.5% and a sensitivity of 82.0%. Nevertheless, this was only slightly different than the existing *MSMR* case definition (PPV=60.0%, sensitivity=83.6%), and would result in similar overcounting of HCV if used for surveillance in the absence of chart review (80 individuals with RME or outpatient records compared to 61 individuals with confirmed HCV). In contrast, outpatient and RME records alone slightly undercounted the true incidence of confirmed HCV, while inpatient records dramatically undercounted this incidence. Of those 67 who only had six visits or less with an HCV diagnosis, 34 (51%) had confirmed HCV. Of the 18 who had seven or more visits, 16 (89%) had confirmed HCV **(data not shown)**.

Editorial Comment

The number of individuals with confirmed active HCV infection in the active component U.S. military was 61 in 2019, which was 28% lower than the number of unique individuals who met the *MSMR* case definition for HCV the same year (n=85). This is because only 60% of cases identified using the *MSMR* case definition were found to be confirmed, and 16% of confirmed cases were not identified by the *MSMR* case definition. However, the degree of misclassification was heterogeneous by HCV type (acute or chronic). None of the 10 cases which the *MSMR* case definition identified as acute HCV were found to be confirmed as acute, suggesting that all of these cases may also have been misclassified in previous reports.[2] Furthermore, only 61 cases of chronic HCV were confirmed in 2019, which was 27% lower than the number of chronic cases identified by the *MSMR* case definition (n=83), suggesting that the true incidence of chronic HCV in previous years was of a similarly lower

TABLE 2. Number of individuals meeting elements of the inclusion criteria for the MSMR HCV case definition by record type, assesssed by measures of performance, active component U.S. military service members, 2019

Case finding record type	Total individuals	Individuals with confirmed, active HCV[a]	PPV[b]	Sensitivity[c]
	No.	No.	%	%
Case identification by individual record type				
RME	43	32	74.4%	52.5%
Inpatient record	9	3	33.3%	4.9%
First diagnostic position	2	2	100.0%	
Second diagnostic position	4	1	25.0%	
Third or later diagnostic position	3	0	0.0%	
Outpatient record	55	34	61.8%	55.7%
First diagnostic position	43	29	67.4%	
Second diagnostic position	9	5	55.6%	
Third or later diagnostic position	3	0	0.0%	
Case identification by combined record type				
RME or inpatient record	51	34	66.7%	55.7%
RME or outpatient record	80	50	62.5%	82.0%
Inpatient or outpatient record	60	35	58.3%	57.4%
RME, inpatient record, or outpatient record[d]	85	51	60.0%	83.6%

[a] Individuals with active HCV confirmed by chart review, by type of record used for case finding.
[b] The percent of service members with active HCV confirmed by chart review, out of the total number of individuals identifed by the respective case finding method.
[c] The percent of service members with active HCV confirmed by chart review, out of the total number of individuals identified by the *MSMR* case definition or the NMCPHC laboratory HCV case-finding algorithm and also confirmed by chart review (n=61).
[d] Represents current *MSMR* case definition.
HCV, hepatitis C virus; RME, reportable medical event; PPV, positive predictive value

magnitude. The sensitivity and PPV varied according to the combinations of record types, and increases in sensitivity resulted in decreases in PPV (and vice versa). Estimates of HCV incidence in the U.S. military should account for this overreporting of both chronic and acute cases. Since no confirmed acute cases were identified, *MSMR* surveillance should only perform surveillance on chronic HCV or simply refer to it as HCV (unspecified)—with a note that all or nearly all are chronic cases.

The NMCPHC laboratory surveillance and *MSMR* surveillance case finding algorithms demonstrated similar results and conclusions, and both have significant limitations in sensitivity and PPV. However, current informatics capabilities make the laboratory-based surveillance time-consuming and difficult, and therefore is likely impractical in most situations. This study revealed that the likely reason some cases were not reported during the previous lab-based study[7] was that they were excluded from the analysis as they did not remain on active duty past 1 January 2020; i.e., they were discharged from basic training, retired, or were discharged due to illegal substance use. However, some may have also been missed by the lab algorithm since many may have been ordered in settings known to have limitations when used for surveillance purposes, such as privately-sourced care, blood donation, shipboard facilities, and in-theater facilities.[11] Nevertheless, in accordance with CDC's HCV surveillance guidelines, DOD should establish a method to receive hepatitis C laboratory data and ensure it is entered into its RME system to improve the accuracy and completeness of HCV reporting, preferably through an automated electronic laboratory reporting system.[12]

The main limitation of this report is the absence of a true "gold standard" for HCV case status. The chart review adds further clarification on classification of chronic and acute infection; however, the potential for referrals to privately-sourced care facilities likely contributes to incomplete review of all electronic medical records. Thus, reliance on chart review for confirmation of infection may also be vulnerable to persistent misclassification and underestimation of the true burden of HCV disease.

This study suggests that the U.S. military should have confidence that the previous estimates derived using the *MSMR* surveillance case definition were moderately close to the true burden of incident chronic HCV infection (the true incidence being about 27% lower), but these reports likely dramatically overestimate acute HCV. For surveillance purposes, it is most important to maintain consistency in disease reporting standards to identify trends and factors which can be used to evaluate public health programs and guide policies and public health action. Since no single

or combination of report types resulted in high sensitivity or PPV, several of the case definitions studied could be reasonably chosen as a surveillance case definition. Since HCV was selected as an RME to guide public health action, it is most suitable to invest public health efforts in strengthening the use of confirmed RMEs as the surveillance case definition. RMEs had the highest PPV of any of the case report types studied here, an intermediate level of sensitivity compared to other case report types, and a similar magnitude of reported cases (n=43) compared to the true disease burden (n=61). Furthermore, public health personnel are the ideal group to improve disease reporting and to ensure all laboratory confirmed cases meet the case definition, as this group supports and inputs the RME data. Finally, HCV RMEs are most similar to the notifiable conditions used by the states and CDC, making this report type the most directly comparable to other civilian HCV surveillance reports.[13]

Nevertheless, any case definition selected for surveillance purposes in future reports will need to acknowledge the likelihood of disease under or overreporting. For example, if confirmed RMEs are used as the surveillance case definition, reports should acknowledge in the limitations section that the true disease burden is likely to be on the order of 42% higher. Public health personnel can use the information in this report to improve both surveillance data accuracy and completeness. In addition to the automated laboratory reporting described above, efforts at communicating with health care personnel providing substance use treatment, blood donations, or discharge physicals may improve HCV reporting. Future reports should also acknowledge the difficulty in comparing with previous reports, which used the surveillance case definition which included RME, outpatient, and inpatient report types. Specifically, they should note in the limitations section that instead of underestimating the true HCV incidence, these prior reports overestimated the true disease burden by 39%. Future studies should assess the impact of any efforts at improving surveillance data accuracy and/or completeness, such as implementation of a laboratory reporting system, implementation of a new EMR (i.e., MHS Genesis), and other temporal trends.

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After the Diagnosis of Hepatitis C (HCV): Overview of Next Steps

Document viremia

Educate and offer referral to HCV treating provider

- HCV Factsheets
- Current HCV treatments are oral, highly effective (>95% cure rate), as short as 8 weeks, with minimal side effects

Identify risk factors for HCV acquisition

- Illicit drug use history (lifetime)
- Blood transfusion (products) or transplant prior to 1992
- Sexual partner with HCV
- Combat or other occupational exposure to blood or needlestick
- Non-sterile (unregulated, home or prison) tattoos or piercings
- Family history (particularly birth mother) of HCV
- Incarceration

Additional HCV history

- Prior evaluation (diagnosis of cirrhosis, ultrasound of the liver, FibroScan®, biopsy)
- Prior HCV treatment (treatment regimen, outcome)

Updated history

- Past medical history and comorbidities
- Past surgical history
- Complete review of systems (ROS)
- Alcohol and substance use history
- Medication reconciliation (including VA and non-VA prescribed medications, OTC medications, vitamins, supplements, herbals, etc.)

Physical examination (if not done within the last year)

Required laboratory tests

- HCV RNA (viral load)
- HCV genotype (not required if a pangenotypic regimen will be used)
- Liver panel (AST, ALT, albumin, bilirubin)
- INR if there is evidence of cirrhosis
- Platelet count
- HIV testing if not previously done or based on current risk factors. If HIV positive, consult with ID or GI/Hepatology for treatment coordination
- Hepatitis B serologies (HBsAg, HBs Ab, HBc Ab total)

Evaluate for evidence of cirrhosis

- Platelets <150,000/mm^3
- FIB-4 >3.25
- APRI >2.0
- If one or more of the above tests is present, then consider ultrasound examination or Fibroscan® (if available and not performed previously)
  - FibroScan® ≥ 10 kilopascals (kPa)
- Patients with no evidence of cirrhosis who are treatment naïve may be considered for a simplified HCV treatment regimens

Refer patients to GI/Hepatology

- Patients with prior HCV treatment history
- Patients with evidence of cirrhosis. Perform HCC surveillance with US abdomen every 6 months (± AFP)

Immunizations

- Hepatitis B, if susceptible and not previously immunized
- Hepatitis A, if susceptible and not previously immunized
- Other recommended immunizations per ACIP recommendations
- For more information: http://www.cdc.gov/vaccines/schedules/hcp/adult.html

Additional resources

- For detailed treatment information, see Chronic Hepatitis C Virus (HCV) Infection: Treatment Considerations

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Letter to the Editor: Clarification of Hepatitis C Virus Screening with Case Definitions and Prevalence Among Trainees

James D. Mancuso, MD, DrPH (COL, MC, USA); Nimfa C. Teneza-Mora, MD, MPH (CAPT, MC, USN)

To the Editor:

We read with interest the brief report regarding the prevalence of Hepatitis C Virus (HCV) infection in basic military trainee blood donors by Kasper and colleagues in the November 2021 issue of the *Medical Surveillance Monthly Report* (*MSMR)*,[1] an update of a previous similar report.[2] The authors are commended for providing timely and actionable information to assess a possible rise in the burden of HCV among new military trainees. We agree that these data should be considered when evaluating whether the U.S. military should institute HCV screening in the Air Force and Army at the time of accession, as has been implemented in the Navy and Marine Corps since 2013.

Our main point of clarification focuses on the case definition employed by Kasper et al. Specifically, the authors stated that "A positive test for HCV antibody in addition to either a positive HCV RNA or EIA indicates active infection."[1] This was further reflected in their methods, which stated that confirmed cases were "positive HCV RNA or EIA." However, the diagnostic guidelines from the Centers for Disease Control and Prevention (CDC) state that only an RNA test confirms the diagnosis of active HCV infection; a second antibody test (i.e. EIA) does not.[3] A positive HCV-antibody test may indicate: 1) current (active) HCV infection (acute or chronic); 2) past infection that has resolved; or 3) a rare false positive. For this reason, national HCV guidelines state that "A test to detect HCV viremia is therefore necessary to confirm active HCV infection and guide clinical management, including initiation of HCV treatment."[4] The CDC and Department of Defense case definitions for confirmed cases of HCV also include a positive HCV antigen test, HCV antibody conversion (from negative to positive) within a 12 month period, or a documented negative HCV antibody or RNA test followed by a positive RNA test within 12 months.[5-7] While all 6 cases described in the report were actually confirmed by RNA (Maj K. Kasper, written communication, 11 March 2022), it is worth clarifying this point to ensure *MSMR* readership understanding.

This discrepancy around HCV case confirmation likely results from the differences between: 1) the CDC recommendations for HCV diagnosis, and 2) the Food and Drug Administration (FDA) recommendations and standards for blood donation screening. CDC guidelines for the diagnosis of HCV state that a positive initial antibody test followed by a negative RNA test indicates "no current HCV infection," but that "additional testing as appropriate" should be performed.[3] In its guidance as to when additional testing is appropriate, CDC states that "to differentiate past, resolved HCV infection from biologic false positivity for HCV antibody, testing with another HCV-antibody assay can be considered." Other national guidelines state that "although additional testing is typically unnecessary...the HCV-RNA test can be repeated when there is a high index of suspicion for recent infection or in patients with ongoing HCV infection risk."[4] In contrast, the FDA states that for blood donors in the same scenario (i.e. who have a positive initial antibody test followed by a negative RNA test), a "second, different licensed donor screening test or an approved or cleared diagnostic test for anti-HCV" should be performed."[8] Furthermore, whereas CDC recommendations generally interpret a positive second antibody test as evidence of a past, resolved HCV infection, FDA recommendations for this scenario state that "if the result is repeatedly reactive for anti-HCV…the test results for the donation are considered positive..."[8] Such a positive result per FDA recommendations considers the blood product "positive" for transfusion purposes. The permanent deferral of individuals with a negative RNA test but a positive second HCV antibody test from blood donation reflects the more cautious approach taken for blood donation screening compared to diagnostic testing. The FDA justifies this position by stating that although the majority of these individuals will have resolved infections, some may have "a chronic persistent infection with transient or intermittent low-level viremia."[8] The Armed Service Blood Program guidelines for transfusion screening and blood donation follow the FDA's approach.[9] This different approach used for blood donation may explain why Kasper et al. considered a second EIA as a confirmatory test for active infection. Despite these differences, the conclusions from Kasper et al. remain the same and valid, since all 6 occurrences in their case series were confirmed by RNA.

Of further note, since the Navy and Marine Corps routinely screen basic military trainees, the prevalence of HCV infection can be assessed directly in those services without the concern for limited generalizability from using blood donors noted in previous Air Force reports.[1,2] These data are routinely collected by the Navy Bloodborne Infection Management Center (NBIMC). The prevalence of confirmed HCV infection in Navy and Marine Corps basic trainees between 2017 and 2020 was 0.275 per 1,000 trainees (83 cases among 302,163 trainees), similar to the prevalence of 0.203 per 1,000 Air Force blood donor trainees (6 cases among 29,615 trainees) reported by Kasper et al. during the same interval (NBIMC, unpublished data, August 2022). The consistency

between these rates suggests that estimates of HCV infection from trainee blood donors may be generalizable to the full population of Air Force trainees. The prevalence of HCV among trainees was also of similar magnitude as that seen among a random sample of deployed service members between 2007 and 2010 (0.43 per 1,000 service members).[10] However, the temporal trends in HCV prevalence were quite different between the Air Force and the Navy/Marine Corps, as shown in the **Table**. While the prevalence of HCV infection among Air Force trainees in 2017-2020 was substantially higher (prevalence ratio=3.1) than that observed in 2013-2016, the prevalence in Navy and Marine Corps trainees was instead lower (prevalence ratio=0.33) in the later time period (NBIMC, unpublished data, August 2022).[1,2] The causes and significance of differing recent trends among the services are unclear, but may be due to the effects of temporal trends, birth cohort, age, the absence of trainee screening procedures in any of the services prior to 2013, or random variability.

As noted by Kasper and colleagues, adult screening for HCV is recommended by CDC and other nationally recognized expert organizations.[1] The Army and Air Force should consider implementing universal screening at accession in order to conform to these recommendations, improve health and readiness, and ensure the safety of the "walking blood bank." The use of blood donations for surveillance purposes can be highly useful, particularly in the absence of the availability of other relevant data. However, when interpreting such data, attention should be paid to assessing any differences from standard diagnostic approaches, differences from standard criteria used to define cases, and the potential for volunteer bias and limited generalizability.

TABLE. Comparison of active, confirmed HCV prevalence[a] between Air Force and Navy/Marine Corps trainees, 2013-2016 and 2017-2020

Service(s)	2013-2016		2017-2020	
	HCV Prevalence[a]	Prevalence Ratio	HCV Prevalence[a]	Prevalence Ratio
Air Force	0.065	1 (ref)	0.203	3.1
Navy/Marine Corps	0.825	1 (ref)	0.275	0.33

[a]Prevalence per 1,000 trainees
HCV, hepatitis C virus; ref, reference

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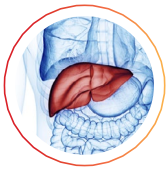
CDC RECOMMENDS

Hepatitis C Testing For:

Every person 18+

At least once *



Every person with risk factors

At least once and periodically if ongoing

All pregnant people

During each pregnancy *

*In settings where prevalence is 0.1% or greater

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

Brief Report: Menstrual Suppression Among U.S. Female Service Members in the Millennium Cohort Study

Yunnuo Zhu, MPH; Claire A. Kolaja, MPH; Nicole Stamas, MS; Rayna K. Matsuno, PhD, MPH; Rudolph P. Rull, PhD, MPH, for the Millennium Cohort Study Team

Menstrual suppression allows for the control or complete suppression of menstrual periods through hormonal contraceptive methods. In addition to preventing pregnancy, suppression can alleviate medical conditions and symptoms associated with menstruation such as iron deficiency anemia,[1] eliminate logistical hygiene-related challenges, and improve quality of life. Suppression methods include short-acting methods such as oral contraceptive pills, transdermal patches, vaginal rings, and injections or long-acting intrauterine devices. While research, including a recent Cochrane review,[2] has found menstrual suppression methods to be efficacious and safe, these methods remain underutilized.[3]

Given the growing number of women serving in the military,[4,5] it is increasingly important to ensure that service women are given the information and resources to manage menstrual-related sanitary practices and hygiene challenges to improve both personal health and force readiness.[6,7] Multiple studies have found that most female service members were interested in suppressing menstruation during field training and deployments.[8-11] However, relatively few female service members were aware of available methods of menstrual suppression[9] while even fewer were offered the option of menstrual suppression during pre-deployment counseling.[7,11,12] Despite this interest in menstrual suppression, reports of prevalence of menstrual suppression across the services are not available.[13] This report describes the prevalence of menstrual suppression at two time points by demographic and military characteristics among female service members enrolled in the Millennium Cohort Study.

Methods

The Millennium Cohort Study is the largest and longest running prospective study of U.S. service members with over 250,000 enrolled participants representing all branches and components.[14,15] The 2007–2008 and 2011–2013 surveys (hereafter called 2008 and 2013 surveys, respectively) included questions on menstrual suppression in the female-only section assessing reproductive health. Demographic and military characteristics were obtained from the Defense Manpower Data Center (DMDC) using data closest to the survey date. Time-varying characteristics, including age, marital status, pay grade, military occupation, service component, and deployment status, represent the status as of the date of survey completion. Deployment dates in and out of theater from the Contingency Tracking System (CTS) were used to identify those who had deployed in the year before survey completion. Marital status and education level were obtained from surveys and backfilled with DMDC data closest to survey date if missing.

This analysis was restricted to female service members in the active component, aged 18–50 at the time of survey completion, who completed survey questions regarding menstrual suppression for the first time on the 2008 or 2013 survey. Additionally, those who reported hysterectomy, menopause, pregnancy, and/or breastfeeding as the reason for no menstrual cycle in the preceding 12 months were excluded. Menstrual suppression was defined as responding "no" to the binary question "Have you had at least one menstrual period in the past 12 months" and identifying "contraception or hormone therapy" as the reason from six possible options for having no menstrual period. Point prevalence estimates were calculated overall and by demographic and military characteristics at each time point. Two-sided chi-square test statistics were calculated to identify significant differences (α=.05) between the prevalence observed at the 2008 and 2013 time points.

Results

A total of 22,920 enrolled female service members were eligible for this analysis **(Table)**, with 15,926 eligible at the 2008 survey and 6,994 eligible at the 2013 survey. There was a significant increase in point prevalence of menstrual suppression when comparing the 2008 and 2013 prevalence (2.5% versus 3.8% respectively, p<.001). As illustrated in the **Figure**, point prevalence of menstrual suppression was significantly higher (p<.05) on the 2013 survey than the 2008 survey by female service members who were 18–24, 25–34 years old or of non-Hispanic White race and ethnicity. The prevalence of menstrual suppression increased among all levels of education and marital status when comparing the 2008 and 2013 cohorts.

Female Army, Navy, and Air Force members reported a significant increase in menstrual suppression while no significant change was seen among those in the Marine Corps, or Coast Guard. Higher prevalence of menstrual suppression were reported in 2013 compared to 2008, regardless of rank or military occupation. Prevalences of menstrual suppression increased among those who deployed within the past year and among those who did not deploy. The highest prevalences of menstrual

suppression in 2013 were among female service members who deployed in the past year (4.7%) or had an occupation in health care or combat specialties (5.1% and 4.7%, respectively).

TABLE. Demographic and military characteristics of Millennium Cohort female service members (among 15,926 eligible at the 2008 survey and 6,994 eligible at the 2013 survey)

	No menstrual suppression (n=22,261)		Menstrual suppression (n=659)	
	No.	Row %	No.	Row %
Age group (years)				
18–24	8,700	97.4%	236	2.6%
25–34	10,845	96.7%	365	3.3%
35–50	2,716	97.9%	58	2.1%
Race and ethnicity group				
Non-Hispanic Black	4,067	97.3%	112	2.7%
Other[a]	4,204	97.5%	109	2.5%
Non-Hispanic White	13,989	97.0%	438	3.0%
Marital status				
Not married	11,913	96.9%	379	3.1%
Married	10,348	97.4%	280	2.6%
Education level				
High school or less	3,223	97.5%	83	2.5%
Some college or more	19,038	97.1%	576	2.9%
Service branch				
Army	7,180	96.9%	231	3.1%
Navy	4,625	97.3%	129	2.7%
Marine Corps	1,173	97.5%	30	2.5%
Air Force	8,661	97.1%	258	2.9%
Coast Guard	622	98.3%	11	1.7%
Grade				
Junior enlisted (E1–E4)	12,764	97.2%	369	2.8%
Senior enlisted (E5–E9)	5,027	96.7%	171	3.3%
Officer (O1-O8; W1-W4)	4,470	97.4%	119	2.6%
Military occupation				
Combat specialties	1,649	97.2%	47	2.8%
Functional support/admin	4,709	96.6%	164	3.4%
Health care specialties	7,952	97.3%	220	2.7%
Other[b]	7,951	97.2%	228	2.8%
Deployed in past year				
No	15,825	97.4%	417	2.6%
Yes	6,436	96.4%	242	3.6%

[a]Includes Hispanic, Asian, Pacific Islander, American Indian, Alaskan Native, multiracial, and other.
[b]Includes electrical repair, communication, intelligence, craft workers, non-occupation, other technical and specialists, or missing occupation

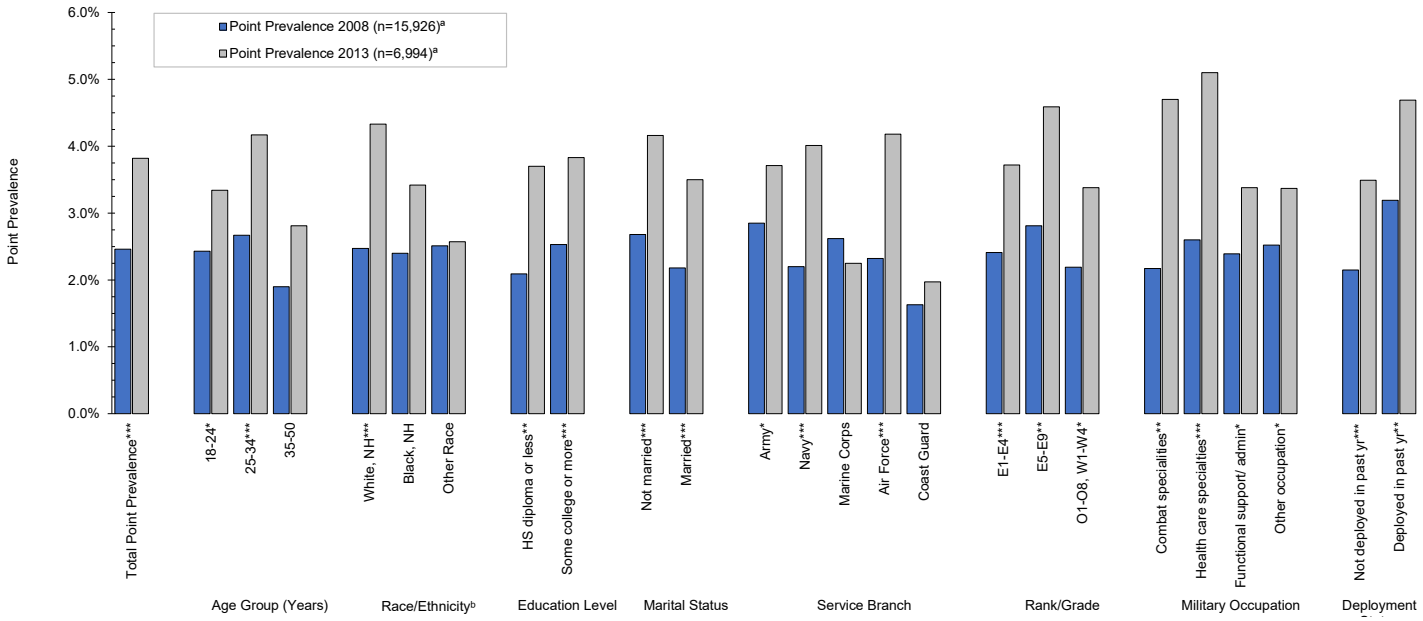
Editorial Comment

These findings suggest that menstrual suppression increased among U.S. female service members from 2008 through 2013. While this increase occurred across demographic and military categories, there was unequal adoption of menstrual suppression among certain subgroups of female service members.

At the time of this report, only 2 other studies have reported prevalence of menstrual suppression among female service members. Powell-Dunford reported that 7% (±4%, 95% CI) of a convenience sample of female Army members (n=154) at Walter Reed Medical Center suppressed their menstrual cycle ever during field training or deployment.[10] Another study reported that 21% of female Army members indicated continuous oral contraceptive use during deployment.[16] Comparisons between these findings and those of the current study should be undertaken with caution as this 2011 paper surveyed a sample of deployed Army personnel (n=500 Active Duty, National Guard or Reserve personnel) and defined menstrual suppression as 3 continuous months of oral contraceptive use.[16]

Access to menstrual suppression during deployment not only ensures menstrual control, but can also decrease the risk of iron deficiency anemia and reduce the need for evacuation out of theatre due to heavy menstrual bleeding or pregnancy.[7] While CENTCOM MOD 14 (Modification 14 to USCENTCOM Individual Protection and Individual/Unit Deployment Policy)[17] mandates pre-deployment appointments to address medical issues as well as a 180-day supply of maintenance medication, this policy does not specifically apply to menstrual management or contraception use.[7] Discussion of menstrual suppression methods at pre-deployment appointments may also be too late as many methods involve irregular bleeding in the first few months of adoption.[7,18] Recently established programs to address this knowledge gap include full-service walk-in contraceptive clinics,[19] dissemination of information on contraceptive use for reproductive and menstrual suppression purposes through the "Decide + Be Ready" mobile app, and the addition of questions pertaining to contraceptive use and counseling on the annual Periodic Health Assessment.[20] Equipping female service members with the tools to

FIGURE. Point prevalence of menstrual suppression among eligible Millennium Cohort Study participants in 2008 and 2013, by demographic and military characteristics



* p<0.05; ** p<0.01; *** p<0.001
[a]p-values indicate the difference in point prevalence by survey year
[b]Other Race includes Hispanic, Asian, Pacific Islander, American Indian, Alaskan Native, multiracial, and other
NH, non-Hispanic; HS, high school; E, enlisted; O, officer; W, warrant officer

manage their health care needs improves their health, readiness, and their ability to contribute to overall unit readiness.

A notable limitation of this analysis is that survey-derived estimates may not be reflective of the overall menstrual suppression prevalence of all female service members. In the absence of a validated measure for menstrual suppression, the prevalence estimates in this study are conservative and may exclude those who opted for shorter menstrual suppression cycles or started menstrual suppression less than 12 months before survey completion. Female service members who use menstrual suppression solely during deployment may not have been captured in this study as deployment periods can vary, with many lasting less than 12 months. However, the large sample size and inclusion of all service branches and both deployed and nondeployed personnel facilitated a unique and more representative look at menstrual suppression. The consistent characterization of menstrual suppression across Millennium Cohort longitudinal surveys, with another round of data collection expected in 2023, allows for the assessment of long-term trends of menstrual suppression.

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