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Sunburn Among Active Component Service Members, U.S. Armed Forces, 2002–2013

Sunburn is caused by acute overexposure to ultraviolet (UV) radiation directly from the sun or from artificial UV sources. Service members are at risk of excessive exposure to sunlight due to the nature of their military duties, which often involve working and training outdoors, and deployment to environments where UV radiation is more intense. From January 2002 through December 2013, a total of 19,172 incident cases of clinically significant sunburn were diagnosed among active component service members. Most of the cases (80.2%) were first degree sunburn. The incidence rates of sunburn diagnoses were higher among females, white non-Hispanics, younger age groups, individuals in the Marine Corps or Army, and among enlisted service members. Additionally, the rate among recruits was more than 3.5 times the rate for non-recruits. Sixty-one percent of all diagnosed cases occurred from May through July. Sunburn cases occurred in all areas of the U.S., particularly near major recruit and combat training locations. Service members are strongly advised to practice sun safety as a part of heat illness prevention, including properly using broad-spectrum sunscreen, finding or constructing shade during work and rest, wearing protective clothing and military combat eye protection items, and avoiding tanning booths and sun lamps.

Sunburn is caused by acute overexposure to ultraviolet (UV) radiation directly from the sun or from artificial UV sources (e.g., sunlamps, tanning beds). In mild cases of sunburn (i.e., first degree), the skin is reddened and both painful and warm to the touch. More severe sunburn (i.e., second and third degree) involves deeper layers of the skin and causes swelling, blistering, and severe pain.[1,2] Heat exhaustion or heat stroke may accompany severe sunburn and cause systemic symptoms such as fever, chills, nausea, headache, blurry vision, and malaise.

Long-term effects of frequent or repetitive overexposure to UV radiation can include deterioration of the skin, such as premature aging and loss of elasticity, dry and rough skin, discolorations of the skin, and cataracts and other damage to the eyes.[1,2] Overexposure to UV radiation with or without sunburn increases the risk of skin cancer;[3–5] basal cell carcinoma and melanoma, in particular, are associated with intermittent, episodic acute overexposures (i.e., sunburns).[3,5,6]

Risk factors for sunburn include having fair or light-colored skin, living in or traveling to areas where the sun is more intense (e.g., closer to the equator, at high altitude), working outdoors, participating in outdoor recreation, history of sunburn, and taking photosensitizing medications (e.g., certain antibiotics).[1] Snow, ice, sand, water, and other surfaces can also reflect and intensify the exposure to UV radiation and thereby increase the severity of sunburn.

Service members are at risk of excessive exposure to sunlight due to the nature of their military duties, which often involve working and training outdoors, and deployment to environments where UV radiation is more intense (e.g., semi-arid and subtropical climates, areas with sand, snow, water, or high altitude). Furthermore, the use of the antimalarial medication doxycycline before, during, and after operational deployment to Afghanistan and other malarious areas increases sensitivity to the sun and may increase the risk of sunburn.

Mild sunburn usually does not require medical treatment and most service members may never seek medical care for sunburn. Military self-care instructions for sunburn advise reporting to sick call if the sunburn covers more than one-quarter of the body, has blisters, is accompanied by weakness, or interferes with normal duties.[7]

This report describes the counts, rates, and trends of clinically significant sunburns (i.e., those associated with documented medical encounters for diagnoses of sunburn) among active component service members.

METHODS

The surveillance period was 2002–2013. The surveillance population included all active component service members of the Army, Navy, Air Force, Marine Corps, and Coast Guard. The data used in this analysis were derived from the Defense Medical Surveillance System (DMSS), which maintains electronic records of all actively serving U.S. military members' hospitalizations and ambulatory healthcare visits in U.S. military and civilian (contracted/purchased care through the Military Health System) medical facilities worldwide. Diagnoses associated with deployment (derived from records of medical encounters of service members deployed to Southwest/Central Asia that were documented in the Theater Medical Data Store [TMDS]) were not included in this analysis. Furthermore, person-time during deployment was

TABLE 1. Incident counts and incidence rates of sunburn by severity and by military and demographic characteristics, active component, U.S. Armed Forces, 2002–2013

	No.	Rate[a]	Rate ratio
Total	19,172	124.8	.
First degree (ICD-9: 692.71)	15,375	100.0	.
Second degree (ICD-9: 692.76)	3,757	24.4	.
Third degree (ICD-9: 692.77)	40	0.3	.
Sex			
Male	15,290	117.1	Ref
Female	3,882	168.0	1.4
Race/ethnicity			
White, non-Hispanic	16,736	173.8	11.7
Black, non-Hispanic	380	14.8	Ref
Hispanic	944	58.5	3.9
Asian/Pacific Islander	251	41.1	2.8
American Indian/Alaskan Native	128	68.5	4.6
Other/unknown	733	95.8	6.5
Age			
≤19	3,512	319.6	10.4
20–24	9,420	190.5	6.2
25–29	3,581	103.9	3.4
30–34	1,384	60.7	2.0
35–39	716	37.7	1.2
40–44	385	33.9	1.1
45+	174	30.8	Ref
Service			
Army	8,037	153.9	1.6
Navy	3,607	95.4	1.0
Air Force	3,639	94.0	Ref
Marine Corps	3,378	167.8	1.8
Coast Guard	511	106.3	1.1
Rank			
Enlisted	18,083	141.5	3.4
Officer	1,089	42.0	Ref
Status			
Recruit	1,430	419.7	3.6
Non-recruit	17,742	118.1	Ref
Occupation			
Combat-specific	2,168	119.1	2.6
Armor/motor transport	844	138.3	3.0
Pilot/air crew	268	46.6	Ref
Repair/engineer	5,380	118.0	2.5
Communications/intelligence	4,116	119.4	2.6
Health care	1,576	119.6	2.6
Other/unknown	4,820	158.6	3.4

[a]Rate per 100,000 person-years

not included in the overall person-time denominator calculations.

An incident case of sunburn was defined by a hospitalization or an ambulatory visit with a sunburn ICD-9 code **(Table 1)** in the primary or secondary diagnostic position. An individual was considered to have a newly incident case of sunburn if at least 30 days had passed since the previous sunburn-associated medical encounter.

The geographic location of each case was defined as the service member's unit ZIP code (three-digit) at the time of incident diagnosis. The sum of all incident sunburn cases was computed for each three-digit ZIP code. Incident counts and associated three-digit unit ZIP codes were loaded into ArcGIS (Esri, Redlands, CA), and joined to an Esri-provided map of U.S. three-digit ZIP codes. Counts based on fewer than 50 cases during the surveillance period were not shown on the map.

RESULTS

During the 12-year surveillance period, a total of 19,172 incident cases of clinically significant sunburn were diagnosed among active component service members **(Table 1)**. The overall crude incidence rate was 124.8 per 100,000 person-years (p-yrs). Most of the cases were first degree sunburn (n=15,375; 80.2%); 19.6% (n=3,757) were second degree sunburn; and 0.2% (n=40) were third degree sunburn. Only a small percentage of sunburn cases were hospitalized (n=23; 0.1%) **(data not shown)**.

The incidence rate of sunburn diagnoses was higher among females compared to males (female-to-male rate ratio [RR]=1.4) **(Table 1)**. Among all racial/ethnic groups, white, non-Hispanic service members had the highest incidence rate (173.8 per 100,000 p-yrs). Sunburn incidence rates were highest among the younger age groups (RR=10.4 between youngest and oldest age groups). Individuals in the Marine Corps and Army, enlisted service members, and recruits also demonstrated higher incidence rates of sunburn compared to their respective counterparts.

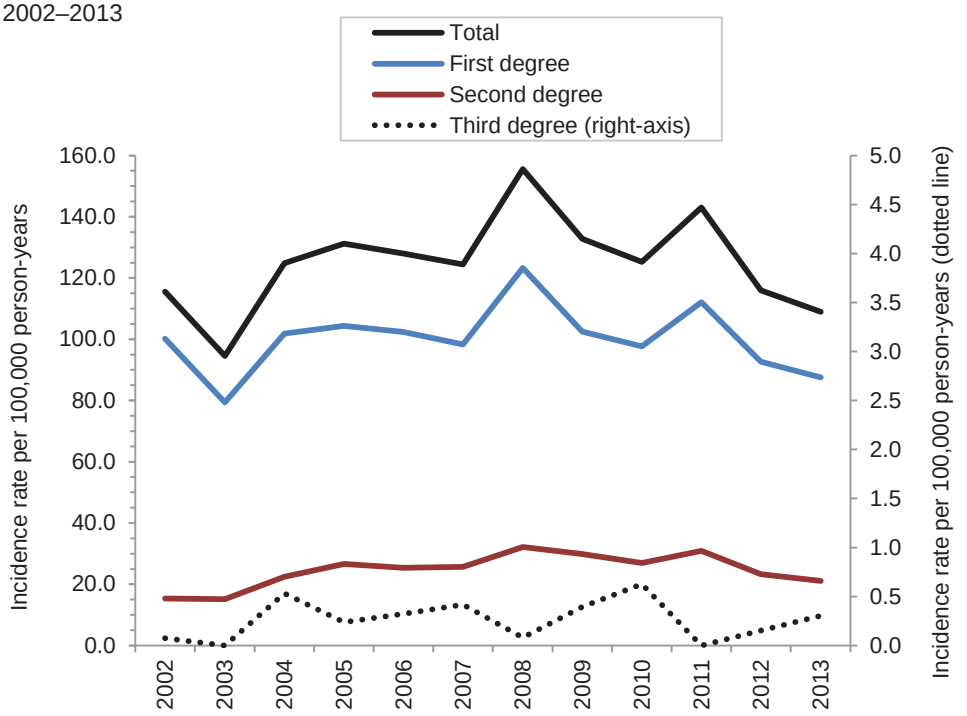
The other/unknown and armor/motor transport occupational categories were associated with the highest incidence rates of sunburn and the pilot/air crew category had the lowest incidence rate **(Table 1)**. Further analysis by three-digit occupational categories showed that 10 specific occupations accounted for 50% of all cases **(Table 2)**. Ten percent of sunburn cases were identified as "not occupationally qualified," a category that includes recruits, students, and trainees.

The annual incidence rates of sunburn varied from year to year, but demonstrated peaks in 2008 and 2011 **(Figure 1)**. These peaks were apparent in both first and

TABLE 2. Top 10 military occupations with the most reported sunburns, active component, U.S. Armed Forces, 2002–2013

Occupational code	Description	No.	% total
195	Not occupationally qualified	1,913	10.0
160	Aircraft and aircraft-related	1,268	6.6
101	Infantry	1,153	6.0
110	Radio/radar	969	5.1
130	Medical care	940	4.9
155	Other functional support	914	4.8
183	Law enforcement	812	4.2
161	Automotive	713	3.7
104	Artillery/gunnery, rockets, and missiles	525	2.7
181	Motor transport	490	2.6

FIGURE 1. Incidence rate of sunburn by severity, active component, U.S. Armed Forces, 2002–2013



second degree sunburn. The annual rate of second degree sunburn increased 37.8% during the surveillance period. Diagnoses of third degree sunburn occurred at comparatively lower rates during each year of the surveillance period and no noteworthy temporal trends were observed. During the period overall, more cases of sunburn occurred in June (n=4,491; 23% of total cases) than in any other month **(Figure 2)**. Sixty-one percent of all diagnosed cases occurred from May through July, but first and second degree sunburn cases were diagnosed in every month and third degree sunburn cases were documented in 7 of the 12 months.

There were 72 geographic locations (i.e., unit ZIP codes to which affected service members were assigned) that had 50 or more sunburn cases during the surveillance period **(Figure 3)**. A majority of cases were diagnosed in the Sun Belt region of the U.S. (i.e., areas of the South and Southwest that are characterized by desert, semi-arid, or humid subtropical climates). However, sunburn cases occurred in all areas of the U.S., particularly near major recruit and combat training locations. Of the 72 locations that were affected by 50 or more cases, eight were located outside of the U.S. and reported a total of 2,051 sunburn cases (480 Japan, 185 Korea, 140 Germany, 126 Italy, and 1,120 unspecified locations outside of the U.S.) **(data not shown)**.

EDITORIAL COMMENT

Members of the U.S. Armed Forces are at risk for sunburn during outdoor operations, training, and recreational activities. Service members are strongly advised to practice sun safety as a part of heat illness prevention, including avoiding midday (1000–1500 hours) sun exposure when possible; properly using broad-spectrum sunscreen with a minimum sun protection factor (SPF) of 15; finding or constructing shade during work and rest; wearing protective clothing and military combat eye protection items that block 100% of the most harmful UV rays; and avoiding tanning booths and sun lamps.[8–10] Despite the ready availability of adequate information about sunburn prevention, clinically significant sunburns continue to occur among members of the active component. Although most are first degree sunburns, second and third degree sunburns also do occur, and the rate of second degree sunburn increased during the surveillance period.

It is not surprising that white, non-Hispanic service members had the highest rates of diagnosed sunburn compared to other races/ethnicities; however, it should be noted that all races/ethnicities had sunburn cases. Race/ethnicity is a poor proxy for sunburn and skin cancer risk because individual risk factors (e.g., lighter skin color, having skin that burns easily, freckles/nevi, personal/family history) vary within each race/ethnicity.[11] Members of every racial/ethnic group should be encouraged to use appropriate preventive measures against

FIGURE 2. Incident cases of sunburn by severity and calendar month, active component, U.S. Armed Forces, 2002–2013

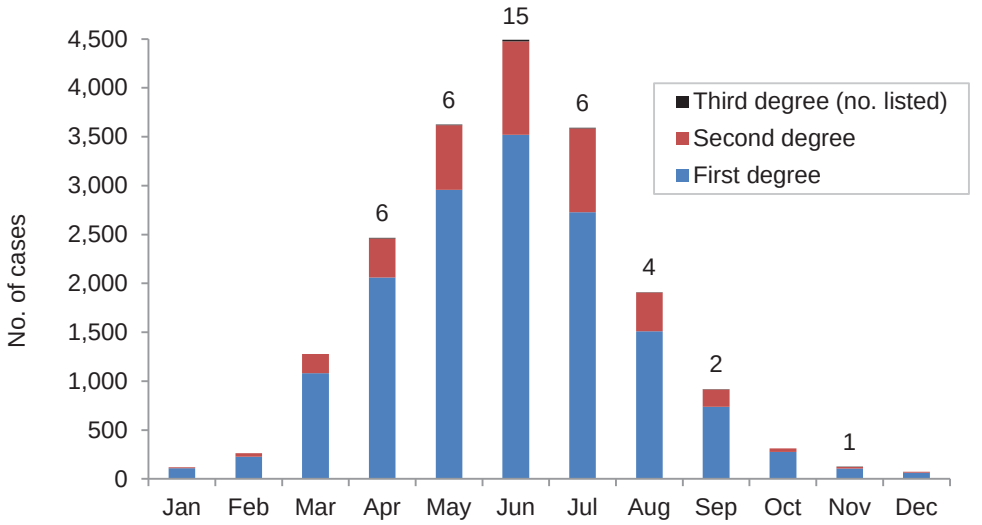
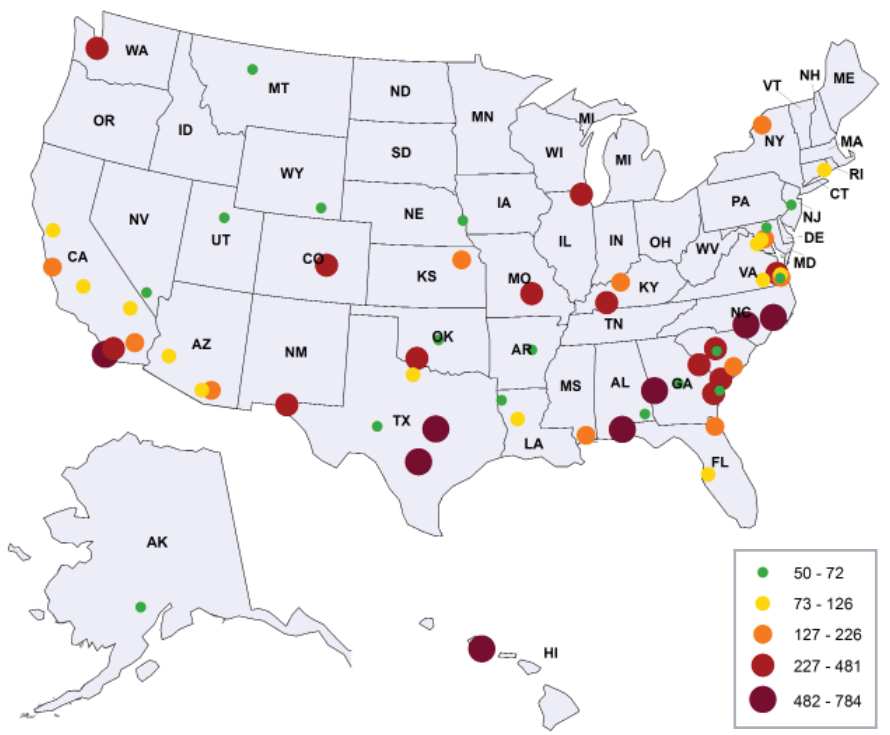


FIGURE 3. Incident counts of sunburn among active component service members by unit location,[b] 2002–2013



[b]Unit location based on three-digit ZIP code; locations with fewer than 50 cases are not shown.

sun exposure and sunburn. Furthermore, based on a 2012 "Grade B" recommendation from the U.S. Preventive Services Task Force, individuals aged 10–24 years who have fair skin should be counseled about minimizing their exposure to UV radiation to reduce the risk for skin cancer.[12]

The finding that rates of sunburn diagnoses were highest among the youngest age group is similar to observations in other studies reporting the prevalence of sunburn and sun exposure among teenagers and young adults in large populations.[13,14] Despite knowledge of the risks of sun exposure and the available preventive measures, major attitudinal and behavioral change among young adults in regard to sun tanning has not taken place.[14–16]

The incidence rate among recruits was more than 3.5 times that of non-recruits. Higher rates may be due to a greater proportion of younger service members in recruit status, the nature of recruit training (e.g., intense outdoor physical training), the location of recruit training centers (many in sunny Southern climates), and lack of knowledge or preparation for sun exposure. Higher rates of sunburn diagnosis among recruits may also reflect easier access and increased incentive to report to sick call. Regardless, recruits should be provided with and encouraged to use sunscreen (SPF 15 or higher) during training throughout the year. During field training exercises or at other times when insect repellents are also used, it is recommended to use separate products, as opposed to combination sunscreen-repellent, because the need for sunscreen reapplication may result in unnecessary repellent exposure. When both products are used, sunscreen should be applied first. It should be remembered that DEET-based repellents may decrease the SPF by one-third.[17]

Occupational risk of sun exposure may explain the discrepancy in sunburn diagnosis rates by occupational groups. Of note, service members in repair/engineer occupational categories (particularly those in aircraft, radio/radar, and automotive-related positions) may be exposed to surfaces (glass, metals, etc.) that intensify the effect of the sun, and to extended periods of time working outdoors. Similarly, occupations that involve long periods of outdoor training and service (e.g., combat-specific occupations, law enforcement) may be at higher risk of sun exposure. Education and training targeted toward specific occupational groups may reduce the incidence of occupation-related sun exposure.

The use of unit ZIP code location to assign location of sunburn cases should be considered in light of possible misclassification bias. If the sunburn occurred during training exercises/operational deployment away from the service member's assigned home unit ZIP code, the sunburn case would be attributed to the home unit ZIP code, not the true location of exposure. Therefore, some counts of sunburn cases

may be overestimated and others may be underestimated.

Excessive sun exposure and sunburn can occur in service members both on- and off-duty. Reduction of excessive sun exposure and sunburn is a feasible and achievable step to protect oneself against skin cancer, cataracts, and premature aging. Additional information about sun safety can be found at: http://phc.amedd.army.mil/topics/discond/hipss/Pages/SunSafety.aspx and http://www.cdc.gov/niosh/docs/2010-116/pdfs/2010-116.pdf.

REFERENCES

1. Mayo Clinic. Sunburn. http://www.mayoclinic.org/diseases-conditions/sunburn/basics/definition/con-20031065. Accessed on 7 July 2014.
2. WebMD. Skin problems and treatments health center: sunburn. http://www.webmd.com/skin-problems-and-treatments/guide/sunburn. Accessed on 7 July 2014.
3. Elwood JM, Jobson J. Melanoma and sun exposure: an overview of published studies. Int J Cancer. 1997;73:198–203.
4. Brown TT, Quain RD, Troxel AB, Gelfand JM. The epidemiology of sunburn in the US population in 2003. J Am Acad Dermatol. 55(4):577–583.
5. Aubry F, MacGibbon B. Risk factors of squamous cell carcinoma of the skin. A case-control study in the Montreal region. Cancer. 1985;55(4):907–911.
6. Gandini S, Sera F, Cattaruzza MS, et al. Meta-analysis of risk factors for cutaneous melanoma: II. Sun exposure. Eur J Cancer. 2005;41(1):45–60.
7. United States Army Public Health Command. Self-care instructions for sunburn. http://phc.amedd.army.mil/PHC%20Resource%20Library/Sunburn.pdf. Accessed on 7 July 2014.
8. United States Army Public Health Command. Sun Safety. http://phc.amedd.army.mil/topics/discond/hipss/Pages/SunSafety.aspx. Accessed on 7 July 2014.
9. Naval Safety Center. Sunburn. http://safetycenter.navy.mil/. Accessed on 7 July 2014.
10. Department of the Air Force. Air Force Guidance Memorandum to AFPAM 48-151, Thermal Injury, 7 May 2013. http://static.e-publishing.af.mil/production/1/af_sg/publication/afpam48-151/afpam48-151.pdf. Accessed on 10 July 2014.
11. Centers for Disease Control and Prevention. Sunburn prevalence among adults—United States, 1999, 2003, and 2004. MMWR. 2007;56(21):524–528.
12. U.S. Preventive Services Task Force. Behavioral counseling to prevent skin cancer. http://www.uspreventiveservicestaskforce.org/uspstf/uspsskco.htm. Accessed on 9 July 2014.
13. Brown TT, Quain RD, Troxel AB, Gelfand JM. The epidemiology of sunburn in the US population in 2003. J Am Acad Dermatol. 2006;55(4):578–583.
14. Stott MA. Tanning and sunburn: knowledge, attitudes and behaviour of people in Great Britain. J Public Health Med. 1999;21(4):377–384.
15. Robinson JK, Rademaker AW, Sylvester JA, Cook B. Summer sun exposure: knowledge, attitudes, and behaviors of Midwest adolescents. Prev Med. 1997;26(3):364–372.
16. Balk SJ, Fisher DE, Geller AC. Teens and indoor tanning: a cancer prevention opportunity for pediatricians. Pediatrics. 2013;131(4):772–785.
17. Ansdell VE, Reisenauer AK. "Sunburn" in chapter 2, CDC Health Information for International Travel 2014. http://wwwnc.cdc.gov/travel/yellowbook/2014/chapter-2-the-pre-travel-consultation/sunburn. Accessed on 14 July 2014.

How to Protect Yourself from the Sun

SUNSCREEN

- Wear sunscreen with SPF 30 or higher.
- Apply sunscreen liberally (minimum of 1 oz) approximately 30 minutes before sun exposure and reapply it at least every two hours throughout the day.
- Apply sunscreen first, followed by repellant containing DEET. Apply sunscreen approximately 30 minutes prior to applying DEET skin repellent and reapply sunscreen more often throughout the day.

CLOTHING

- Use wide-brimmed hats to protect your eyes, head and neck.
- Wear light-colored, loose fitting clothing to cover your arms, legs and torso.

turn card over

SHADE

- Work and rest in the shade when possible. Construct shades if necessary.
- Short shadow = seek shade! The sun's rays are strongest between 1000 and 1600 hours. This doesn't mean that "no risk" is present outside of these time periods - especially in the tropics, sun risk can still be present in the morning and later afternoon hours.

EYEWEAR

- Eyewear should block UV rays. Military Combat Eye Protection items block 100 percent of UVA and UVB rays.
- Use wraparound design eyewear if possible. These will protect against sun rays that come from the front and side.

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Brief Report

Sunburn Diagnoses While Deployed in Southwest/Central Asia, Active Component, U.S. Armed Forces, 2008–2013

The U.S. Central Command (CENTCOM) area of responsibility (AOR) (i.e., Southwest/Central Asia) comprises arid and subtropical regions with flat, barren deserts and rugged mountainous areas. Service members who deploy to CENTCOM countries may be at risk of excessive sun exposure due to the abundance of sunlight and exacerbating factors such as sand, wind, and altitude, and the paucity of shade-producing ground cover (e.g., trees). Deployment guidelines recommend that each deploying service member pack a supply of sunscreen (sun protection factor [SPF] 30 or higher) and practice sun safety while deployed: apply sunscreen, find or construct places affording shade, avoid midday (1000–1500 hours) sun exposure, wear uniforms properly, and wear sunglasses with ultraviolet (UV) protection. In addition to the harsh deployment environment, many service members deployed to Afghanistan take malaria prophylaxis, specifically doxycycline, and other medications that can cause sensitivity to sunlight.

This report summarizes counts, rates, and trends of cases of clinically significant sunburn (i.e., those associated with documented medical encounters for diagnoses of sunburn) among active component service members who served in CENTCOM (mainly Iraq and Afghanistan) during the period 2008–2013.

METHODS

The surveillance period was 1 January 2008 through 31 December 2013. The surveillance population included all active component service members of the Army, Navy, Air Force, Marine Corps, and Coast Guard who served at least 1 day in a theater of operations in the CENTCOM AOR during the surveillance period. Diagnoses associated with deployment were derived from records of medical encounters of service members deployed to the CENTCOM AOR that were documented in the Theater Medical Data Store (TMDS). Denominators for rates of sunburn during deployment were determined by calculating the length of all deployments during the period of interest and summing them into an aggregate of deployed person-time. If the deployment end date was missing, the end date was imputed based on the average deployment time for each of the Services. Individuals who were ascertained as cases of sunburn who did not have a corresponding deployment record were excluded from the analysis.

An incident case of sunburn was defined as any medical encounter with a sunburn-specific ICD-9 code **(Table 1)** in the primary or secondary diagnostic position. An individual could be counted as a newly incident case of sunburn if at least 30 days had elapsed since the previous sunburn-associated medical encounter.

RESULTS

During the 6-year surveillance period, a total of 427 cases of sunburn were diagnosed in service members deployed in Southwest/Central Asia **(Figure 1)**. The incidence rate among deployed service members was 51.4 per 100,000 person-years (p-yrs). Incidence rates increased 140% from 2008 to 2011, then decreased in 2012. The incidence rate in 2013 (63.7 per 100,000 p-yrs) was higher than in 2012 and was the second highest annual rate during the period. Of all documented cases, most (n=368; 86.1%) were diagnosed as first

TABLE 1. Incident counts and incidence rates of sunburn among active component service members deployed to Southwest/Central Asia, 2008–2013

	No.	Rate[a]	RR
Total[b]	427	51.4	.
First degree (ICD-9: 692.71)	368	44.3	.
Second degree (ICD-9: 692.76)	59	7.1	.
Sex			
Male	343	46.0	Ref
Female	84	99.9	2.2
Race/ethnicity			
White, non-Hispanic	362	67.6	3.6
Black, non-Hispanic	25	18.7	Ref
Hispanic	20	21.9	1.2
Asian/Pacific Islander	7	21.6	1.2
Other/unknown	13	34.8	1.9
Age			
≤19	23	95.1	3.2
20–24	195	63.1	2.2
25–29	115	52.8	1.8
30–34	47	38.5	1.3
35–39	26	29.3	Ref
40+	21	30.7	1.0
Service			
Army	295	55.6	4.7
Navy	33	51.0	4.3
Air Force	86	69.4	5.8
Marine Corps	13	11.8	Ref
Coast Guard	0	0.0	.
Rank			
Enlisted	390	55.5	1.9
Officer	37	28.9	Ref
Occupation			
Combat-specific	64	32.6	Ref
Armor/motor transport	32	69.6	2.1
Pilot/air crew	10	34.2	1.0
Repair/engineer	132	64.9	2.0
Communications/ intelligence	98	52.5	1.6
Health care	21	41.7	1.3
Other/unknown	70	59.2	1.8

[a]Rate per 100,000 person-years

[b]There were no third degree sunburn (ICD-9: 692.77) diagnoses.

RR=rate ratio

FIGURE 1. Incident counts of sunburn by severity and incidence rates among active component service members deployed to Southwest/Central Asia, 2008–2013

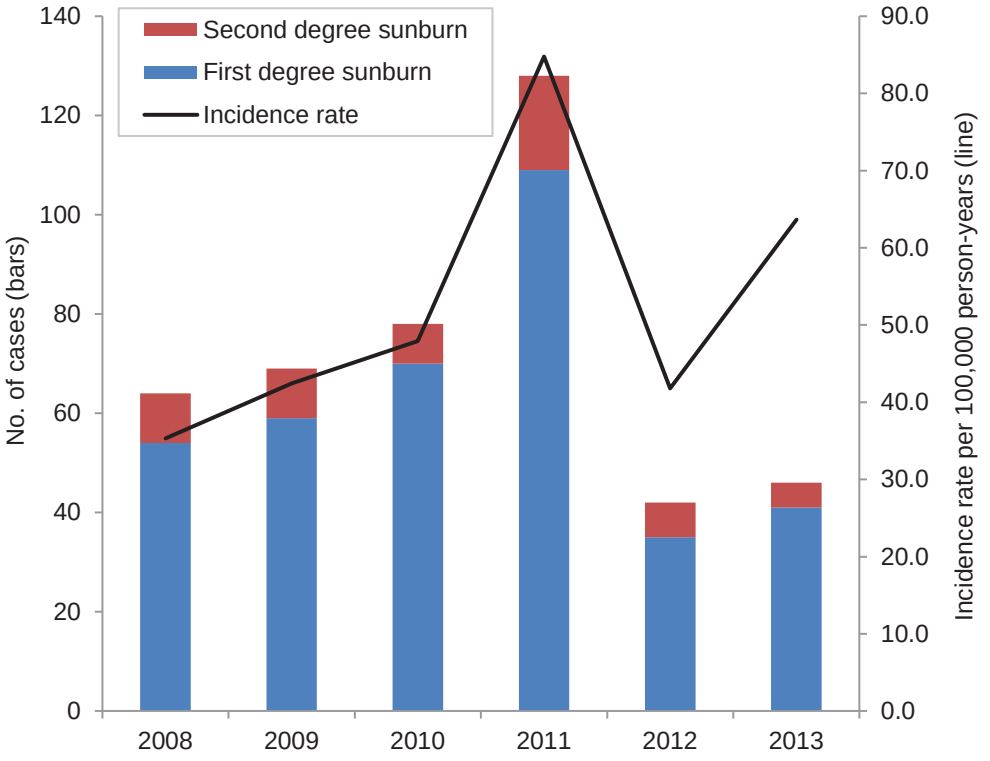


TABLE 2. Military occupations with the most reported sunburns among active component service members deployed to Southwest/Central Asia, 2008–2013

Occupational code	Description	No.	% total
155	Other functional support	37	8.7
101	Infantry	32	7.5
161	Automotive	26	6.1
110	Radio/radar	26	6.1
160	Aircraft and aircraft-related	25	5.9
125	Combat operations control	20	4.7
181	Motor transport	25	5.9
182	Material receipt, storage and issue	19	4.4
183	Law enforcement	17	4.0

degree sunburn. No third degree sunburns were diagnosed during the period.

Incidence rates of sunburn were higher among females than males (female-to-male rate ratio [RR]=2.2) and among white, non-Hispanics (67.6 per 100,000 p-yrs) than any other racial/ethnic subgroup of service members **(Table 1)**. Service members who were enlisted, in the Air Force or Army, and aged 20–24 years had higher incidence rates of sunburn than their respective counterparts.

Incidence rates of sunburn were relatively high among service members in armor/motor transport and repair/engineer occupational categories **(Table 1)**. Analyses of subgroups (three-digit levels) of occupational categories revealed nine specific occupations that accounted for more than half of all cases (53.2%) **(Table 2)**.

During the 6-year period overall, more sunburn cases occurred in May (n=86; 20.1% of total cases) than in any other month **(Figure 2)**. Sixty-four percent of all cases occurred between April and July and 21.8% of cases were diagnosed from October through March. Both first and second degree sunburn cases were diagnosed in every month.

EDITORIAL COMMENT

The overall crude rate of sunburn diagnoses while serving in Southwest/Central Asia was approximately one-third of the rate among non-deployed service members (see article on page 2). The risks of prolonged and intensive sun exposures during combat assignments in Asia are likely similar to or higher than those during most peace time assignments; however, service members in war zones may be more likely to follow sun safety measures (e.g., wearing sunscreen, utilizing shaded areas) and less likely to receive care for sunburns (particularly first degree sunburns) in medical treatment facilities. Also, in general, military members serving in war zones have less time for recreational activities, wear military uniforms more often (which cover the arms and legs and include donning head gear and protective sunglasses while outdoors), and are prohibited from drinking alcohol. Alcohol intake has been associated with increased risk of sunburn.[1,2]

The finding of sharply lower rates of sunburn among deployed than non-deployed service members should be considered in light of several limitations. For example, the report includes only cases that were documented in standardized electronic treatment records maintained in the TMDS; as such, the report excludes cases that were self-treated, resolved without medical treatment, or were treated

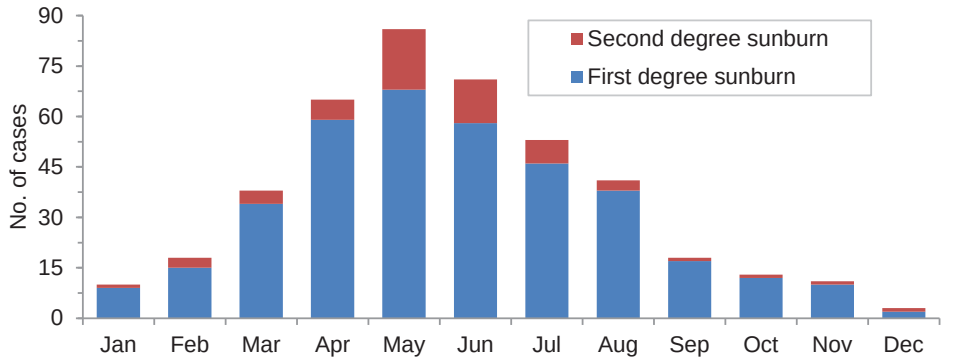
by unit medical support personnel outside of deployed medical clinics/field hospitals. Therefore, the numbers and rates documented in this report likely underestimate the true incidence of sunburn in the deployed setting.

As among their non-deployed counterparts, rates of sunburn were relatively high among female and white, non-Hispanic deployed service members. Also, trends in rates of sunburn in relation to military occupation were also similar in the deployed and non-deployed settings.

Of all service branch members, those in the Air Force had the highest sunburn rate during deployment but the lowest rate when not deployed. Conversely, members of the Marine Corps had the lowest rate of sunburn while deployed but the highest rate when not deployed. The discordant experiences of the Services in the deployed and non-deployed settings may reflect, at least in part, differences in access to medical treatment facilities that document sunburn diagnoses in electronic medical records.

Compared to the findings for the non-deployed setting, a greater proportion of sunburn cases in the deployed setting occurred during the cooler months of the year. Because severe sunburns have immediate effects on the military operational capabilities of those affected (e.g., interfere with uniform/equipment wear, decrease load-bearing abilities) and increase risks of life-threatening skin cancers long term, training about proper sun safety should be provided to all service members prior to deployments and should be enforced by commanders and supervisors at all levels and throughout the year during deployments.

FIGURE 2. Incident counts of sunburn by severity and calendar month among active component service members deployed to Southwest/Central Asia, 2008–2013



REFERENCES

1. Brown TT, Quain RD, Troxel AB, Gelfand JM. The epidemiology of sunburn in the US population in 2003. *J Am Acad Dermatol*. 2006;55(4):577–583.
2. Mukamal KJ. Alcohol consumption and self-reported sunburn: a cross-sectional, population-based survey. *J Am Acad Dermatol*. 2006;55(4):584–589.

Surveillance of Cataract in Active Component Service Members, U.S. Armed Forces, 2000–2013

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A cataract is an opacity of the lens that is associated with risk factors such as aging, trauma, cigarette smoking, and exposure to excessive ultraviolet rays from sunlight. Cataracts most commonly affect individuals aged 40 years and older; however, military members can have occupational exposures (e.g., eye injury) that may make them susceptible to developing cataracts at an earlier age. During the 14-year surveillance period (2000–2013), there were 22,418 cases of cataract diagnosed in active component service members; the female-to-male rate ratio was 1.2. Older service members and service members in the Army (128.7 per 100,000 person-years [p-yrs]) had the highest incidence rate of cataract from all causes while the Marine Corps (63.1 per 100,000 p-yrs) had the lowest incidence rate. Interestingly, the Marine Corps had the highest incidence rate of traumatic cataract compared to the other Services (10.2 per 100,000 p-yrs).

A cataract is a pathologic condition characterized by opacity of the lens in the eye and is generally associated with visual impairment. Cataracts are currently the leading cause of vision loss in the U.S.[1] Service members are presumed to be free of cataract when they enter military service because a current diagnosis or history of any opacity of the lens (including cataract) is considered disqualifying for service under current enlistment standards. Service members may still develop cataract after entry due to either advancing age or other risk factors.

In April 2014, the *MSMR* reported a total of 1,594 cataract-related medical encounters among members of the active component U.S. Armed Forces in 2013.[2] Although increasing age is the primary risk factor for developing cataracts, some military members may be at increased risk due to occupational exposures; for example, pilots may be at increased risk for cataract due to ionizing radiation exposure. Trauma to the eyes is also an important risk factor for cataract formation and is highly relevant to service members who may experience ocular trauma during combat or other hazardous activities.[3] Other risk factors for cataract are cigarette smoking, heavy alcohol consumption, diabetes, obesity, and excessive exposure to ultraviolet B light.

This analysis examines the incidence of cataract in active component service members over a 14-year surveillance period.

METHODS

The surveillance period was 1 January 2000 through 31 December 2013. The study population included all active component service members who served in the U.S. Armed Forces at any time during the surveillance period. The data used in this analysis were retrieved from the Defense Medical Surveillance System (DMSS), which maintains electronic records of all actively serving U.S. military members' hospitalizations and ambulatory healthcare visits in U.S. military and civilian (contracted/purchased care through the Military Health System) medical facilities worldwide. This analysis classified cataracts into eight categories based on ICD-9 codes **(Table 1)**.

For surveillance purposes, an incident case of cataract was defined as an inpatient or outpatient medical encounter that had a case-defining ICD-9 code in any diagnostic position. An individual was considered a case once during the surveillance period. If multiple cataract diagnoses were found in the same record, the ICD-9 code in the earliest diagnostic position was preferentially retained; for example, if ICD-9: 366.2 (traumatic cataract) was recorded in the first (primary) diagnostic position and ICD-9: 366.8 (other cataract) was listed in the third diagnostic position, the case was assigned to the traumatic cataract category.

TABLE 1. ICD-9 codes for cataract by etiologic type

Cataract type	ICD-9 code
Infantile, juvenile, and presenile cataract	366.00–366.09
Senile cataract	366.10–366.19
Traumatic cataract	366.20–366.23
Cataract secondary to ocular disorders	366.30–366.34
Cataract associated with other disorders	366.41–366.46
After-cataract	366.50–366.53
Other cataract	366.8
Unspecified cataract	366.9

RESULTS

During the 14-year surveillance period, a total of 22,418 cases of cataract were diagnosed among active component service members **(Table 2)**. The overall crude incidence rate was 112.3 per 100,000 person-years (p-yrs). Although male cases greatly outnumbered female cases, the incidence rate for females (130.6 per 100,000 p-yrs) was 20.2% higher than the rate for males (109.1 per 100,000 p-yrs). The higher incidence rates of cataracts in females compared to males were observed in every year of the surveillance period **(data not shown)**.

The incidence rate of cataract was almost 10% higher in black, non-Hispanic service members (123.0 per 100,000 p-yrs) compared to their white, non-Hispanic counterparts (112.6 per 100,000 p-yrs).The overall incidence rate increased with age. After age 34, the incidence rates doubled with each succeeding 5-year age group. The rate of cataract among service members aged 55 years and older was 121 times that of the youngest age group.

The incidence rates of cataract were notably higher among service members in the Army, Coast Guard, and Air Force than in service members of the Navy and Marine Corps **(Table 2)**. Most of the incidence rate ratios (RRs) by occupation were in the range of 1.0–1.4, but the RR was conspicuously higher for service members in healthcare occupations (RR=2.5).

The annual incidence rate of cataract increased 37% from 2001 (96.6 per 100,000 p-yrs) to a peak in 2006 (132.4 per 100,000 p-yrs) **(Figure 1)**. The incidence rates then decreased from 2007 to a nadir in 2010 (88.6 per 100,000 p-yrs), and increased again from 2011 to 2012. In 2013, the incidence rate remained stable compared to 2012. The most recent increase was consistent across all demographic, rank, and occupational categories.

A majority of the specific diagnoses of cataracts were either senile cataract (35.7%) or infantile, juvenile, and pre-senile cataract (25.2%) **(Table 3)**. Traumatic cataract accounted for 6.8% of all cases.

TABLE 2. Incident counts and incidence rates of cataract, active component service members, U.S. Armed Forces, 2000–2013

	No.	Rate[a]	Rate ratio
Total	22,418	112.3	.
Sex			
Male	18,625	109.1	Ref
Female	3,791	130.6	1.2
Race/ethnicity			
White, non-Hispanic	14,079	112.6	1.1
Black, non-Hispanic	4,193	123.0	1.2
Other	4,146	102.2	Ref
Age			
<20	728	40.0	Ref
20–24	3,106	46.6	1.2
25–29	2,651	61.8	1.6
30–34	2,130	73.3	1.8
35–39	2,927	120.6	3.0
40–44	3,885	304.7	7.6
45–49	3,402	763.1	19.1
50–54	2,234	1,939.7	48.5
55+	1,348	4,871.4	121.8
Service			
Army	9,246	128.7	2.0
Navy	4,757	98.5	1.6
Air Force	6,064	126.2	2.0
Marine Corps	1,641	63.1	Ref
Coast Guard	710	128.4	2.0
Rank			
Junior enlisted (E1–E4)	4,905	56.1	Ref
Senior enlisted (E5–E9)	10,042	126.5	2.3
Warrant officers (W1–W5)	653	249.2	4.4
Junior officers (O1–O4)	2,875	118.1	2.1
Senior officers (O5–O10)	3,937	665.0	11.9
Occupation			
Combat-specific	2,256	89.8	Ref
Armor/motor transport	750	87.5	1.0
Pilot/air crew	699	93.9	1.1
Repair/engineering	5,206	88.6	1.0
Communication/intelligence	5,222	116.3	1.3
Health care	3,600	220.0	2.5
Other/unknown	4,685	121.5	1.4

[a]Rate per 100,000 person-years

Traumatic cataract

There were 1,530 diagnoses of traumatic cataract recorded during the surveillance period **(Table 3, 4)**. The overall incidence rate was 7.7 per 100,000 p-yrs. Traumatic cataract was more than twice as likely (RR=2.7) to be diagnosed in males (8.4 per 100,000 p-yrs) as in females (3.2 per 100,000 p-yrs). The incidence rate was higher among black, non-Hispanic service members. Rates increased only slightly with advancing age over 35 years. Service members in the Marine Corps

FIGURE 1. Incidence rates of cataract (all types), active component, U.S. Armed Forces, 2000–2013

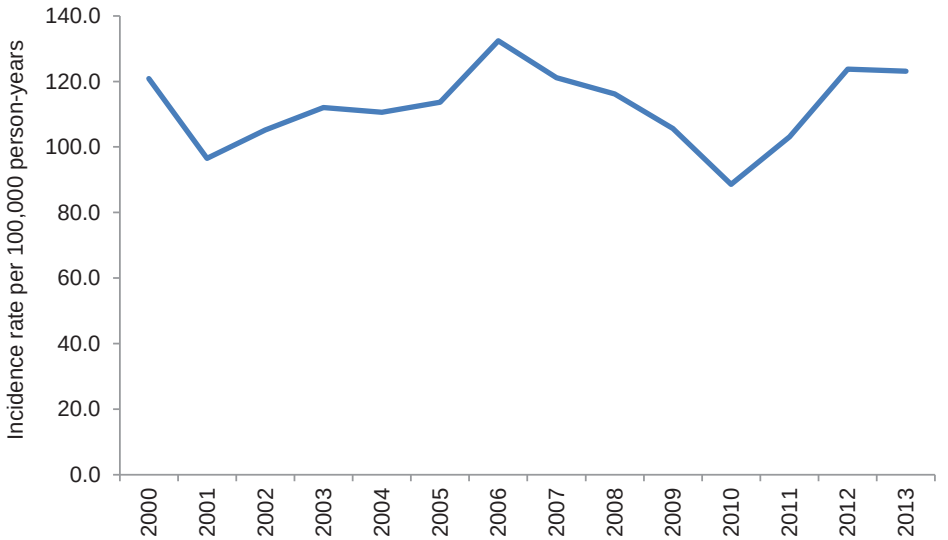


TABLE 3. Frequency of cataract type, active component, U.S. Armed Forces, 2000–2013

Cataract type	No.	%
Senile cataract	8,008	35.7
Infantile, juvenile, and presenile cataract	5,659	25.2
Traumatic cataract	1,530	6.8
After-cataract	465	2.1
Cataract associated with other disorders	81	0.4
Cataract secondary to ocular disorders	70	0.3
Other cataract	924	4.1
Unspecified cataract	5,681	25.3
Total	22,418	100.0

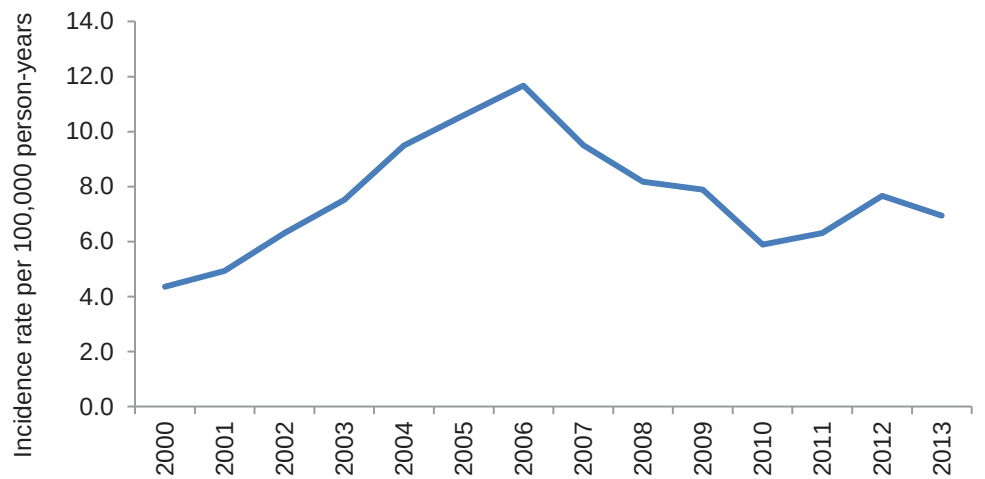
were the most likely to have traumatic cataract compared to the other Services (RR=2.0). Service members in combat-specific occupations were almost three times more likely to have been diagnosed with traumatic cataract (12.7 per 100,000 p-yrs) compared to pilot/air crew (4.6 per 100,000 p-yrs).

The annual incidence rates of traumatic cataract initially increased 168% from 4.4 per 100,000 p-yrs in 2000 to a peak of 11.7 per 100,000 p-yrs in 2006, but then decreased 40% to 6.9 per 100,000 p-yrs in 2013 **(Figure 2)**.

EDITORIAL COMMENT

Although accession standards preclude the entry into military service of persons with cataracts, service members are still at risk for the development of cataracts during the course of their military careers due to either advancing age or other risk factors.

FIGURE 2. Incidence rates of traumatic cataract, active component, U.S. Armed Forces, 2000–2013



This analysis revealed that female service members had an overall higher incidence rate than males for cataract diagnoses of all types combined. However, for the category of traumatic cataract, the incidence rate was strikingly higher in male service members. Males may be more likely to be exposed to traumatic events where the risk of injuries to the eyes is greater (e.g., combat-related injury, sports injuries). Previous *MSMR* analyses have demonstrated that more serious eye injuries (i.e., those requiring hospitalization) are more likely to occur in males; these injuries are also more likely to be caused by guns or explosives, motor vehicle accidents, or fights.[3] In general, males are four times more likely to experience ocular trauma than females.[4]

The decreasing trend in diagnoses of traumatic cataract observed between 2006 and 2013 may be attributable to two distinct temporal trends. In the early part of the period, use of eye protection may have increased as a result of better adherence to the Military Combat Eye Protection program, which was initiated in late 2004. Additionally, the decline in the later years of the surveillance period may also be due in part to a decline in combat-related activities in Iraq.

TABLE 4. Incidence of traumatic cataract by demographic and military characteristics, active component, U.S. Armed Forces, 2000–2013

	No.	Rate[a]	Rate ratio
Total	1,530	7.7	.
Sex			
Male	1,438	8.4	2.7
Female	92	3.2	Ref
Race/ethnicity			
White, non-Hispanic	956	7.6	1.2
Black, non-Hispanic	307	9.0	1.4
Other	267	6.6	Ref
Age			
<20	136	7.5	1.2
20–24	513	7.7	1.2
25–29	314	7.3	1.2
30–34	181	6.2	Ref
35–39	184	7.6	1.2
40–44	133	10.4	1.7
45–49	53	11.9	1.9
50–54	13	11.3	1.8
55+	2	7.2	1.2
Service			
Army	664	9.2	1.8
Navy	316	6.5	1.3
Air Force	247	5.1	Ref
Marine Corps	264	10.2	2
Coast Guard	39	7.1	1.4
Rank			
Junior enlisted (E1–E4)	757	8.7	1.5
Senior enlisted (E5–E9)	569	7.2	1.2
Warrant officers (W1–W5)	21	8.0	1.4
Junior officers (O1–O4)	143	5.9	Ref
Senior officers (O5–O10)	40	6.8	1.2
Occupation			
Combat-specific	320	12.7	2.8
Armor/motor transport	79	9.2	2
Pilot/air crew	34	4.6	Ref
Repair/engineering	413	7.0	1.5
Communication/intelligence	275	6.1	1.3
Health care	110	6.7	1.5
Other	299	7.8	1.7

[a]Rate per 100,000 person-years

The incidence rates of cataracts overall were highest in the Army, Coast Guard, and Air Force and lowest in the Navy and Marine Corps. This pattern may be consistent with the age distributions within each service (i.e., greater proportions of older service members in the Army, Coast Guard, and Air Force). However, for traumatic cataracts, the incidence rates were highest in the Marine Corps and Army; this finding likely reflects a greater risk of traumatic injuries to the eye. In fact, this pattern is consistent with the dramatically higher numbers and rates of eye injury-related hospitalizations among active component service members in the Army and Marine Corps.[3]

The incidence rates of cataracts overall and of traumatic cataract were slightly higher among black, non-Hispanic service members compared to service members in the white, non-Hispanic and other race/ethnicity groups. Although some reports indicate that the incidence of cataract is higher in black, non-Hispanic Americans, most studies of the prevalence of cataract in populations focus on those older than 40 years of age. More than half of the cataract diagnoses in this study were for service members younger than 40 years of age. This study did not compare the incidence of cataract by age and sex within different racial/ethnic groups, so the generalizability of the results are uncertain.

Some of the targets of opportunity in cataract prevention include risk factors important for other adverse health effects, including cigarette smoking, heavy alcohol consumption, diabetes, obesity, and excessive exposure to ultraviolet light. Health promotion strategies to address these risk factors deserve continued emphasis because of the beneficial effects on long-term health, just one of which happens to be cataract prevention.

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REFERENCES

1. Jacobs DS, Trobe J, Park L. UpToDate: Cataracts in Adults. Found at: http://www.uptodate.com/contents/cataract-in-adults. Accessed on 8 July 2014.
2. Armed Forces Health Surveillance Center. Absolute and relative morbidity burdens attributable to various illnesses and injuries, 2013. *MSMR*. 2014;21(4):2–7.
3. Armed Forces Health Surveillance Center. Eye injuries, active component, U.S. Armed Forces, 2000-2010. *MSMR*. 2011;18(5):2–6.
4. Graham RH, Mulrooney BC. Medscape: traumatic cataract. http://emedicine.medscape.com/article/1211083-overview#a0199. Accessed on 7 July 2014.

Relationships Between Diagnoses of Sexually Transmitted Infections and Urinary Tract Infections Among Male Service Members Diagnosed with Urethritis, Active Component, U.S. Armed Forces, 2000–2013

A previous *MSMR* report found that 42.8% of all incident (first-time) urinary tract infections (UTIs) in males, but only 0.4% of such UTIs in females, were diagnosed as "urethritis, unspecified" (ICD-9: 597.80). This study explored the possibility that many of the diagnoses of urethritis in males represented sexually transmitted infections (STIs), even though ICD-9: 597.80 is explicitly reserved for cases of urethritis that are deemed to not be sexually transmitted. Examined were relationships between diagnoses of urethritis, diagnoses of STIs, and recurrent diagnoses of UTIs. Male service members who received a diagnosis of "urethritis, unspecified" had an increased risk of a subsequent UTI diagnosis, especially of "urethritis, unspecified," compared to all male service members. Most service members who were diagnosed with "urethritis, unspecified" had no documented diagnoses of an STI in their Military Health System health records; however, recurrent UTIs were more common among service members who did have documented STIs. The most commonly diagnosed STIs in this study were "other non-gonococcal urethritis" (which includes that caused by *Chlamydia trachomatis*) and gonorrhea.

In February 2014, a MSMR report documented that approximately 3.5% of all active component male service members had been diagnosed with a lower urinary tract infection (UTI) (e.g., urethritis, cystitis) at least once while in military service, and that 13.0% of male service members with one UTI diagnosis had been subsequently diagnosed with another (recurrent) UTI.[1] It was noteworthy that 42.8% of all incident (first-time) UTIs in males were diagnosed as "urethritis, unspecified" (ICD-9: 597.80), but that only 0.4% of UTIs in females were given that diagnosis. The report suggested that many diagnoses of urethritis among military members represented sexually transmitted infections (STIs), even though ICD-9: 597.80 is explicitly reserved for cases that are not considered sexually transmitted. This report describes temporal relationships among diagnoses of urethritis, diagnoses of STIs, and recurrent diagnoses of UTIs.

METHODS

As in the February 2014 MSMR study, the surveillance period was 1 January 2000 through 31 December 2013.[1] The surveillance population included only male active component service members of the Army, Navy, Air Force, Marine Corps, and Coast Guard. The data used in this analysis were derived from the electronic healthcare records of the Defense Medical Surveillance System (DMSS), which maintains records of all actively serving U.S. military members' hospitalizations and ambulatory healthcare visits in U.S. military and civilian (contracted/purchased care through the Military Health System [MHS]) medical facilities worldwide. Diagnoses during deployments were not included and consequently, military service while deployed was not included in the overall person-time used as denominators for rate calculations.

For this analysis, DMSS records were examined for male service members whose first-ever diagnoses of UTIs were for "urethritis, unspecified" (ICD-9: 597.80). Individuals whose first UTI diagnoses were not "urethritis, unspecified" or who had been diagnosed with any type of UTI (including "urethritis, unspecified") prior to the surveillance period (i.e., prevalent cases) were excluded from the analysis. A case was defined as an individual with a diagnosis of "urethritis, unspecified" documented in the primary or secondary diagnostic position of a record of a hospitalization or ambulatory care encounter during the surveillance period. For incidence rate calculations, an individual was counted as a case just once during the surveillance period.

For those male service members who met the above criteria for a case of "urethritis, unspecified," their DMSS records were searched to determine whether they had ever been diagnosed with an STI. A case of STI was defined as an individual with a case-defining ICD-9 code **(Table 1)** documented in the first or second diagnostic position of a record of a hospitalization or ambulatory care encounter. All cases of STI were categorized based on whether they were diagnosed prior to or after the first-ever diagnoses of urethritis in the affected service members.

Lastly, for all male service members who met the above criteria for a case of "urethritis, unspecified," their DMSS records were searched to determine whether they had been diagnosed with a lower UTI (hereafter referred to simply as UTI) after their initial diagnosis of urethritis. As in the previous study, subsequent (recurrent) UTIs were counted as new UTIs if at least 30 days had passed since any previous UTI encounter. In this analysis, any of the four

TABLE 1. ICD-9 codes for categories of sexually transmitted infection (STI), lower urinary tract infection (UTI)

Categories of STI	ICD-9 codes
Syphilis	091.x–097.x
Gonorrhea	098.x
Other non-gonococcal urethritis (NGU) (includes NGU caused by *Chlamydia trachomatis*)	099.4x
Other venereal diseases due to *Chlamydia trachomatis* (does not include urethritis)	099.5x
All other STI	099.0–099.3, 099.8–099.9
Categories of lower UTI	**ICD-9 codes**
Urethritis, unspecified	597.80[a]
Acute cystitis	595.0
Cystitis, unspecified	595.9
UTI, site not specified	599.0

[a]Under ICD-9: 597, "urethritis, not sexually transmitted, and urethral syndrome"

TABLE 2. Counts and rates of incident diagnoses of first-ever "urethritis, unspecified" (ICD-9: 597.80), male active component service members, U.S. Armed Forces, 2000–2013

	No.	Rate[a]
Total	49,649	3.2
Age		
<20	3,679	3.3
20–24	22,608	4.6
25–29	12,341	3.7
30–34	5,497	2.4
35–39	3,445	1.7
40–44	1,535	1.3
≥45	544	1.0
Service		
Army	21,757	4.2
Navy	9,676	2.5
Air Force	11,698	3.2
Marine Corps	5,313	2.4
Coast Guard	1,205	2.5
Race/ethnicity		
White, non-Hispanic	23,141	2.3
Black, non-Hispanic	18,305	7.8
Hispanic	4,778	3.1
Other/unknown	3,425	2.3

[a]Rate per 1,000 person-years

specific types of UTIs shown in Table 1 were captured. Individuals could have been diagnosed with multiple UTIs as long as they met the 30-day criterion each time.

RESULTS

During 2000–2013, a total of 49,649 active component male service members were diagnosed with "urethritis, unspecified" as their first-ever UTI **(Table 2)**. The overall incidence rate was 3.2 cases per 1,000 person-years (p-yrs). Incidence rates were highest among male service members aged 20–24 years, and rates steadily decreased in age groups older than 24 years. Compared to their counterparts, incidence rates were higher among male service members who were black, non-Hispanic and among those in the Army. Annual incidence rates were relatively low during the early years of the surveillance period, increased to their highest levels during 2006–2008, and then gradually declined **(Figure 1)**. Temporal trends were similar in all age groups **(data not shown)**.

Among the 49,649 male service members with urethritis, a total of 7,282 (14.7%) were subsequently diagnosed with at least one recurrent UTI; there were 10,123 recurrent UTI cases overall **(Table 3)**. The vast majority of recurrent UTIs were diagnosed as "urethritis, unspecified" (77.5% of total) or "UTI, site not specified" (18.9%); only 3.6% of recurrent UTIs were attributed to cystitis.

Most (n=37,943; 76.4%) of the 49,649 male service members with first-time diagnoses of urethritis had no documented diagnoses of STIs any time during the surveillance period **(Table 3)**. Of all men affected with urethritis but no STIs, 11.7% (n=4,445) had at least one recurrent UTI diagnosis during the period; the average number of recurrent UTIs among those with any recurrences was 1.3. Of all recurrent UTIs (n=5,690), most by far were diagnosed as either "urethritis, site not unspecified" (73.3%) or "UTI, unspecified" (22.3%).

Nearly one-fourth (n=11,706; 23.6%) of all male service members with first-time urethritis diagnoses had one or more documented STIs during the surveillance period **(Table 3)**. Approximately one-fourth (n=2,837; 24.2%) of these individuals had at least one recurrent UTI diagnosis.

Among those who had STI diagnoses *both before and after* their first urethritis diagnoses (n=1,211), 36.7% had at least one recurrent UTI diagnosis **(Table 3)**. The average number of recurrent UTIs among those affected by recurrences was 1.7.

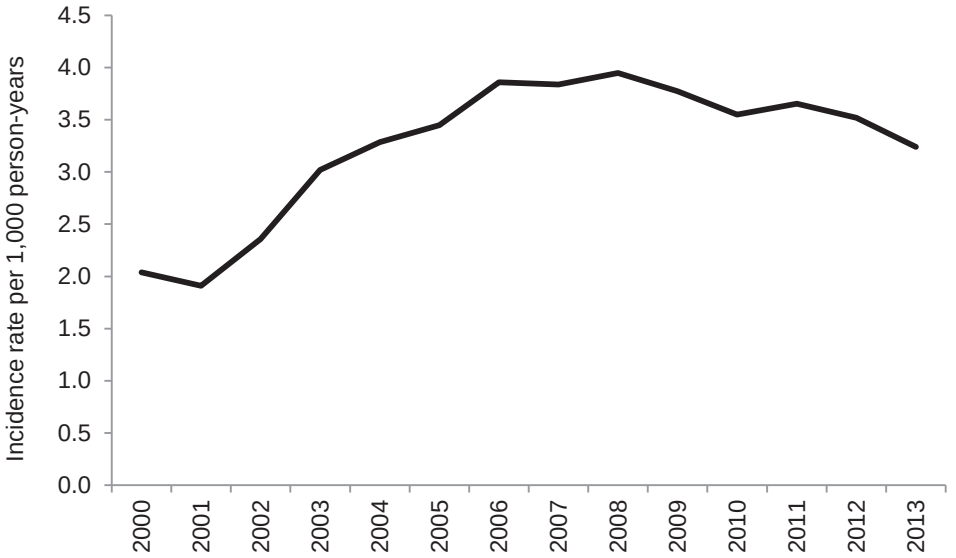
Among those whose only STI diagnoses were *after* their first urethritis diagnoses (n=5,335), 28.9% had at least one recurrent UTI **(Table 3)**. The average number of recurrent UTIs among those affected by recurrences was 1.6.

Among those whose only STI diagnoses were *before* their first urethritis diagnoses (n=5,160), 16.5% had at least one recurrent UTI **(Table 3)**. The average number of recurrent UTIs among those affected by recurrences was 1.3.

Overall, 6,371 men were diagnosed with one or more STIs prior to their first diagnoses of urethritis **(Table 3)**. Nearly one-third (29.0%) of all STIs that preceded initial urethritis diagnoses were recorded within 30 days of the respective urethritis diagnosis dates **(data not shown)**.

Overall, 1,985 men had at least one recurrent UTI and were diagnosed with at least one STI after their first diagnosis of urethritis **(Table 3)**. Of these men, 15.8% and 42.7% were diagnosed with an STI

FIGURE 1. Annual incidence rates of first-ever cases of "urethritis, unspecified," active component, U.S. Armed Forces, 2000–2013



within or more than 30 days, respectively, before the diagnosis of a recurrent UTI **(data not shown)**. Also, 10.2% and 31.2% of these men were diagnosed with an STI within or more than 30 days, respectively, after the diagnosis of a recurrent UTI.

For those men who were diagnosed with an STI before their first-ever diagnosis of urethritis, the most frequently diagnosed STIs were "other non-gonococcal urethritis" (which includes that caused by *Chlamydia trachomatis*) (45% of STIs) and gonorrhea (24%) **(data not shown)**. Among those men who were diagnosed with an STI after their first-ever diagnosis of urethritis and who had a recurrent UTI, the most frequently diagnosed STIs were similar (44% and 31%, respectively).

EDITORIAL COMMENT

A previous *MSMR* report revealed that 42.8% of first-ever urinary tract infections among male service members were documented with ICD-9: 597.80, "urethritis, unspecified".[1] This diagnosis code is appropriately used to document cases of urethritis that are not considered sexually transmitted **(Table 1)**. The results of this report suggest that the "urethritis, unspecified" diagnosis code is often used inappropriately, particularly when documenting urethritis cases of unknown infectious etiologies.

In military medical treatment facilities, patients often present with signs and symptoms of urethritis; however, there are several possible infectious etiologies. If healthcare providers determine that such cases were sexually transmitted, appropriate, tentative diagnoses (and ICD-9 codes) would include "other non-gonococcal urethritis [NGU]" (ICD-9: 099.4), "other NGU, unspecified" (including "nonspecific urethritis") (ICD-9: 099.40), and even "venereal disease, unspecified" (ICD-9: 099.9). More specific "rule-out" diagnoses might include "NGU, *Chlamydia trachomatis*" (ICD-9: 099.41), "NGU, other specified organism" (ICD-9: 099.49), and possibly "acute gonococcal urethritis" (ICD-9: 098.0), although such specific diagnoses are generally reserved until confirmed by a laboratory.

It is noteworthy that, of all those male service members whose health records indicated a first-ever UTI diagnosed as "urethritis, unspecified," 14.7% received subsequent diagnoses of a UTI. A previous *MSMR* report showed that 13% of

TABLE 3. Sexually transmitted infections (STIs) and recurrent urinary tract infections (UTIs) among male service members with first-ever diagnoses of "urethritis, unspecified," active component, U.S. Armed Forces, 2000–2013

		Affected individuals		Individuals with recurrent UTI		Cases of recurrent UTI		Proportions of recurrent cases by type of UTI			
		No.	%	No. with recurrent UTI	% with recurrent UTI	No. of recurrent UTI cases	Recurrent cases per individual	% urethritis, unspecified	% acute cystitis	% cystitis, unspecified	% UTI, site not specified
Males with first-ever urethritis diagnoses		49,649	100.0	7,282	14.7	10,123	1.4	77.5	1.9	1.7	18.9
History of STI											
No STI during period		37,943	76.4	4,445	11.7	5,690	1.3	73.3	2.3	2.0	22.3
Any STI during period		11,706	23.6	2,837	24.2	4,433	1.6	82.8	1.4	1.2	14.6
STI before urethritis	STI after urethritis										
Yes	Yes	1,211	10.3	444	36.7	744	1.7	86.4	0.4	1.2	12.0
No	Yes	5,335	45.6	1,541	28.9	2,542	1.6	83.1	1.4	1.2	14.3
Yes	No	5,160	44.1	852	16.5	1,147	1.3	79.9	1.9	1.2	17.0

males who had been diagnosed with a UTI of any type experienced at least one recurrent UTI.[1] These observations contrast with the general experience of all male service members, only 3.5% of whom ever received a diagnosis of a UTI. These data suggest that some males who are diagnosed with urethritis are, at least temporarily, at increased risk of UTI recurrences.

This analysis assessed relationships between recurrent urinary tract infections (UTIs) and sexually transmitted infections (STIs). Overall, approximately one-fourth (23.6%) of all male service members who had at least one UTI-related diagnosis of urethritis also had one or more STI diagnoses during their military service careers. With respect to the potential relationship between STIs and recurrent UTIs, just 11.7% of men with diagnoses of urethritis, but no documented diagnoses of STIs, had recurrent UTIs. At the other extreme, 36.7% of men who had STI diagnoses both before and after their initial urethritis diagnoses experienced recurrent UTIs.

In males, a diagnosis of acute urethritis should prompt clinical evaluation for a sexually transmitted infection, particularly with *C. trachomatis* and *Neisseria gonorrhoeae*, by far the most common bacterial causes of urethritis.[2] Incidence rates of these two infections among male service members have been estimated as approximately seven and two cases per 1,000 p-yrs, respectively.[3,4] Because coinfections with these bacteria are common, evaluation for both is indicated when feasible, because each agent requires a different antibiotic treatment regimen. Other STI-related causes of urethritis include *Trichomonas vaginalis, Mycoplasma genitalium*, *Ureaplasma urealyticum*, herpes simplex virus, and adenoviruses, but these causes are far less common than *Chlamydia* and *Neisseria*.[2]

Although the results of this analysis suggest some correlation between diagnoses of UTIs and documented healthcare encounters for STIs, most first-ever cases of urethritis (76.4%) and most recurrent UTIs (61.0% of individuals; 56.2% of cases) were diagnosed in male service members whose military health records contained no documentation of STI diagnoses. For at least those service members, the use of the ICD-9 597.80 (urethritis, unspecified) was appropriate if the provider believed that the clinical presentation was not due to an STI.

The results described herein should be considered in light of several limitations. This analysis examined diagnoses rendered and documented in records of inpatient and outpatient care in the MHS. Diagnoses in the Services' reportable medical events systems were not included. As a result, this analysis did not account for STI cases with positive laboratory tests that were not documented with the corresponding diagnoses in the patients' health records. Also not captured in this study were diagnoses made when service members obtained health care outside the MHS. Accordingly, the counts of cases of urethritis, other UTIs, and particularly STIs are likely underestimates of the true incidence of these conditions; in turn, there is uncertainty regarding estimates of the natures and strengths of the relationships between UTIs and STIs. In addition, because only one encounter with the requisite diagnostic code was necessary to be counted as a case (of any of the conditions of interest), this method is somewhat vulnerable to overestimating incident cases because of errors in recording diagnoses or the associated ICD-9 codes. No attempt was made to control for other risk factors for UTI (such as injury, surgery, other systemic illnesses) or for the duration of follow-up for cases of urethritis. As a result of the latter limitation, some cases likely qualified for inclusion in the study shortly before they left military service or shortly before the end of the surveillance period. Such cases had little follow-up time to permit identification of subsequent STIs or recurrent UTIs.

In summary, this report documents that male military members who were diagnosed with "urethritis, unspecified" had increased risk of subsequent UTI diagnoses, especially of "urethritis, unspecified," when compared to their male military counterparts. Of note, most men who were diagnosed with "urethritis, unspecified" had no documented diagnoses of STIs in their military health records; however, recurrent UTIs were more common among those who did have documented STIs. The most commonly diagnosed STIs in this study were "other non-gonococcal urethritis" (which includes that caused by *C. trachomatis*) and gonorrhea.

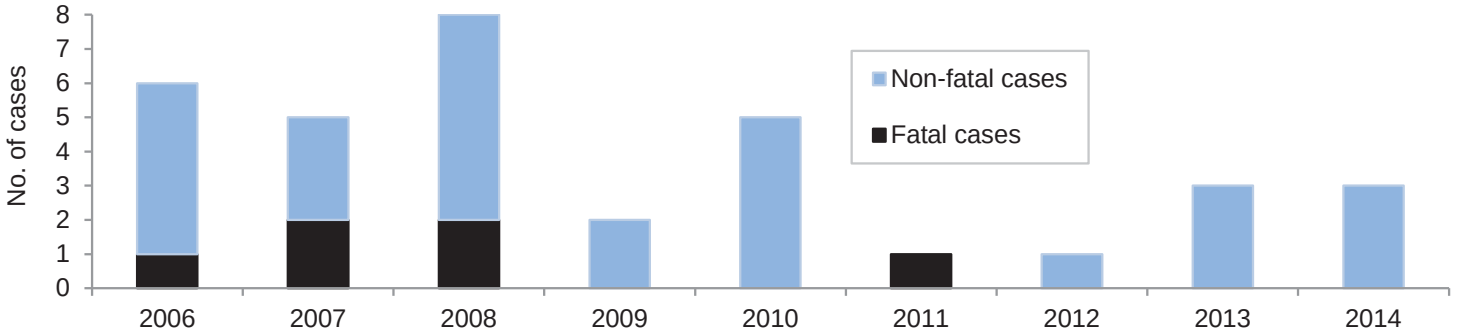
REFERENCES

1. Armed Forces Health Surveillance Center. Urinary tract infections, active component, U.S. Armed Forces, 2000-2013. *MSMR*. 2014;21(2):7–12.
2. McCormack WM. Urethritis. In: Mandell GL, Bennett JE, and Dolin R, eds. *Principles and Practice of Infectious Diseases*. 7th ed. Philadelphia: Churchill Livingstone Elsevier; 2010:1485–1494.
3. Armed Forces Health Surveillance Center. Sexually transmitted infections, U.S. Armed Forces, 2004-2009. *MSMR*. 2010;17(8):2–10.
4. Armed Forces Health Surveillance Center. Sexually transmitted infections, active component, U.S. Armed Forces, 2000-2012. *MSMR*. 2013;20(2):5–10.

Surveillance Snapshot: Cases of Service Member Meningococcal Disease Reported to the Naval Health Research Center Laboratory–Based Meningococcal Disease Surveillance Program, 2006–2014

Michael P. Broderick, PhD

FIGURE. Annual counts of fatal and non-fatal cases of meningococcal disease among active duty service members, U.S. Armed Forces, 2006–2014 (through June 2014)



The Naval Health Research Center (NHRC), San Diego, CA, conducts laboratory-based surveillance to capture every case of meningococcal disease in U.S. military active duty members and dependents. The surveillance program has been in place since 2007.

Rates of meningococcal disease have decreased by more than 90% since the early 1970s,[1] and in recent years, the incidence rates in the military and general populations have become equivalent.[2] Of the 34 cases reported in this snapshot **(Figure)**, 32 have a record of receipt of quadrivalent meningococcal vaccine before their illnesses; for the other two cases, the vaccine history was unavailable. All fatal cases (n=6) had been immunized. Among the 34 cases, serogroups of *Neisseria meningitidis* identified were type B (n=10), type C (n=8), type Y (n=11), and undetermined (n=5). The distribution of serogroups among the fatal cases showed two each of types B, C, and Y. Among the seven most recent cases (2012–2014), four were infected with group B; there was one each of groups C and Y; and one was nongroupable. Serogroup B is not covered in the available quadrivalent vaccines (which protect against serogroups A, C, W-135, and Y) licensed in the U.S.

NHRC identifies cases of meningococcal disease through the Services' reportable events systems; daily feeds of laboratory results from the Navy and Marine Corps Public Health Center in Portsmouth, VA; a monthly report from the Armed Forces Health Surveillance Center covering diagnoses of meningococcal disease made during healthcare encounters in the Military Health System; and feeder reports from public health agencies in South Carolina and San Diego.

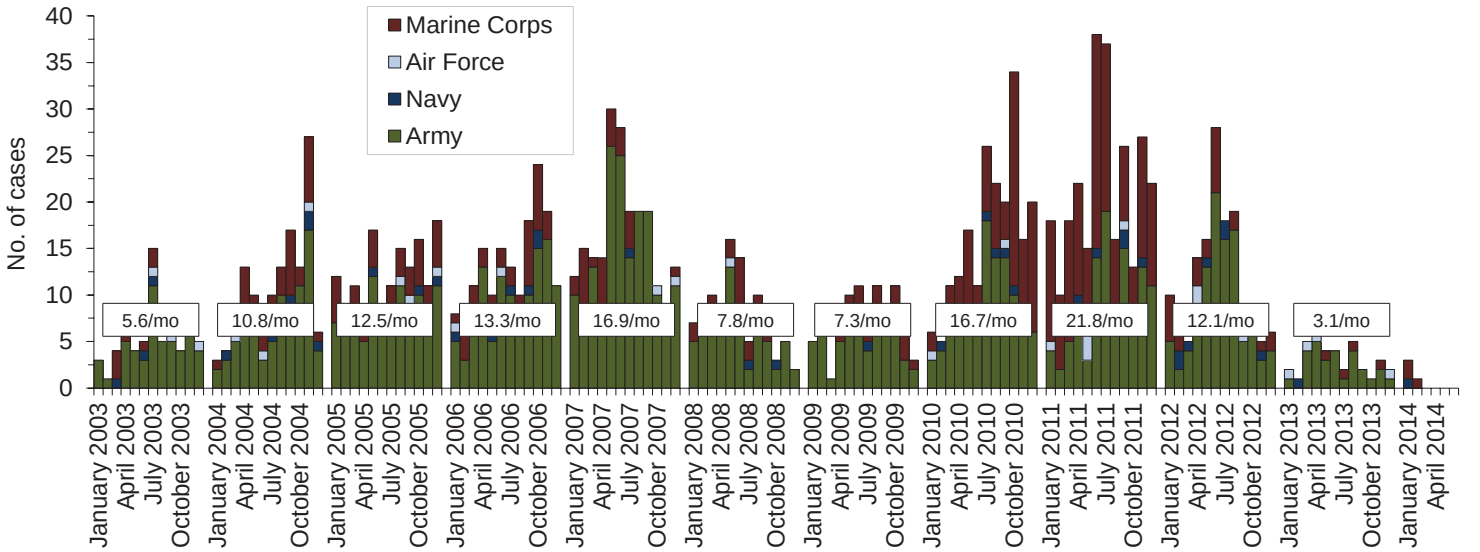
Clinicians and public health officials are encouraged to report cases of meningococcal infection and to forward microbiologic specimens to NHRC for confirmatory testing and serogrouping. Results are reported back to the originating treatment facility. NHRC produces a quarterly surveillance report, which is available online at http://www.med.navy.mil/sites/nhrc/geis/Documents/MGCreport.pdf.

Author affiliation: Naval Health Research Center, San Diego, CA

1. Brundage JF, Ryan MA, Feighner BH, Erdtmann FJ. Meningococcal disease among United States military service members in relation to routine uses of vaccines with different serogroup-specific components, 1964–1998. *Clin Infect Dis.* 2002;35(11):1376–1381.
2. Broderick MP, Faix DJ, Hansen CJ, Blair PJ. Trends in meningococcal disease in the United States military, 1971–2010. *Emerg Infect Dis.* 2012;18(9):1430–1437.

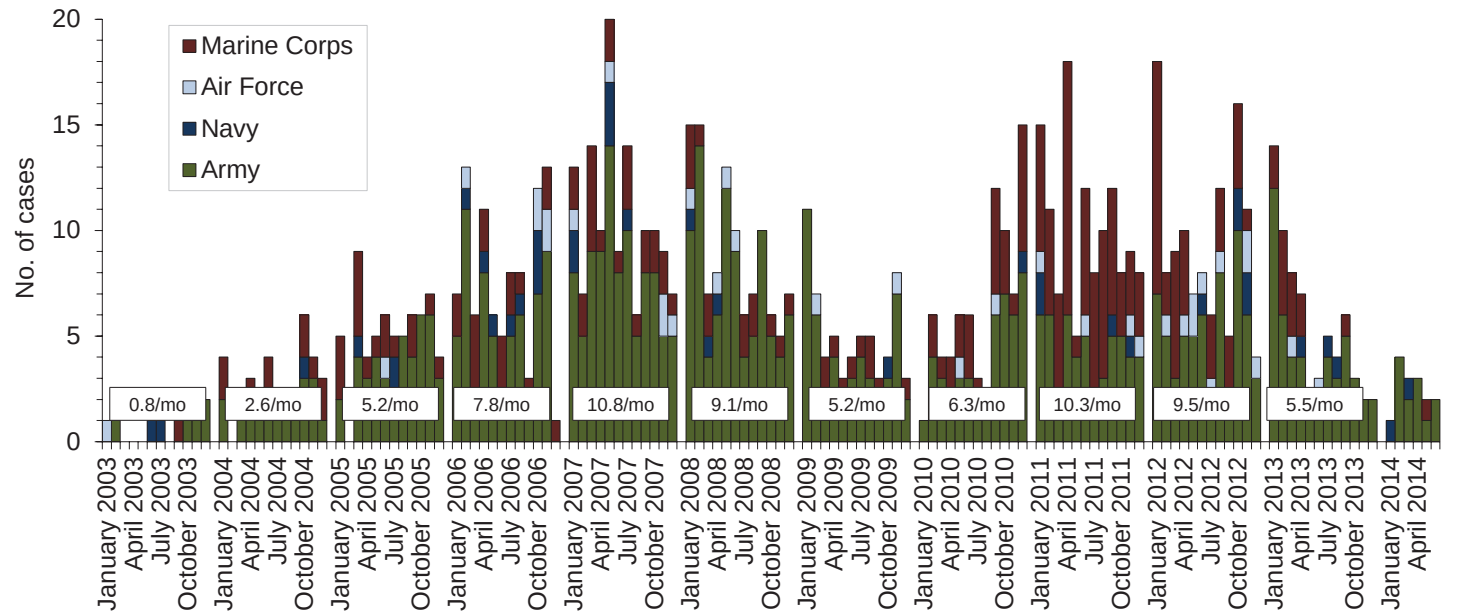
Deployment-related Conditions of Special Surveillance Interest, U.S. Armed Forces, by Month and Service, January 2003–June 2014 (data as of 22 July 2014)

Amputations (ICD-9-CM: 887, 896, 897, V49.6 except V49.61–V49.62, V49.7 except V49.71–V49.72, PR 84.0–PR 84.1, except PR 84.01–PR 84.02 and PR 84.11)[a]



Reference: Army Medical Surveillance Activity. Deployment-related condition of special surveillance interest: amputations. Amputations of lower and upper extremities, U.S. Armed Forces, 1990–2004. *MSMR*. Jan 2005;11(1):2–6.
[a]Indicator diagnosis (one per individual) during a hospitalization while deployed to/within 365 days of returning from deployment.

Heterotopic ossification (ICD-9: 728.12, 728.13, 728.19)[b]



Reference: Army Medical Surveillance Activity. Heterotopic ossification, active components, U.S. Armed Forces, 2002–2007. *MSMR*. Aug 2007; 14(5):7–9.
[b]One diagnosis during a hospitalization or two or more ambulatory visits at least 7 days apart (one case per individual) while deployed to/within 365 days of returning from deployment.

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