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Reported Gastrointestinal Infections in the U.S. Air Force, 2000–2012

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During 2000–2012, U.S. Air Force Public Health Offices reported 3,429 cases of gastrointestinal infection (GI) diagnosed at Air Force medical treatment facilities. The four most commonly reported specific etiologies of GIs accounted for 86.7% of all GI cases (n=2,972). Salmonellosis accounted for 41.4% (n=1,420) of all cases. The next most commonly reported events were associated with *Campylobacter* infection, shigellosis, and giardiasis. The majority of GI cases were reported among dependents, most notably among those aged 0–5 years. *Campylobacter* infections represented a significantly larger proportion of GI reported from locations outside the continental United States (OCONUS) (n=222, 33.7%) compared to continental U.S. (CONUS) locations (n=363, 13.1%). CONUS locations reported higher proportions of salmonellosis, shigellosis, and giardiasis infections compared to OCONUS locations. Annual numbers of reported cases of GI peaked in 2002, declined to much lower numbers during 2004–2007, and then began to climb until the end of the surveillance period.

Infectious disorders of the gastrointestinal tract have historically caused significant morbidity among U.S. military members. Acute diarrhea was the most common illness reported among military personnel during World War II. During the Vietnam conflict, diarrhea accounted for four times as many hospital admissions as did malaria.[1] During Operation Desert Shield, 57.0% of surveyed troops reported that they had experienced at least one episode of diarrhea, and an estimated 20.0% of them were temporarily unable to perform their duties due to their symptoms.[2] Recent studies have demonstrated that diarrhea continues to be a common problem for U.S. military personnel during deployment, and that the impact of illness poses a threat to accomplishing the mission.[3,4]

Important risk factors for acquiring diarrhea in deployed settings include time spent off base and consumption of local (non-military-approved) food.[4] Infectious disorders of the gastrointestinal tract also cause substantial morbidity in the U.S. population. The Centers for Disease Control and Prevention (CDC) estimates that 47.8 million cases of foodborne illness are acquired within the U.S. every year from both known and unknown pathogens.[5,6]

Gastrointestinal pathogens include bacterial, viral, and parasitic agents. Although these agents are most commonly transmitted via contaminated food or water, person-to-person spread and contact with animal reservoirs are also important routes. Individual cases of diarrhea and vomiting are seldom investigated thoroughly to determine the source of infection. Some infectious disorders of the gastrointestinal tract produce symptoms and clinical manifestations different from the typical presentations of diarrhea and vomiting (e.g., botulism, brucellosis, hepatitis A, trichinosis, and typhoid fever).

For the purposes of this report, the term “gastrointestinal infection (GI)” is used to refer to a diverse group of illnesses that share the route of infection via the gastrointestinal tract. Because the spectrum of disease attributable to GI includes many relatively mild illnesses, there is substantial underreporting of these infections. Consequently, estimates of the incidence of GI, particularly according to specific etiology, are difficult to determine, even among military beneficiaries supported by a robust healthcare system; a recent *MSMR* report found that, among all diagnoses of GI in active component military personnel, the most frequently recorded diagnosis was “diarrhea, not otherwise specified.”[4]

Air Force Public Health personnel at each base monitor the occurrence of GI as defined in the *Armed Forces Reportable Medical Events Guidelines & Case Definitions*[7,8] and submit electronic reports through the Air Force Reportable Events Surveillance System (AFRESS) to the Epidemiology Consult Service at the U.S. Air Force School of Aerospace Medicine. Historically, the Epidemiology Consult Service has compiled annual incidence rates for certain reportable events, including GI. These rates were tabulated and analyzed according to major command and by installation. Beginning in 2011, reportable medical events were summarized by week of onset and specific diagnosis (more information is available from the Epidemiology Consult Service). To date, however, GI data reported in AFRESS have not been analyzed to examine demographic, geographic, or long-term trends. This report reviews GI data reported in AFRESS during 2000–2012 and examines demographics, geographic distribution, and reporting trends of the most frequently reported conditions. Opportunities for prevention and control are discussed in light of these findings.

METHODS

The surveillance period was 1 January 2000 through 31 December 2012. AFRESS was queried for ICD-9 codes corresponding to amebiasis, botulism, brucellosis, *Campylobacter* infection, cholera, cryptosporidiosis, *Cyclospora* infection, Shiga toxin-producing *E. coli*, *Vibrio parahaemolyticus*, giardiasis, hepatitis A, listeriosis, norovirus, salmonellosis, shigellosis, trichinosis, and typhoid fever. Information on GI outbreaks that occurred during the surveillance period, but were not reported as individual cases, was not included in the analysis.

The population of interest consisted of recipients of health care at Air Force medical treatment facilities (MTFs) during the surveillance period. Beneficiaries of such care were grouped into four categories: 1) military members (including active and reserve component members), 2) retired service members, 3) dependents (i.e., family members), and 4) others. By using dates of onset and information in the comment fields of AFRESS reports, duplicate records were removed, as were cases for which a GI was ultimately ruled out. Air Force MTFs were grouped by geographic location as either within the continental United States (CONUS) or outside the continental United States (OCONUS).

Cases were categorized by season of onset: winter (December–February), spring (March–May), summer (June–August), and fall (September–November).

Descriptive statistics included an assessment of the distribution of total GI and the four most frequently reported GI by demographic category. Comparisons between demographic groups were made using a Z-test of proportions and ANOVA, correcting for multiple comparisons using the Bonferroni method. Significance was determined at alpha values of less than 0.05. Data were analyzed using STATA 9.2 and 13.0 (StataCorp., College Station, TX).

RESULTS

During the 13-year surveillance period, 3,429 cases of GI were reported among beneficiaries receiving care at AF MTFs. Dependents represented 60.0% of all reported cases (n=2,059); only 846 cases (24.7%) were reported among military members **(Table 1)**. Of all reported cases, 43.4% were among children aged 0–17 years. Males (n=1,871, 54.5%) experienced more reported GIs than females (n=1,480, 43.2%). Among case reports with completed race/ethnicity information (n=1,838), nearly 80% (n=1,455) pertained to white, non-Hispanic persons. Most cases (n=2,771, 80.8%) were reported from CONUS locations compared to OCONUS locations (n=658, 19.2%). Nearly two-thirds (n=2,146, 62.6 %) of the cases occurred during June–November. In total, 3,361 (98.0%) reported cases were recorded in AFRESS as confirmed in accordance with the *Armed Forces Reportable Medical Events Guidelines & Case Definitions* in effect at the time of disease onset. The most common confirmation method was culture (n=2,585, 75.4%). The gender and age distribution of reported GIs reflected the expected distribution of these characteristics for this beneficiary population **(data not shown)**.

The annual numbers of reported GI cases peaked in 2002, remained relatively stable between 2003 and 2009, and then increased yearly through the end of 2012 **(Figure 1)**. The spike in reported GI cases during 2002 was associated with a 1-year dramatic increase in shigellosis reports **(Figure 2)**. The 142 reported cases of shigellosis in 2002 contrast with a mean of 41 cases per year for the entire surveillance period and with the second highest annual counts of such cases (51 cases in 2001 and 2003) **(data not shown)**. During 2009–2012, the proportion of salmonellosis cases decreased, and the proportion of *Campylobacter* infections increased.

Salmonellosis (36.9%) and *Campylobacter* infection (33.2%) cases

TABLE 1. Demographic and other characteristics of all reported cases of gastrointestinal infection, U.S. Air Force, 2000–2012

	No.	%
Beneficiary status		
Dependent	2,059	60.0
Military	846	24.7
Retiree	122	3.6
Other	41	1.2
Not reported	361	10.5
Age group		
0–5	1,051	30.7
6–17	435	12.7
18–24	454	13.2
25–34	637	18.6
35–44	396	11.5
45–54	218	6.3
55–64	143	4.2
65+	92	2.7
Not reported	3	0.1
Sex		
Male	1,871	54.5
Female	1,480	43.2
Not reported	78	2.3
Race/ethnicity		
White, non-Hispanic	1,455	42.4
All others	383	11.2
Not reported	1,591	46.4
Location of reporting treatment facility		
CONUS (Continental United States)	2,771	80.8
OCONUS (Outside CONUS)	658	19.2
Season		
Winter (Dec–Feb)	603	17.6
Spring (Mar–May)	680	19.8
Summer (Jun–Aug)	1,106	32.3
Fall (Sep–Nov)	1,040	30.3
Service		
Air Force	2,896	84.5
Army	230	6.7
Navy	158	4.6
Marine Corps	36	1.0
Coast Guard	14	0.4
Other[a]	95	2.8
Total	3,429	100.0

[a]85 civilians (non-service affiliated), nine U.S. Public Health Service members, and one unknown

FIGURE 1. Cases of gastrointestinal infection reported through the Air Force Reportable Events Surveillance System, 2000–2012

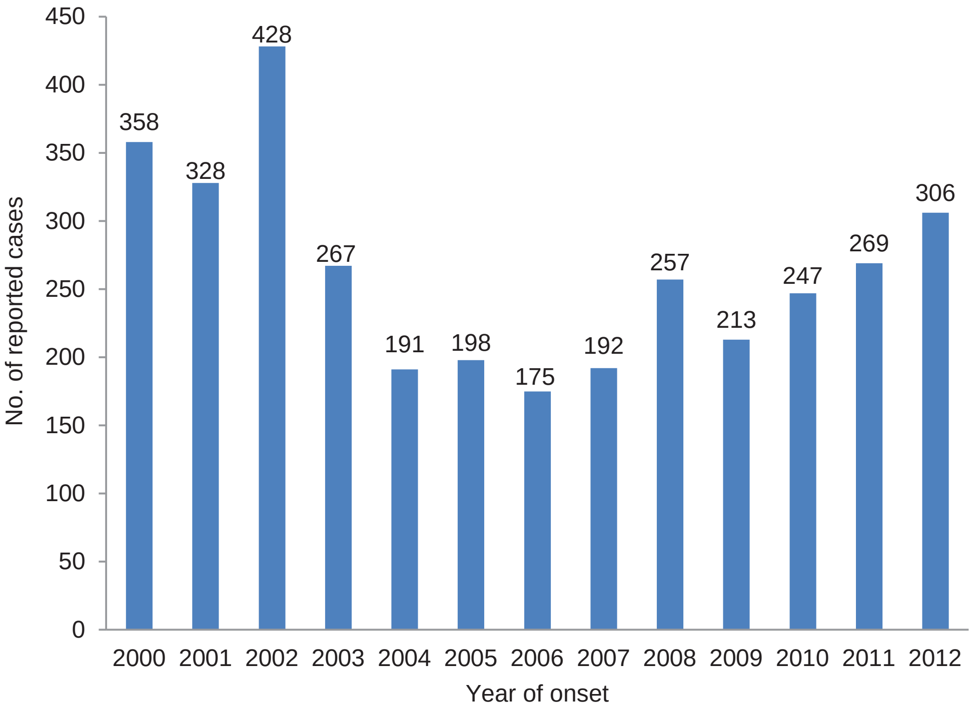
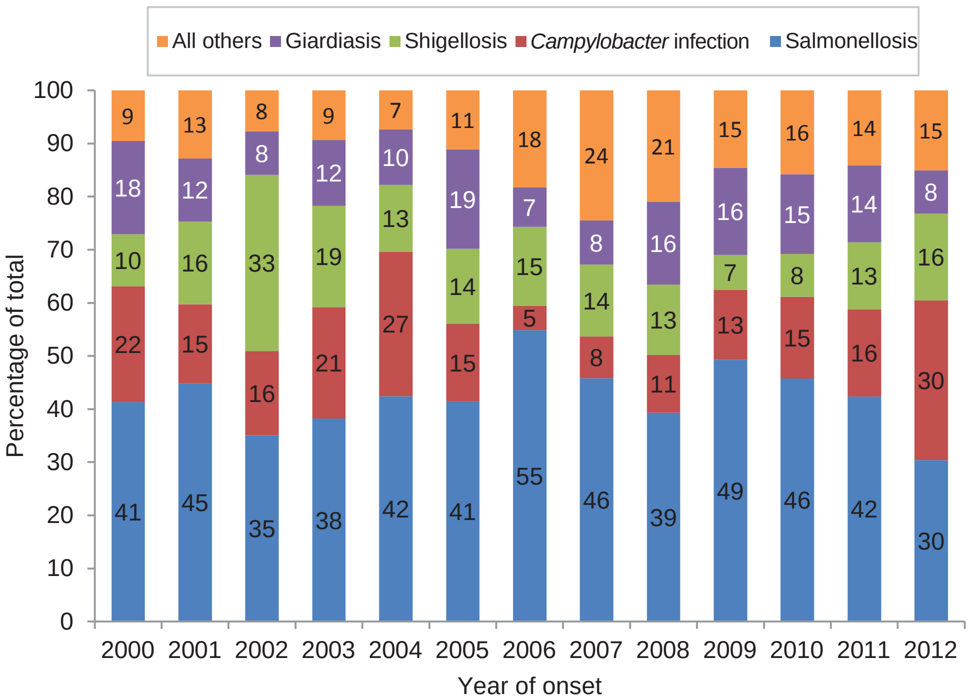


FIGURE 2. Most common gastrointestinal infections (GIs) as a percentage of total GIs reported, by year, U.S. Air Force, 2000–2012



occurred predominantly in the summer months **(Figure 3)**. More shigellosis cases (36.5%) had their onset in the fall (September–November) than in any other season. Giardiasis reporting was relatively consistent across all four seasons, ranging from 20.8% in the spring to 27.1% in the summer.

The most commonly reported GIs were salmonellosis (n=1,420), *Campylobacter* infection (n=585), shigellosis (n=535), and giardiasis (n=432) **(Table 2)**. Together, these four accounted for 86.7% (n=2,972) of all GIs reported in AFRESS. Salmonellosis was the cause of 49.9% of the reported GIs among dependents, but only 29.9% of the reported GIs among military personnel **(Table 3a)**. Similarly, shigellosis accounted for 19.2% of dependents with a GI but only 8.6% of military personnel with a GI. In contrast, *Campylobacter* infection and giardiasis were the causes of significantly higher proportions of the reported GIs among military personnel, compared to GIs reported among dependents.

Gender differences were observed for salmonellosis, *Campylobacter* infection, and giardiasis **(Table 3a)**. Salmonellosis comprised a larger proportion of all GI cases among females (44.8% of all GIs) as compared to males (39.2%; p=0.001). Likewise, *Campylobacter* infection (19.5%) and giardiasis (14.1%) comprised larger proportions of all GI cases among males as compared to females (14.1% and 10.5%; p<0.001 and p=0.002, respectively). No gender differences were observed with shigellosis (p=0.347).

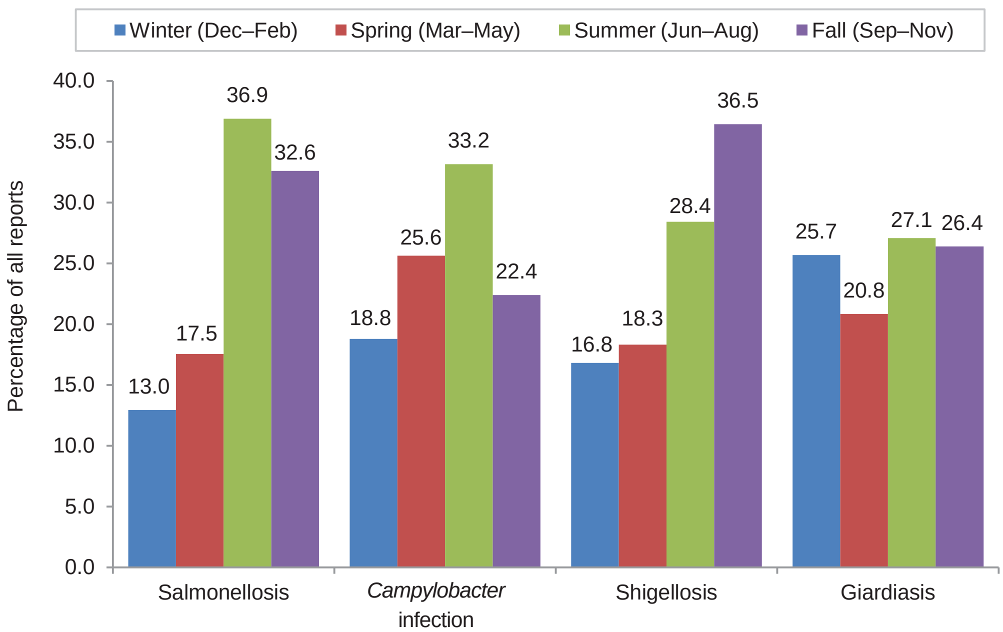
Salmonellosis accounted for a greater proportion (59.7%) of GIs among patients aged 0–5 years than among patients in any other age category **(Table 3b)**. The differences in proportions were statistically significant for all of the other age groups except for those in the oldest age group. Conversely, reports of *Campylobacter* infections accounted for a larger proportion of all GIs among those aged 18–64 years compared to those aged 0–5 years (p<0.000 for all age categories 18–64).

CONUS locations reported more salmonellosis, *Campylobacter* infection, shigellosis, and giardiasis compared to OCONUS **(Table 4)**. At CONUS locations, dependents accounted for sizable majorities of reported salmonellosis and shigellosis cases (76.9% and 77.4%, respectively) while military personnel

TABLE 2. Cases of gastrointestinal infections reported by Air Force medical treatment facilites, by beneficiary category, 2000–2012

	All	Military	Dependent	Retiree	Other/ unknown
Salmonellosis	1,420	253	1,028	41	98
Campylobacter infection	585	201	224	28	132
Shigellosis	535	73	396	11	55
Giardiasis	432	151	208	17	56
Hepatitis A	154	57	53	11	33
E. coli (Shiga-toxin producing)	80	12	60	3	5
Cryptosporidiosis	69	11	52	1	5
Amebiasis	67	39	22	1	5
Unspecified hepatitis	28	10	6	5	7
Norovirus	24	22	2	.	.
Brucellosis	11	4	3	1	3
Typhoid fever	8	5	1	.	2
Listeriosis	4	1	1	1	1
Cholera	3	3	.	.	.
Vibrio parahaemolyticus	3	2	.	1	.
Trichinosis	3	1	1	1	.
Botulism	2	.	2	.	.
Cyclospora infection	1	1	.	.	.
Total	3,429	846	2,059	122	402

FIGURE 3. Season of onset for most common gastrointestinal infections reported, U.S. Air Force, 2000–2012



experienced relatively few cases of these GI. In contrast, at OCONUS locations, military members accounted for more than one-third (38.5%) of salmonellosis cases and nearly half (47.2%) of all reported shigellosis cases. *Campylobacter* infection accounted for 33.7% of all GI cases reported from OCONUS locations but only 13.1% of GI cases at CONUS locations **(data not shown)**.

Travel or deployments within 60 days preceding disease onsets were documented in AFRESS for 412 (12.0%) of all reportable events. Specific locations were identified for 295 of these cases, including 172 military. Among military cases for which location of travel was reported, 84 (48.8%) cases were currently assigned to or recently returned from a U.S. Central Command deployment. An additional 24 (13.9%) cases reported recent travel to the U.S. Pacific Command. For a majority of cases (n=3,017, 88.0%), no travel beyond the local residence area was recorded **(data not shown)**.

EDITORIAL COMMENT

This report summarizes GI among Department of Defense (DoD) beneficiaries receiving care at AF MTFs during 2000–2012. Salmonellosis was associated with the largest proportion of overall reportable events, followed by *Campylobacter* infection, shigellosis, and giardiasis infection. It is important to note that norovirus infection was not a reportable condition in the DoD until 2009[8] and consequently was not a frequently reported event among DoD beneficiaries during the surveillance period. With the exception of norovirus, the findings of this analysis are consistent with a CDC report that identifies norovirus as the most common cause of acute gastroenteritis in the U.S., followed by nontyphoidal *Salmonella*.[5]

The spike in reporting of GI during 2002 was attributed to the occurrence of two shigellosis outbreaks affecting one installation's child development center and a local elementary school. These outbreaks contributed 45 of the 60 total cases of shigellosis reported that year among those aged 0–5 years. Other GI outbreaks likely occurred during the reporting period but were not identified as such in AFRESS. For example, although the authors are aware of at least one norovirus outbreak occurring among military personnel during the surveillance period,[9] the individual case events were not reported in AFRESS and thus are not included in the reported case events.

The increasing numbers of annual reports of GI beginning in 2009 is similar to a pattern reported by the CDC for the same years in the U.S.[10] The CDC reported

TABLE 3a. Demographic characteristics of four most commonly reported gastrointestinal infections, U.S. Air Force, 2000–2012

		Beneficiary status		Sex		Race/ethnicity	
	Total	Dependent reference[a]	Military	Male, reference[a]	Female	All others, reference[a]	White, non-Hispanic
	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
Salmonellosis	1,420 (41.4)	1,028 (49.9)	253 (29.9)	733 (39.2)	663 (44.8)	148 (38.6)	595 (40.9)
			p<0.000		p=0.001		p=0.424
Campylobacter infection	585 (17.1)	224 (10.9)	201 (23.8)	364 (19.5)	208 (14.1)	41 (10.7)	241 (16.6)
			p<0.000		p<0.000		p=0.005
Shigellosis	535 (15.6)	396 (19.2)	73 (8.6)	280 (15.0)	239 (16.1)	84 (21.9)	234 (16.1)
			p<0.000		p=0.347		p=0.007
Giardiasis	432 (12.6)	208 (10.1)	151 (17.8)	264 (14.1)	156 (10.5)	53 (13.8)	189 (13.0)
			p<0.000		p=0.002		p=0.662

[a]Method: two-sample Z-test for proportions

TABLE 3b. Demographic characteristics (continued) of four most commonly reported gastrointestinal infections, U.S. Air Force, 2000–2012

	Age group							
	0–5 reference[a]	6–17	18–24	25–34	35–44	45–54	55–64	≥65
	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	
Salmonellosis	627 (59.7)	188 (43.2)	148 (32.6)	191 (30.0)	106 (26.8)	68 (31.2)	50 (35.0)	41 (44.6)
		p<0.000	p<0.000	p<0.000	p<0.000	p<0.000	p<0.000	p=0.099
Campylobacter infection	83 (7.9)	39 (9.0)	113 (24.9)	159 (25.0)	94 (23.7)	45 (20.6)	33 (23.1)	18 (19.6)
		p=1.000	p<0.000	p<0.000	p<0.000	p<0.000	p<0.000	p=0.100
Shigellosis	183 (17.4)	132 (30.3)	42 (9.3)	89 (14.0)	46 (11.6)	26 (11.9)	10 (7.0)	7 (7.6)
		p<0.000	p=0.001	p=1.000	p=0.168	p=1.000	p=0.031	p=0.329
Giardiasis	104 (9.9)	27 (6.2)	53 (11.7)	95 (14.9)	103 (26.0)	28 (12.8)	18 (12.6)	3 (3.3)
		p=1.000	p=1.000	p=0.064	p<0.000	p=1.000	p=1.000	p=1.000

[a]Method: ANOVA correcting for multiple comparisons using Bonferroni correction

a 14% increase in *Campylobacter* infections and 43% increase in *Vibrio* infections in 2012 compared with 2006–2008. The trend in GI reporting in AFRESS from 2009 to 2012 reflects a similar increase in *Campylobacter* infections as well as shigellosis. The findings in this analysis are also similar to those of a 2013 article describing GI among service members from 2002 to 2012.[4] The latter analysis utilized inpatient and outpatient medical records to examine all GI cases. Although the authors reported a rise in *Campylobacter* infections through 2012, they also observed that the highest incidence rates for GI were associated with conditions with unspecified etiologies. In contrast, this analysis focused on reportable medical events in an established surveillance system with specific etiologies. *Campylobacter* infections may still be underreported here because the reportable case definition for *Campylobacter* is limited to only *Campylobacter jejuni* species. Infections caused by other species or those that were not identified beyond genus would be excluded from AFRESS. Although underreporting of GI in general remains a limitation of this analysis, the use of surveillance data allowed a closer look at demographic and geographic trends for specific GI pathogens.

The proportions of *Campylobacter* infections and giardiasis cases among all reported GI infections were significantly higher among military members than among dependents. Even when controlling for location to account for differences related to overseas deployment, the association remained significant. It is unclear whether this finding is related to exposures and activities unique to military service or reflects differences in health-care-seeking behavior between the two beneficiary groups.

The seasonality of GI reporting in this analysis is consistent with U.S. trends reported by the CDC for many GI. *Campylobacter* infections, giardiasis, salmonellosis, and shigellosis, which comprised 86.7% of the events reported in AFRESS, tended to occur more frequently in the summer or fall compared to spring or winter. The reduced proportion of shigellosis reporting in the summer compared to the fall may be associated with differences in the opportunity for disease transmission among children during the summer months compared to during the school year.

Observed differences in reporting from the various geographical regions are likely due to differences in reporting practice or availability of laboratory testing, particularly in the case of bases in Air Force Central Command. For some pathogens, however, the observed difference may be due to variation in endemicity, such as certain parasitic GIs that were most frequently

TABLE 4. Reported cases of selected gastrointestinal infections by location and beneficiary category, U.S. Air Force, 2000–2012

	Continental United States (CONUS)							Outside CONUS (OCONUS)						
	Military		Dependent		Retiree/other		Total	Military		Dependent		Retiree/other		Total
	No.	%	No.	%	No.	%	No.	No.	%	No.	%	No.	%	No.
Salmonellosis	166	13.9	918	76.9	110	9.2	1,194	87	38.5	110	48.7	29	12.8	226
Campylobacter infection	121	33.3	153	42.2	89	24.5	363	80	36.0	71	32.0	71	32.0	222
Shigellosis	56	11.2	386	77.4	57	11.4	499	17	47.2	10	27.8	9	25.0	36
Giardiasis	124	33.5	184	50.0	61	16.5	369	27	42.9	24	38.1	12	19.0	63

reported from Air Force Central Command bases. Additionally, observed differences in location may be related to opportunity for exposure. For example, persons with giardiasis, which was more frequently reported among those assigned to bases in CONUS compared to OCONUS, may have engaged in recreational activities that increased exposure to contaminated water, a known risk factor. Likewise, the observation that *Campylobacter* infection represented a larger proportion of OCONUS GI reports compared to CONUS may reflect differences in overall food safety and sanitation conditions in OCONUS locations.

These findings have important implications for prevention and control of GI among DoD beneficiaries. Historically, much of the military's efforts to control these diseases have focused on food safety and field sanitation measures in the deployed environment, as well as proactive food handler training and use of military-approved food sources in garrison. These measures have been in use from World War II through the Gulf War to reduce the impact of diarrheal disease on military operations and have been largely successful in reducing the adverse impact of GI on mission effectiveness. However, several notable findings, including the association between CONUS assignment and giardiasis infection and the high frequency of salmonellosis and shigellosis reporting among young dependents, point to other opportunities for prevention. GI may occur frequently among young children due to their immature immune systems, poor hygiene, and increased opportunity for exposure in schools and childcare settings. Pathogens can easily spread to other household members caring for an ill child, leading to additional cases. Moreover, off-duty activities such as camping and hiking that expose individuals to contaminated water, as well as unsafe food preparation and storage in the home, may also contribute to the transmission of GI pathogens to adults and children.

These data underscore the need for increased education and prevention efforts aimed at both the service member and dependents, tailored to activities and settings in which they are at increased risk of exposure to GI pathogens. Renewed focus on sanitation practices and exclusion policies in base child care, youth centers, and schools should also be emphasized. Targeted public health messages, aimed at the right audience with the right content at the right time, may prove effective in further reducing the risk of GI among DoD beneficiaries.

The views expressed in this article are those of the authors and do not necessarily reflect the official policy or position of the Air Force, the Department of Defense, or the U.S. Government.

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Gallbladder Disease and Cholecystectomies, Active Component, U.S. Armed Forces, 2004–2013

Gallbladder disease is a common healthcare problem in the U.S. that often results in gallbladder removal (cholecystectomy). During the 10-year surveillance period, 20,001 active component service members were identified as incident cases of gallbladder disease. The overall incidence rate of gallbladder disease was 1.4 per 1,000 person-years (p-yrs); the incidence rate increased 32% during the period. During the same period, 15,487 cholecystectomies were performed. A majority were removed laparoscopically (94.4%) and in the outpatient setting (60.3%). Laparoscopic cholecystectomies accounted for fewer hospital bed days than open cholecystectomies. The mean number of days between incident gallbladder disease encounter and cholecystectomy was 40 days among gallbladder disease cases and 82 days among cholecystectomy cases. Gallbladder disease and cholecystectomies were more common among females, service members older than 40 years, Hispanics, members of the Air Force, and those in healthcare occupations. Gallbladder disease and cholecystectomies are common among active component service members, particularly among those with identified risk factors for gallstone formation.

Located under the right lobe of the liver, the gallbladder is a small sac that stores bile produced by the liver. The gallbladder releases bile through the bile ducts into the small intestine where bile salts facilitate the digestion and absorption of dietary fat. Irritation and inflammation of the gallbladder is known as cholecystitis. Most inflammation occurs due to cholelithiasis, the presence of gallstones that may impede the release of bile from the gallbladder. Gallstones form when cholesterol, bile salts, or calcium accumulate into solid fragments within the gallbladder or bile ducts. Gallstones range in size from a grain of sand to a golf ball. Common risk factors for gallstone development include non-modifiable factors such as female gender, age over 40, family history, and Native American or Mexican-American descent.[1–4] Modifiable risk factors for gallbladder disease include being overweight or obese, rapid fluctuations in body weight, a high-fat or high-cholesterol diet, diabetes, and certain medications.[1–5] Pregnancy and history of pregnancy are also associated with an increased risk of gallstone formation.[1,5]

Gallstones can trigger acute "gallbladder attacks" characterized by abdominal pain, bloating, nausea, and vomiting. The frequency of gallbladder attacks can be reduced by avoiding foods rich in fat and cholesterol, highly processed foods, and whole-milk dairy products. In some individuals, attacks become frequent, recurrent, and more severe. In these circumstances, the typical course of treatment is cholecystectomy (i.e., surgical removal of the gallbladder).[1] The less invasive laparoscopic approach using several small incisions in the abdominal wall to insert a camera and dissection tools is now standard for cholecystectomies.[6] It is preferred over open cholecystectomy, which entails a 2- to 3-inch incision and longer periods of hospitalization and convalescence.

Gallbladder disease is a common healthcare problem in the U.S. According to the National Hospital Discharge Survey, 310,000 individuals were hospitalized for cholelithiasis and 403,000 cholecystectomies were performed in 2007.[7] In 2013, among those in the active component of the U.S. Armed Forces, 519 service members were hospitalized for cholelithiasis.[8] This report describes the counts and rates of newly diagnosed gallbladder disease and cholecystectomies among active component service members during a 10-year surveillance period.

METHODS

The surveillance period was 2004–2013. The surveillance population included all active component service members of the Army, Navy, Air Force, Marine Corps, and Coast Guard who served at any time during the surveillance period. For the purposes of this report, "gallbladder disease" included not only cholelithiasis and cholecystitis, but also "other disorders of the gallbladder" and "other disorders of the biliary tract" **(Table 1)**. An incident (first-ever) case of gallbladder disease was

TABLE 1. Gallbladder disease case-defining ICD-9 and cholecystectomy procedure codes

ICD-9-CM diagnostic codes	
Cholelithiasis	
574.xx	Cholelithiasis
Cholecystitis	
575.0	Acute cholecystitis
575.1x	Other (chronic/unspecified) cholecystitis
Other/unspecified disorder of gallbladder or biliary tract	
575.2–575.9	Other/unspecified disorder of gallbladder
576.x	Other/unspecified disorder of biliary tract
Inpatient procedure (PR) codes	
51.23, 51.24	Laparoscopic cholecystectomy
51.21, 51.22, 51.36, 51.41, 51.51	Open cholecystectomy
Outpatient Current Procedural Terminology (CPT) codes	
47562, 47563, 47564	Laparoscopic cholecystectomy
47600, 47605, 47610, 47612, 47620	Open cholecystectomy

defined as an inpatient encounter with a case-defining ICD-9 code in the primary diagnostic position, or two outpatient encounters with a relevant ICD-9 code in the primary diagnostic position **(Table 1)**. An individual was considered a case once during the surveillance period.

A case of cholecystectomy was defined as an inpatient encounter with a procedure (PR) code for cholecystectomy in any position or an outpatient encounter with a Current Procedural Terminology (CPT) code for cholecystectomy in any position **(Table 1)**. An individual was considered a case of cholecystectomy only once during the surveillance period; cholecystectomies were analyzed separately from gallbladder disease cases.

RESULTS

Gallbladder disease

During the 10-year surveillance period, 20,001 incident cases of gallbladder disease were documented on inpatient or outpatient medical records among active component service members **(Table 2)**. The overall incidence rate was 1.4 per 1,000 person-years (p-yrs). A majority of the cases were diagnosed as cholelithiasis (70.7%); cholecystitis was reported among 11.1%, and other/unspecified disorders of gallbladder/biliary tract were reported among 18.2% of cases **(data not shown)**. The annual incidence rates for all gallbladder disease increased 51.9% from 2004 through 2010, then decreased 12.8% from 2010 through 2013 **(Figure 1)**.

The incidence rate of gallbladder disease in females was 3.5 times the rate in males, and rates were highest among

FIGURE 1. Incidence rates of gallbladder disease by type, active component, U.S. Armed Forces, 2004–2013

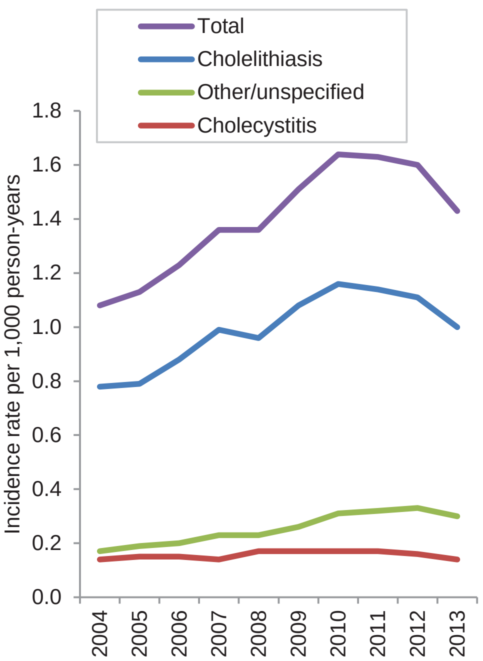


TABLE 2. Demographic and military characteristics of gallbladder disease and cholecystectomies, active component, U.S. Armed Forces, 2004–2013

	Gallbladder disease		Cholecystectomies	
	No.	Rate[a]	No.	Rate[a]
Total	20,001	1.4	15,487	1.1
Sex				
Male	12,581	1.0	9,617	0.8
Female	7,420	3.6	5,870	2.8
Race/ethnicity				
White, non-Hispanic	12,564	1.4	9,654	1.1
Black, non-Hispanic	2,544	1.1	1,966	0.8
Hispanic	2,870	1.9	2,298	1.5
Asian/Pacific Islander	738	1.3	569	1.0
American Indian/Alaskan Native	224	1.3	187	1.1
Other/unknown	1,061	1.5	813	1.1
Age				
≤19	450	0.4	325	0.3
20–24	4,309	0.9	3,332	0.7
25–29	4,445	1.4	3,444	1.1
30–34	3,458	1.7	2,674	1.3
35–39	3,426	2.1	2,632	1.6
40–44	2,513	2.7	1,954	2.1
45+	1,400	3.2	1,125	2.6
Service				
Army	7,301	1.4	6,038	1.2
Navy	4,348	1.3	3,556	1.1
Air Force	6,213	1.8	1,116	0.6
Marine Corps	1,434	0.8	4,401	1.3
Coast Guard	705	1.7	376	0.9
Rank				
Enlisted	3,033	1.3	2,473	1.0
Officer	16,967	1.4	13,013	1.1
Occupation				
Combat-specific	1,523	0.8	1,245	0.7
Armor/motor transport	770	1.3	639	1.1
Pilot/aircrew	547	1.0	400	0.8
Repair/engineer	5,297	1.3	4,017	1.0
Communications/intelligence	5,620	1.8	4,290	1.4
Health care	2,762	2.3	2,307	2.0
Other/unknown	3,482	1.3	2,589	0.9

[a]Rate per 1,000 person-years

Hispanics, members of the Air Force, and those in healthcare occupations **(Table 2)**. Incidence rates increased linearly with each age group **(Table 2, Figure 2)**. The greatest increase in annual incidence rates was among service members aged 35–39 years (42.7%). Annual rates among service members in their 20s and early 30s increased by more than 30% from 2004 through 2013.

Cholecystectomy

From 2004 through 2013, a total of 15,487 active component service members underwent cholecystectomies **(Table 2)**. The incidence rate of cholecystectomy was 1.1 per 1,000 p-yrs. Three-fifths of all the procedures were performed in the outpatient setting (n=9,341; 60.3%) and most were performed laparoscopically (n=14,625; 94.4%) **(data not shown)**. The annual rate of cholecystectomy procedures increased 18.6% during the surveillance period; increases were demonstrated in rates of outpatient cholecystectomies (+59.3%) and laparoscopic cholecystectomies (+24.5%) **(Figure 3)**. Decreases were observed among rates of inpatient cholecystectomies (-27.1%) and open cholecystectomies (-50.0%).

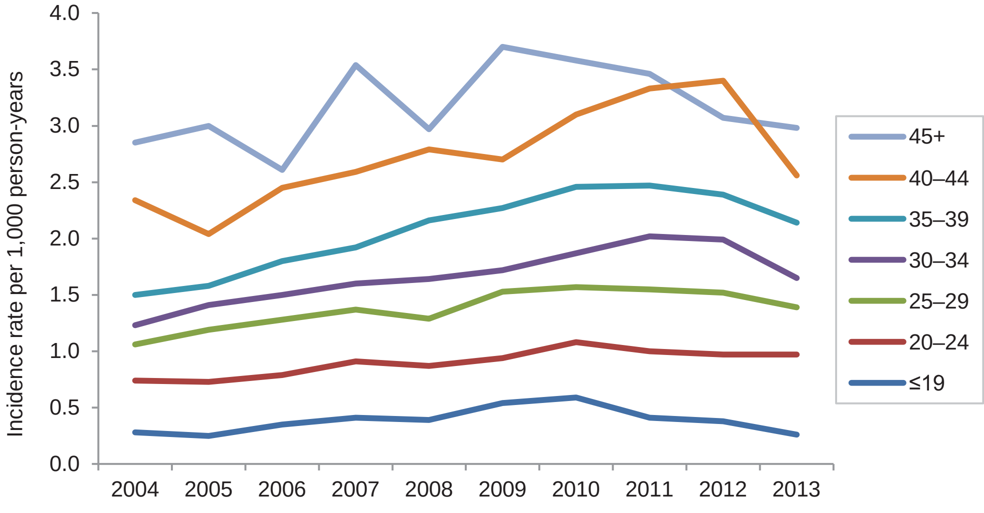
On average there were 1.3 hospital bed days associated with each laparoscopic cholecystectomy and 7.5 bed days per open cholecystectomy **(Figure 4)**. The number of bed days for laparoscopic cholecystectomy remained under 2 bed days during each year of the surveillance period and decreased approximately 1 day during the most recent 3 years. Bed days for open cholecystectomy were relatively high during the first 4 years of the surveillance period (range: 8.3–16.6 bed days), but decreased to 5.7 bed days in 2008 and ranged from 3.2 to 4.7 bed days during the most recent 5 years.

Relationship between gallbladder disease diagnoses and cholecystectomy

Of the 20,001 individuals who were identified as cases of gallbladder disease, 13,722 (68.6%) were also identified as having a cholecystectomy performed following their first-ever case-defining encounter **(data not shown)**. Among the gallbladder disease cases who had a cholecystectomy, 41.0% had their first-ever gallbladder encounter on record on the same day as the cholecystectomy; however, the mean interval between first-ever gallbladder disease diagnosis and surgery was 40 days.

Among the 15,487 service members who were identified as having undergone cholecystectomy, 97.9% (n=15,166) had at least one gallbladder disease encounter (with a gallbladder disease case-defining ICD-9 code in any diagnostic position) prior to their cholecystectomy **(data not shown)**. The average number of days between their first-ever gallbladder disease encounter and cholecystectomy was 82 days (approximately 2.7 months).

FIGURE 2. Incidence rates of gallbladder disease by age group, active component, U.S. Armed Forces, 2004–2013



EDITORIAL COMMENT

Gallbladder disease was newly diagnosed in 2,000 service members on average each year and approximately 1,500 cholecystectomies were performed per year. The annual rates of gallbladder disease increased 32% and the annual rates of cholecystectomies increased 19% during the period. This analysis cannot clarify the reasons for the overall increases in rates, but it is conceivable that these trends may be related to previously reported increases in overweight and obesity among active component service members in both genders and in all age groups.[9] Furthermore, service members may be remaining in service longer, thereby increasing the population of older service members (who are at greater risk for gallbladder disease).

It is not surprising that rates were highest among older service members, females, and Hispanics, because these are well established risk factors for gallbladder disease. The observed higher rates in the Air Force and in healthcare occupations may be related to the fact that these groups have comparatively greater proportions of females and older individuals. This report did not find an increased rate among Native American/Alaskan Native service members despite the previously reported increase in risk of gallbladder disease among Native American populations from the U.S.

The increase in the number of laparoscopic and outpatient cholecystectomies during the period was expected because laparoscopic cholecystectomy is the current standard of care for gallbladder removal and most laparoscopic procedures are performed in the outpatient setting.[6] The hospital bed days associated with both open and laparoscopic cholecystectomies also decreased during the period. Despite the increases in the rates for gallbladder disease and removal, the recovery time for

FIGURE 3. Incidence rates of cholecystectomy by type, active component, U.S. Armed Forces, 2004–2013

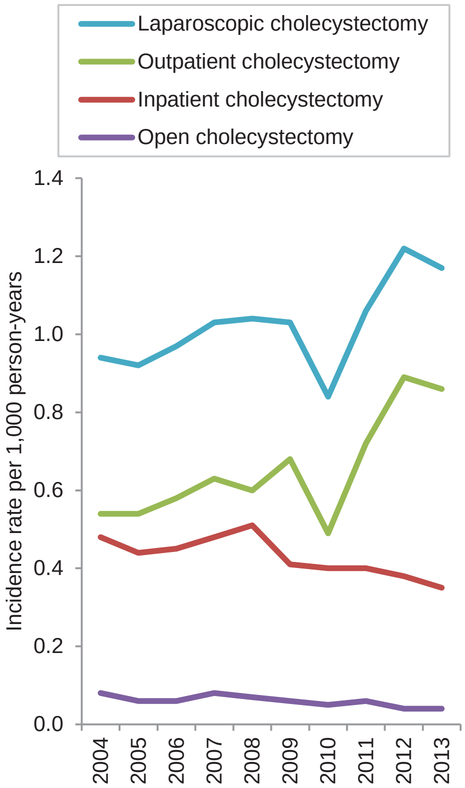
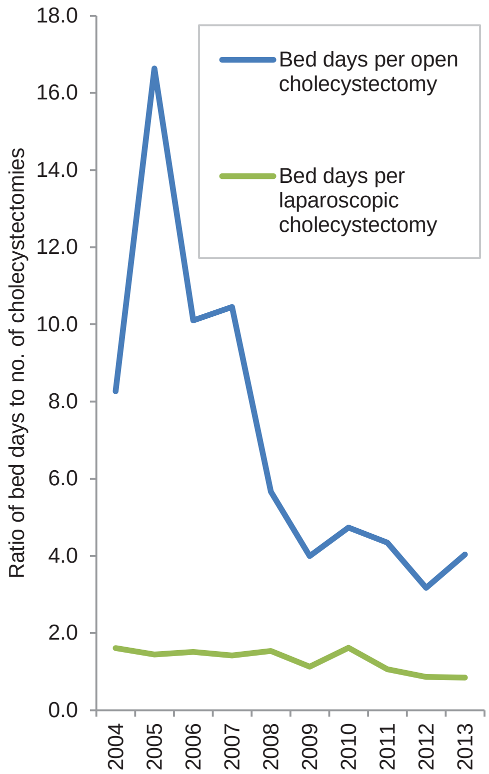


FIGURE 4. Ratio of bed days per cholecystectomy by year and type, active component, U.S. Armed Forces, 2004–2013



all types of cholecystectomy has improved, particularly in the last 5 years of the surveillance period.

The mean number of days between incident gallbladder disease encounter and cholecystectomy (40 days among gallbladder disease cases and 82 days among cholecystectomy cases) suggests that clinicians and individuals with gallbladder disease are not waiting long periods before gallbladder removal. This may be due to the availability of a curative surgical option with a relatively short recovery period (i.e., laparoscopic surgery), access to free health care to perform the procedure, and the military's desire to maintain a fit and ready force.

It should be noted that this report's findings about the number of individuals who underwent cholecystectomy following a gallbladder disease diagnosis are most likely an underestimation. Some service members may have left military service and were lost to follow-up before undergoing cholecystectomy. In addition, some of the most recently identified cases (i.e., those identified at the end of the surveillance period) may not have had enough follow-up time for the cholecystectomy to occur.

The number of cholecystectomy cases exceeded the number of gallbladder disease cases who underwent cholecystectomy because some individuals did not have gallbladder disease case-qualifying encounters (e.g., the individual had only one outpatient encounter or had a case-defining diagnosis reported in a non-primary diagnostic position) and were not counted in this report. Furthermore, other gallbladder encounters may have occurred before entrance into military service, before the surveillance period, or in healthcare settings outside the Military Health System.

Gallbladder disease and cholecystectomies are common among active component service members, particularly among those with identified risk factors for gallstone formation. Clinicians should advise service members at greatest risk for gallbladder disease of the modifiable lifestyle changes that could prevent gallstone formation—particularly, maintaining a healthy weight and a diet low in fat and cholesterol.

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Brief Report

The Geographic Distribution of Incident Coccidioidomycosis Among Active Component Service Members, 2000–2013

Coccidioidomycosis, or "Valley Fever," is an infectious illness caused by inhalation of the spores of *Coccidioides immitis* or *Coccidioides posadasii*, which are naturally occurring fungi found primarily in the soil of large areas of the southwestern U.S. and Central and South America. Recently, *C. immitis* was detected in soil samples from south central Washington State, indicating that the geographic range of this fungus may be increasing.[1] Coccidioidomycosis is a significant occupational hazard for U.S. military members who are assigned to or train in endemic areas.[2,3] Because this illness has non-specific clinical manifestations and delayed onset of symptoms, affected military members may present for care outside of endemic areas; in such cases, correct diagnoses and indicated treatments may be delayed.[3,4] This report updates the counts and rates of coccidioidomycosis among active component service members and identifies the duty stations of the cases at the time of diagnosis.

METHODS

For this report, an incident case of coccidioidomycosis was defined by one notifiable medical event; or a single hospitalization; or two or more ambulatory visits within 14 days that included the diagnosis code ICD-9-CM: 114.x (coccidioidomycosis). The geographic location of each case was defined as the service member's unit three-digit ZIP code at the time of incident diagnosis. The sum of all incident coccidioidomycosis cases was computed for each three-digit ZIP code and incidence rates were computed by dividing these cases by the sum of the active component person-time in years for each three-digit unit ZIP code. Incidence rates and associated three-digit unit ZIP codes were loaded into ArcGIS (Esri, Redlands, CA, USA), and joined to an Esri-provided map of U.S. three-digit ZIP codes. Rates based on fewer than four cases during the surveillance period were not shown on the map.

RESULTS

During the period between January 2000 and December 2013, there were 511 incident cases of coccidioidomycosis among active component service members. The crude annual incidence rates ranged from a low of 1.2 per 100,000 person-years (p-yrs) in 2003 to 3.8 per 100,000 p-yrs in 2006 **(Figure 1)**.

Twenty-two three-digit ZIP codes were associated with four or more cases of coccidioidomycosis during the surveillance period and accounted for 82.6% (n=422) of the total number of cases **(Figure 2)**. Most of these cases were located within the *Coccidioides*-endemic area in the southwestern U.S.; however, some locations outside of the endemic area were also linked to cases (e.g., Florida, Alaska, Hawaii). The highest rates were for service members who were assigned to Naval Air Station (NAS) Lemoore, CA (152.0 per 100,000 p-yrs), Davis-Monthan Air Force Base (AFB), AZ (71.7 per 100,000 p-yrs), and Mojave, CA (69.1 per 100,000 p-yrs). The three-digit ZIP code for Mojave includes Edwards Air Force Base and Naval Air Weapons Station China Lake.

There were 37 cases among service members assigned outside the U.S., including Japan, Italy, and Germany **(data not shown)**. Forty-nine three-digit ZIP codes were associated with three or fewer cases; only 12 of those 49 (25%) ZIP codes were for *Coccidioides*-endemic locations. Twenty-two cases did not have a ZIP code reported.

The three locations with the highest absolute number of incident cases were NAS Lemoore, CA (n=68), Davis-Monthan AFB, AZ (n=63), and Naval Station San Diego, CA (n=53) **(Figure 3a)**. At

FIGURE 1. Incidence rates of coccidioidomycosis, active component, U.S. Armed Forces, 2000–2013

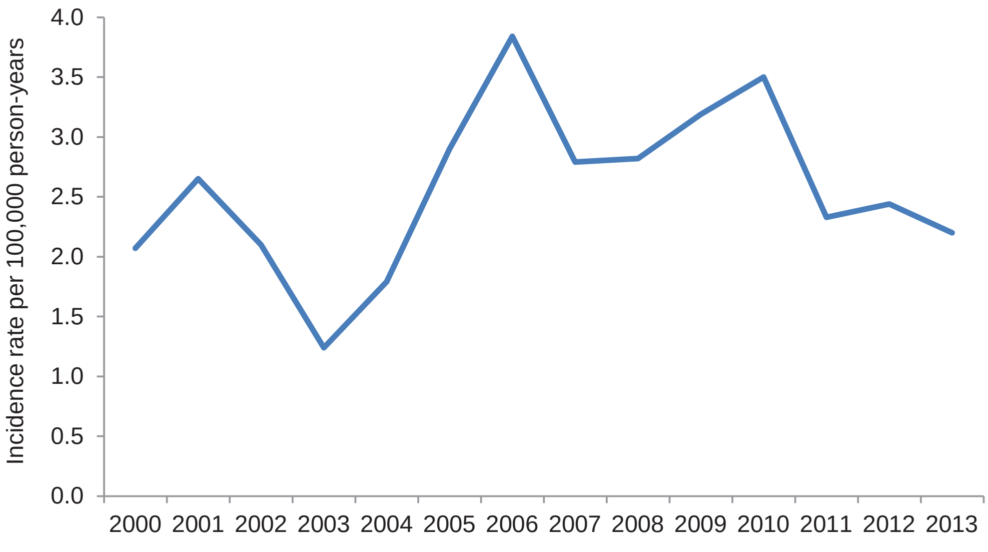
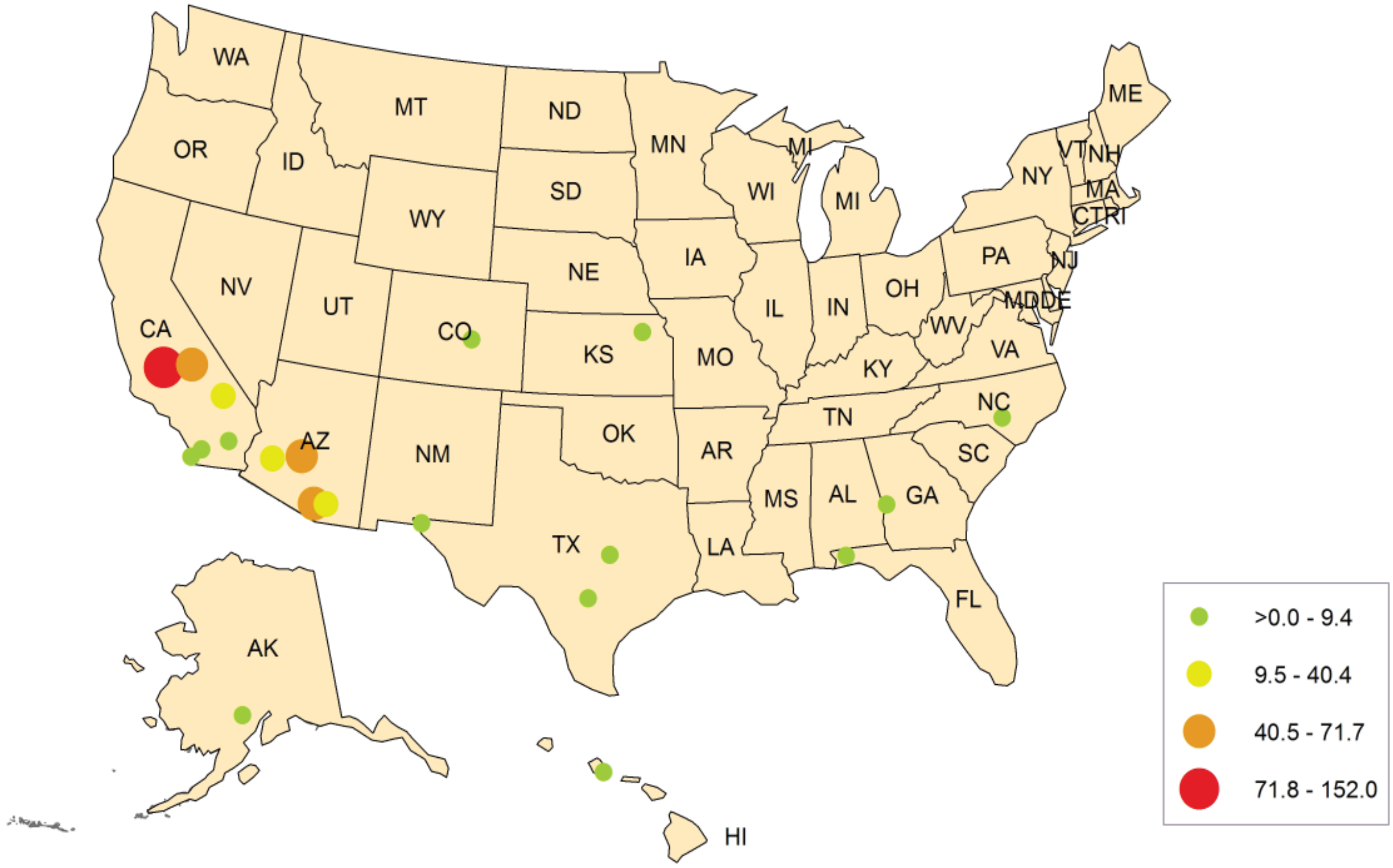


FIGURE 2. Incidence rates[a] of coccidioidomycosis among active component service members by unit location,[b] 2000–2013



[a]Rate per 100,000 person-years; rates based on fewer than four cases are not shown.

[b]Unit location based on three-digit unit ZIP code

these locations, there was some evidence of clustering of cases, particularly during November 2005 through April 2006 at NAS Lemoore during which 22 cases were diagnosed. Four locations outside of the *Coccidioides*-endemic locations had five or more cases: Eglin AFB, FL (n=7); Fort Riley, KS (n=6); Marine Corps Base Hawaii, HI (n=6); and Fort Benning, GA (n=5) **(Figure 3b)**. These cases did not appear to cluster temporally, but occurred sporadically during the period.

EDITORIAL COMMENT

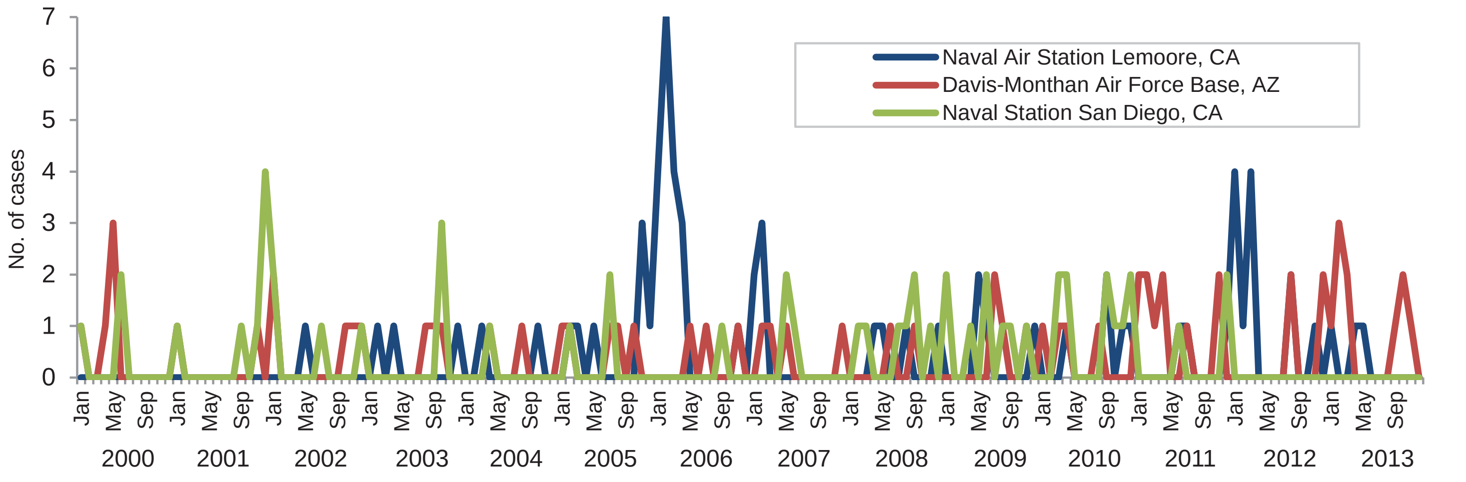
In the civilian U.S. population, incidence rates of coccidioidomycosis have increased dramatically over the past decade. During 2000–2007, rates in California almost tripled (2.4 cases per 100,000 population vs. 7.4 cases per 100,000 population) and Arizona reported even greater increases.[5,6] In contrast, incidence rates in active component military members over the same time period did not demonstrate a consistently increasing trend; between January 2000 and December 2013, incidence rates ranged from a low of 1.2 per 100,000 p-yrs in 2003 to 3.8 per 100,000 p-yrs in 2006.

Most of the cases reported among active component service members occurred in those assigned to *Coccidioides*-endemic locations. In addition to the risk from living and working in an endemic area, more cases may be identified at these locations because clinicians may suspect and test for coccidioidomycosis more readily, thus identifying larger proportions of incident cases. NAS Lemoore previously reported increases in incidence and severity of coccidioidomycosis during the period of January 2002 through December 2006,[7] and reported an outbreak among 18 beneficiaries following a natural dust storm in 1979.[8]

The cases reported in non-endemic areas did not appear to cluster temporally; however, this observation does not exclude the possibility of outbreaks from common source exposures. Service members may train in, or travel to, endemic areas and then return to duty elsewhere and present with symptoms after widely varying incubation periods, making case clusters less apparent to detection. Most infections with *Coccidioides* are self-limited in duration and will not be specifically identified in the absence of laboratory testing. Providers of health care to U.S. military members should consider coccidioidomycosis as a potential cause of febrile, respiratory, infectious illnesses, particularly when the patient has a history of recent travel to an endemic area.

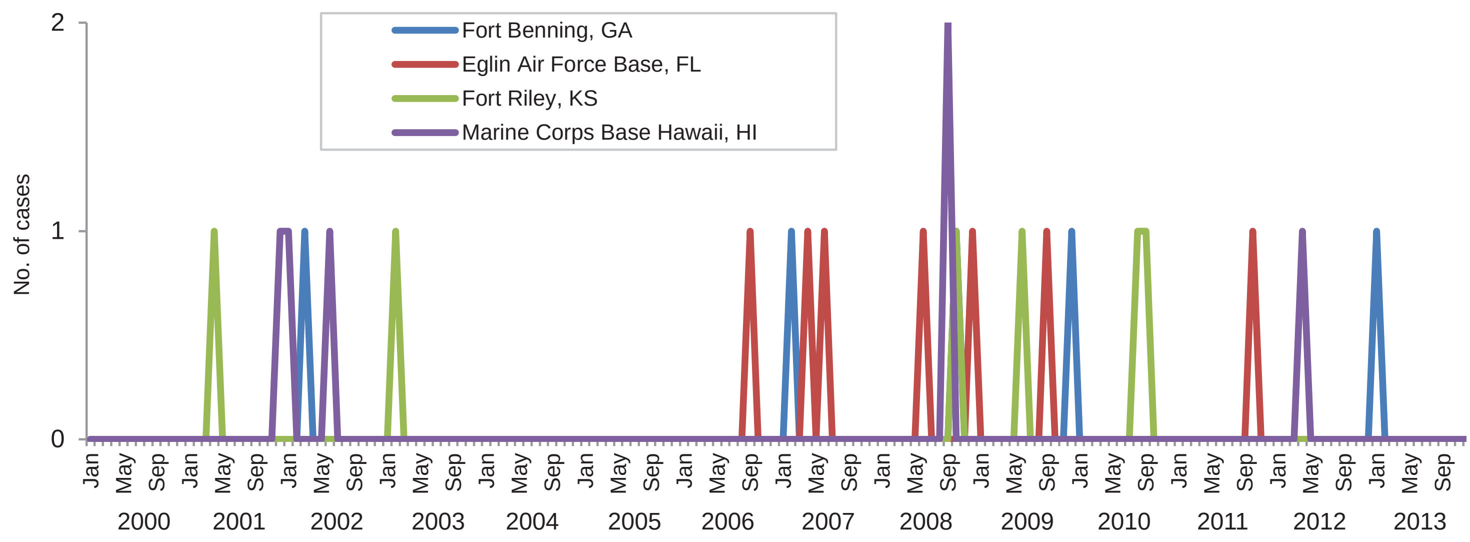
Acknowledgement: The authors wish to thank Penny Masuoka for technical assistance with geospatial mapping.

FIGURE 3a. Incident cases of coccidioidomycosis at the top three unit locations[a] with the highest absolute numbers, active component, U.S. Armed Forces, 2000–2013



[a]Unit location based on three-digit unit ZIP code

FIGURE 3b. Incident cases of coccidioidomycosis at unit locations[a] with five or more cases in non-endemic areas,[b] active component, U.S. Armed Forces, 2000–2013



[a]Unit location based on three-digit unit ZIP code

[b]Non-endemic areas include areas outside of the southwestern U.S. where *Coccidioides* species are not naturally occurring.

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Brief Report

Mid-Season Influenza Vaccine Effectiveness Estimates for the 2013–2014 Influenza Season

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The Department of Defense (DoD) conducts influenza surveillance for military members, dependents, and select civilian populations. The Armed Forces Health Surveillance Center (AFHSC), Naval Health Research Center (NHRC), and the U.S. Air Force School of Aerospace Medicine (USAFSAM) conduct annual mid-season influenza vaccine effectiveness (VE) analyses for the aforementioned populations. This report describes VE estimates at the midpoint for the 2013–2014 influenza season (29 September 2013 through 15 February 2014).

These three organizations performed separate analyses using the case-control method to estimate VE. Cases were individuals with positive laboratory tests for influenza during the first half of the 2013–2014 influenza season. In their individual studies, NHRC and USAFSAM used the control-test negative method for the selection of controls, while AFHSC used healthy controls.

AFHSC utilized data from the Defense Medical Surveillance System (DMSS) to identify all active component, non-recruit service members during the study period. Health Level 7 data in DMSS were used to identify influenza cases that were laboratory confirmed by a rapid influenza test, reverse transcriptase polymerase chain reaction (RT-PCR), or viral culture. Controls were active component service members with healthcare encounters for musculoskeletal conditions with no respiratory infections at the time of the encounters and no record of influenza during the study period. Controls were matched to cases by sex, age, date of diagnosis (±3 days), and treatment facility. Most cases and controls were treated at military or civilian medical facilities in the U.S.; however, the data did include service members who sought care at military treatment facilities (MTFs) in Europe, South Korea, Japan, and Guam. Vaccination status was determined by immunization records documented in DMSS.

The NHRC analysis relied on febrile respiratory illness (FRI) surveillance among DoD dependents living in Southern California and Illinois and civilians at clinics and hospitals near the U.S.–Mexico border from 25 November 2013 through 16 January 2014. Influenza cases were individuals who had positive laboratory tests for influenza by RT-PCR. Controls were FRI cases who tested negative for influenza. Vaccination status was determined by medical chart review. Individuals were considered vaccinated if their diagnoses occurred more than 14 days and less than 180 days since influenza vaccination.

The USAFSAM VE analyses were conducted using data generated from the DoD Global, Laboratory–based, Influenza Surveillance Program during the study period. Cases and controls were military dependents who presented to sentinel or other participating MTFs with influenza-like illness. As with AFHSC's analysis, most cases and controls presented to MTFs in the U.S.; however, dependents presenting to MTFs in Guam, Japan, and South Korea were also included. Cases were those who had positive laboratory tests for influenza by RT-PCR, viral culture, or multiplex PCR respiratory panel testing. Controls were individuals who tested negative for influenza. Vaccination status was obtained from electronic immunization records or the program's surveillance questionnaire. Individuals were considered vaccinated if the vaccine was given at least 14 days prior to specimen collection.

Crude and adjusted odds ratios (ORs) were calculated using logistic regression. VE was defined as (1 – OR) × 100.[1] When possible, analyses were stratified by influenza subtype and vaccine type (inactivated influenza vaccine [IIV] and live-attenuated influenza vaccine [LAIV]). Models were adjusted for 1) AFHSC: age, sex, and 5-year vaccination history for influenza as a dichotomous variable (Y=at least one vaccination in the previous 5 years, N=no vaccinations for influenza during the previous 5 years); 2) NHRC: age, hospitalization status (inpatient/outpatient), and surveillance population/location; and 3) USAFSAM: age group and time period (collapsed into four equal quartiles).

For the NHRC analyses of civilian and dependent populations, the estimated overall adjusted VE was 53% (95% confidence interval [CI], 17–74). By comparison, USAFSAM calculated an overall VE of 66% (95% CI, 51–76) for military dependents **(Table)**. USAFSAM's subanalysis of VE by vaccine type (i.e., IIV and LAIV) indicated a statistically significant VE of 74% (95% CI, 60–83) for IIV and a statistically nonsignificant VE for LAIV (40%; 95% CI, -5–66). AFHSC's overall analyses estimated a nonsignificant VE for active component military members, 7% (95% CI, -32–35). Additional subanalyses by vaccine type also

TABLE. Mid-season influenza vaccine effectiveness (VE) among different populations for the 2013–2014 influenza season

Population	Viral subtype	Vaccine type	No. of cases (% vaccinated)	No. of controls (% vaccinated)[a]	Crude VE (95% CI)	Adjusted VE (95% CI)[b]
Active component service members (AFHSC)	Overall	Any type	518 (90)	2060 (91)	11 (-27–37)	7 (-32–35)
		IIV	183 (32)	1086 (48)	31 (0–53)	28 (-5–51)
		LAIV	324 (56)	910 (40)	-13 (-63–22)	-17 (-70–19)
Civilians and dependents (NHRC)	Overall	Any type	106 (19)	278 (33)	52 (17–72)	53[c] (17–74)
	Influenza A (H1)	Any type	84 (17)	278 (33)	59 (23–78)	63[c] (33–81)
Dependents (USAFSAM)	Overall	Any type	339 (26)	469 (39)	44 (24–59)	66[c] (51–76)
		IIV	302 (17)	425 (33)	57 (38–70)	74[c] (60–83)
		LAIV	234 (15)	248 (16)	6 (-54–42)	40 (-5–66)

[a]AFHSC used healthy controls (matched to cases by sex, age, and date [+/– 3 days] and treatment facility) and NHRC and USAFSAM used unmatched influenza test negative controls.
[b]Adjusted for 1) AFHSC: age, sex, 5-year prior vaccination status; 2) NHRC: age, hospitalization status (inpatient/outpatient) and surveillance population/location (overall VE only); or 3) USAFSAM: age group, time period (collapsed into four quartiles)
[c]Statistically significant
Abbreviations: AFHSC=Armed Forces Health Surveillance Center; NHRC=Naval Health Research Center; USAFSAM=U.S. Air Force School of Aerospace Medicine; IIV=inactivated influenza vaccine; LAIV=live-attenuated influenza vaccine

produced nonsignificant estimates for VE **(Table)**. Due to small sample sizes, NHRC was not able to compare VE by vaccine type or by influenza subtype.

Overall adjusted VE estimates for dependents and civilians included in these analyses indicated moderate protection and were similar to estimates published by other groups, including the Centers for Disease Control and Prevention (61%) and the Canadian Primary Care Sentinel Surveillance Network (74%).[2,3] The civilian and dependent results suggest that the influenza vaccine reduced the risk of medically attended influenza from 53% to 66% among these populations. These findings demonstrate the benefits of the 2013–2014 seasonal influenza vaccine at mid-season.

These analyses indicate a statistically significant VE for the IIV vaccine in dependent and select civilian populations. VE was not statistically significant for LAIV. This finding is consistent with other published studies indicating IIV has a greater VE.[4–8] It has been suggested that the differences in effectiveness could be due to the inability of the live, attenuated viruses to stimulate antibody response due to recipients' past exposure to similar influenza viruses.[8,9] LAIV has been shown to have a VE comparable to that of IIV in vaccine-naïve adult cohorts and similar or superior efficacy in infants and young children with limited histories of influenza vaccination.[7,10–13]

VE estimations frequently differ between service members and civilians, with higher VE estimates seen among the latter. The most pronounced difference between these two groups is that influenza vaccination is mandatory for U.S. military members. This, in turn, leads to greater experience with, or exposure to, influenza vaccines, which might lead to a diminished antibody response and potentially diminished VE.[14–17] In addition, the fact that the U.S. military starts vaccinating for influenza as early as August each year raises the possibility that individuals vaccinated several months prior to the influenza season peak, typically in January or February, might be left unprotected due to waning immunity when the risk for infection is highest. Additional research aimed at understanding the impact of long vaccination histories (i.e., many vaccinations over many years) and regarding the duration of protection of influenza vaccines is needed to further elucidate these findings.

These analyses have limitations. The generalizability of these results is limited for various reasons. Cases were only included if the patients were sick enough to seek medical attention; therefore, we cannot comment on the vaccine's impact on less severe cases. Also, some vaccination data relied on patient recall and may not accurately reflect actual vaccination status. In addition, because the U.S. military population is younger and healthier than the general U.S. population, vaccine impact cannot be generalized to older, higher-risk populations. Lastly, estimation of VE by specific influenza subtype and by type of vaccine (i.e., IIV and LAIV) could not be adequately examined given limitations of laboratory-based data and small numbers of infected individuals.

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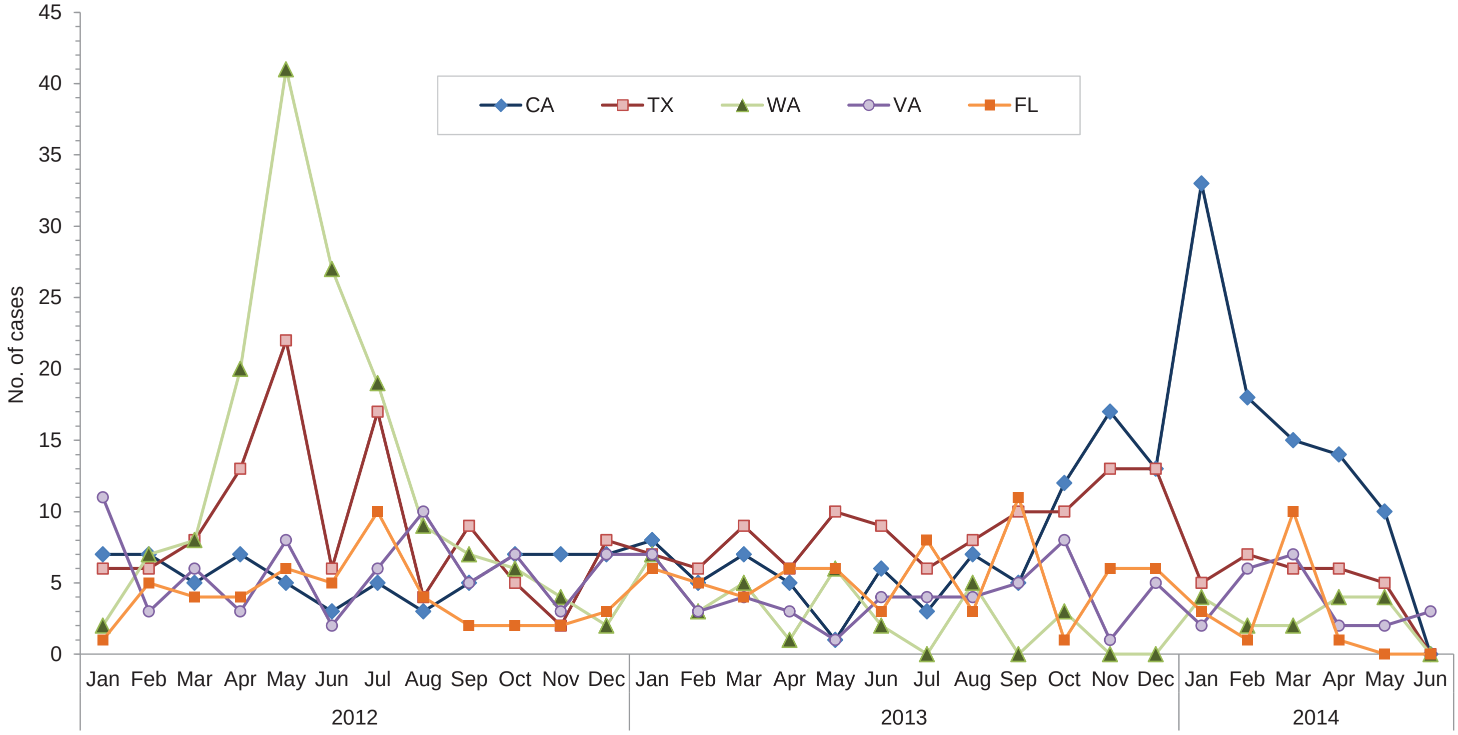
Surveillance Snapshot: States with the Most Pertussis Diagnoses Among Service Members and Other Beneficiaries of the Military Health System, January 2012–June 2014

FIGURE. Number of cases[a] of pertussis among service members and other beneficiaries of the Military Health System by the top five reporting states, January 2012–June 2014



[a]Confirmed and probable cases include those reported through the Department of Defense's reportable medical event system or documented by a diagnosis of pertussis (ICD-9: 033) in the primary position in a record of hospitalization or ambulatory encounter in the Military Health System that was not within 7 days of a record of pertussis vaccination.

According to the Centers for Disease Control and Prevention, so far in 2014, reported cases of pertussis in the U.S. have increased 24% over the previous year; by June 16, a total of 9,964 cases of pertussis had been reported by 50 states and the District of Columbia.[1] On June 13, the California Department of Public Health announced that the state was experiencing a pertussis ("whooping cough") epidemic. As of June 10, a total of 3,458 cases had been reported in the state; this number of pertussis cases exceeds the number of cases reported in the entire year in 2013.[2]

The *MSMR* has previously reported on spatiotemporal clusters of pertussis in the military that were associated with outbreaks in neighboring non-military communities; this association was clearly demonstrated during a previous 2010 outbreak in California.[3]

Between January 2012 and June 2014, the greatest number of pertussis cases (both confirmed and probable) diagnosed in military beneficiaries occurred in California, Texas, Washington, Virginia, and Florida **(Figure)**; 90 cases have been diagnosed in California since January 2014, which is more than was reported in all of 2012 (n=68) or 2013 (n=89).

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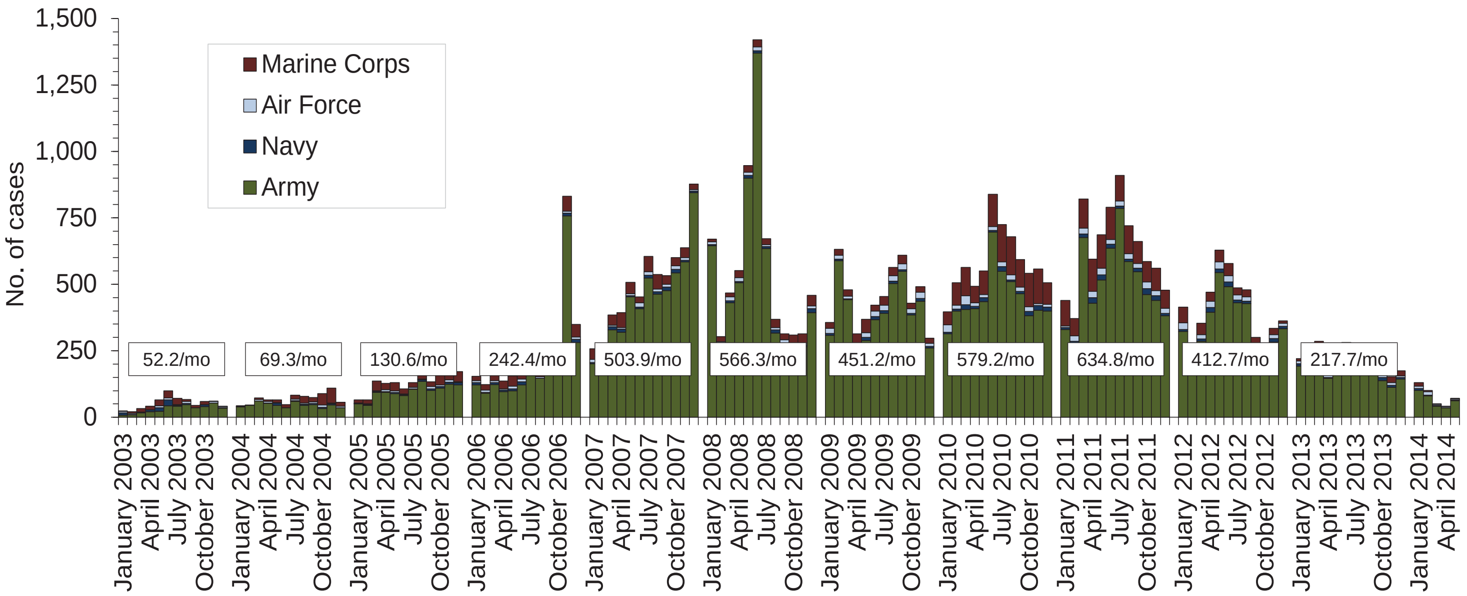
Deployment-related Conditions of Special Surveillance Interest, U.S. Armed Forces, by Month and Service, January 2003–May 2014 (data as of 20 June 2014)

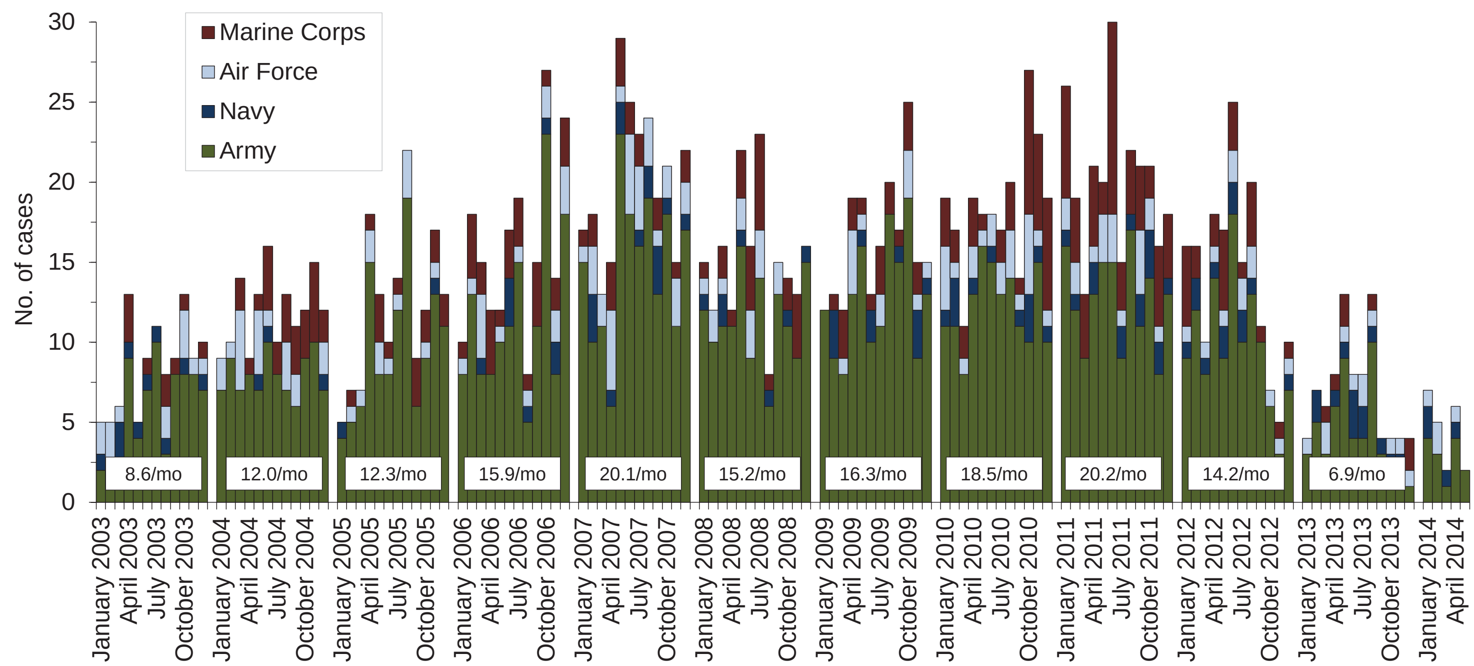
Traumatic brain injury (TBI) (ICD-9: 310.2, 800–801, 803-804, 850–854, 907.0, 950.1–950.3, 959.01, V15.5_1–9, V15.5_A–F, V15.52_0–9, V15.52_A–F, V15.59_1–9, V15.59_A–F)[a]



Reference: Armed Forces Health Surveillance Center. Deriving case counts from medical encounter data: considerations when interpreting health surveillance reports. *MSMR*. 2009; 16(12):2–8.

[a]Indicator diagnosis (one per individual) during a hospitalization or ambulatory visit while deployed to/within 30 days of returning from deployment (includes in-theater medical encounters from the Theater Medical Data Store [TMDS] and excludes 4,486 deployers who had at least one TBI-related medical encounter any time prior to deployment).

Deep vein thrombophlebitis/pulmonary embolus (ICD-9: 415.1, 451.1, 451.81, 451.83, 451.89, 453.2, 453.40–453.42 and 453.8)[b]



Reference: Isenbarger DW, Atwood JE, Scott PT, et al. Venous thromboembolism among United States soldiers deployed to Southwest Asia. *Thromb Res*. 2006;117(4):379–383.

[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 90 days of returning from deployment.

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