



Malaria Report



Photo of An Anopheles Minimus Mosquito - Courtesy of CDC Prevention's Public Health Image Library

Malaria in the Navy and Marine Corps Active Duty Population

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Executive Summary

This report of malaria cases among the Navy and Marine Corps active duty population, produced in odd-numbered years, summarizes malaria cases reported in the past two years (2013-2014) and provides historical data from 2005 through 2014. In 2013 and 2014, there were 5 and 11 cases of malaria among active duty service members, respectively. The malaria rate among Sailors over these two years was relatively stable (1.3 per 100,000 in 2013 to 1.2 per 100,000 in 2014), while the malaria rate among Marines was more variable during this time (0.5 per 100,000 in 2013 to 3.7 per 100,000 in 2014). Historically, the malaria rate among both Sailors and Marines has varied widely from year to year and across the entire 10 year timeframe. Rather than following a clear trend, malaria cases among Sailors and Marines tend to appear in clusters and are often associated with a specific mission or exposure. For example, there were 7 cases of malaria identified (5 Marines and 2 Sailors) following travel to Haiti in 2010 in support of relief efforts in that country following a major earthquake.

With the drawdown of forces from the United States (US) Central Command (CENTCOM) area of responsibility (AOR), malaria cases associated with deployments to this region have also decreased. There were no malaria cases reported among Sailors and Marines in 2013 or 2014 that were associated with deployments to the Middle East. The most recent case associated with deployment to this region was in 2012. On the other hand, cases of malaria associated with deployments to Africa increased after 2008, peaking in 2011 with 10 cases. While there were cases of malaria among Sailors and Marines linked to deployments to Africa during Operation United Assistance (OUA), none were related to OUA support or following travel to countries affected by the outbreak of Ebola virus disease (EVD).

In 2013, 3 of the 5 cases traveled for personal reasons; all were visiting friends and relatives (VFR) travel. Conversely, in 2014, the majority of cases were associated with duty travel. Two of the 11 cases in 2014 traveled for personal reasons and both of these were VFR travel. There may be opportunity to incorporate more targeted education and guidance for personnel traveling to malaria-endemic countries while on leave.

Overall, the burden of malaria in the Navy and Marine Corps is low and at baseline levels, with no significant change in overall risk patterns at this time. However, even at baseline, clusters of cases can still occur, which is why it is important to monitor malaria regularly to identify such events in a timely manner in order to assess contributing factors. Such factors could include new risk patterns requiring new preventive measures, a lack of adherence to current control measures, or failure of current measures when followed correctly.

Background

Naval forces' current and historical operating areas encompass many regions where malaria is endemic. Shipboard personnel are at risk when visiting ports in countries with known malaria transmission. Several instances of service members acquiring malaria are documented where a significant number of cases occurred, including Somalia in 1993, Liberia in 2003, and Haiti in 2010.

BUMEDINST 6230.16, [Malaria Prevention and Control](#) (8 Jul 2013) provides guidelines to commanders and Navy Medicine personnel for assessing risk and preventing and treating malaria among active duty personnel, civilian employees, and other beneficiaries. This instruction references the Navy and Marine Corps Public



Health Center's *Guide to Malaria Prevention and Control* (NMCPHC-TIM 6250.1, 2015) as the primary source of guidance for malaria prevention and control. The Guide outlines preventive measures including personal protective measures, chemoprophylaxis, vector control, and unit-wide prevention strategies such as location of base camp and the treatment of clothing and equipment. Medical Department personnel should work with the cognizant Navy Environmental and Preventive Medicine Unit (NEPMU) prior to a unit's deployment to malaria-endemic areas to receive up-to-date, region-specific risk assessments and prevention and treatment recommendations. Personnel traveling on leave or other official travel should also receive counseling and appropriate prophylaxis before traveling to malaria-endemic regions.

Malaria is a reportable disease under the [Armed Forces Reportable Medical Events Guidelines](#) (2012) and is an urgent event that should be reported in Disease Reporting System-internet (DRSi) no later than 24 hours after event identification (per NMCPHC-TM-PM 6220.12, [Medical Surveillance and Reporting](#), 2013). Furthermore, all malaria cases should be reported through the chain of command to ensure Command Surgeons and Operational Commanders are aware of malaria-related threats to their operations and forces.

Several military operations within the last decade have taken place in Africa and Asia, the primary locations for malaria transmission, such as Operations Enduring Freedom and Iraqi Freedom (OEF/OIF) in the Middle East. These missions scaled down with troop reductions in 2014 and 2011, respectively. US Africa Command (AFRICOM) was established in 2008. The primary responsibilities of AFRICOM are military relations in the African region and coordination of security and humanitarian support. Africa is a primary location for transmission of *Plasmodium falciparum* malaria, which typically causes more severe disease.

In 2014, OUA provided support to the US Agency for International Development (USAID) in efforts to contain the spread of EVD in Liberia, Sierra Leone, and Guinea. US military personnel were primarily involved with logistics expertise, training, and engineering support and did not provide direct care to EVD patients. While service members' risk of exposure to EVD during OUA was relatively low, the risk of exposure to malaria and other endemic diseases remained elevated.

In addition to deployment exposures, personal travel is also a factor when considering malaria incidence among Sailors and Marines. Of particular concern is when foreign-born personnel travel on personal leave to their country of origin for VFR travel. Personnel traveling on leave to malaria-endemic areas should receive guidance and prophylaxis prior to travel. However, VFR travelers are often at greater risk for malaria for several reasons, including longer duration of travel, reduced likelihood to use prevention measures including prophylaxis, or an incorrect risk perception of malaria.

The AFRICOM surgeon labeled malaria the "signature disease of concern" because of its potential for severe morbidity and mortality and due to the fact that it can be prevented through relatively simple personal protective measures, including bed nets, topical and uniform impregnated repellents, and chemoprophylaxis. A key statement from this is that malaria is *preventable*. Regular evaluation of malaria cases contributes to the assessment of current prevention strategies to determine whether current practices are sufficient or need to be reevaluated.



This report summarizes malaria cases among Navy and Marine Corps active duty service members identified using electronic health data from medical treatment facilities (MTFs) worldwide. The two most recent years, 2013 and 2014, are summarized, while historical data from 2005 to 2014 are also presented. Case and trend information in this report serves as a resource for the Navy and Marine Corps Public Health Center (NMCPHC) and Navy and Marine Corps preventive medicine personnel on the current status of malaria in the Department of the Navy.

Technical Notes

Malaria cases were included in this analysis based on documentation of a positive laboratory result for *Plasmodium* spp. in electronic Military Health System (MHS) Composite Health Care System (CHCS) data, a medical event report (MER) for malaria, or an inpatient hospitalization record indicating malaria as a contributing diagnosis for admission. Additional case details were drawn from personnel data. These data are received and stored by the NMCPHC EpiData Center (EDC) Department.

Electronic laboratory records indicating identification of *Plasmodium* spp. included the results of blood smears, rapid diagnostic tests (RDTs), or polymerase chain reaction (PCR) tests. Antibody tests are not valid tests for identifying a case of malaria and were not used for this report. Inpatient hospitalization records indicating malaria as a contributing diagnosis were those with an International Classification of Diseases, 9th Revision (ICD-9) code for malaria in the first, second, or third diagnostic position. ICD-9 codes included were 084.xx (excluding 084.7) and 647.40-647.44.

A limitation to the data presented in this report is that cases who sought care outside the MHS were not captured unless confirmatory laboratory tests were performed within the MHS or a MER was recorded. Given that cases in this report were limited to active duty service members who have universal access to care within the MHS at no cost, it is likely that this limitation would have minimal impact on the analysis. Results may also be affected by underreporting, particularly in light of the less clinically invasive *Plasmodium vivax*, which may be treated empirically without testing in the forward deployed environment.

For further detail on the methods and data used for this report, please refer to NMCPHC-EDC-TR-333-2015, *Malaria Technical Notes* (2 July 2015).

2013-2014 Summary

2013

There were five confirmed cases of malaria among Navy and Marine Corps active duty service members in 2013; four were Sailors and one was a Marine. Rates in the Navy and the Marine Corps were 1.3 per 100,000 and 0.5 per 100,000, respectively. Three cases were in the 18-25 age group and two were in the 36-45 age group. Country of birth was available for four cases; of these, 75% were foreign-born and 25% were born in the US. All of the foreign-born cases were born in Africa; two were born in Nigeria and one was born in Ghana. Two of the cases were infected with *P. falciparum*, while the species was not specified for the remaining three cases.

All five cases were associated with travel to Africa. Three of these were on personal travel, one was on duty travel, and one had an unknown reason for travel. All three cases that traveled to Africa for personal reasons traveled to their country of birth.



2014

There were 11 confirmed cases of malaria among DON active duty service members in 2014; four were Sailors and seven were Marines. Rates in the Navy and the Marine Corps were 1.2 per 100,000 and 3.7 per 100,000, respectively. The majority of cases were in the 18-25 age group (55%). Country of birth was available for 10 cases; of these, 40% were foreign-born and 60% were born in the US. Most of the foreign-born cases were born in Africa (75%); two were born in Nigeria and one was born in Ghana. The remaining foreign-born case was born in Europe (Romania). Three cases were infected with *P. falciparum* and the remaining eight cases did not have a species identified.

Nine cases were associated with travel to Africa; the remaining two had unknown exposure locations. In contrast to travel trends in 2013, the majority of cases in 2014 were on duty travel when the malaria exposure occurred (6/11; 55%), while two were on personal travel and three had unknown reasons for travel. The two cases that traveled to Africa for personal reasons both traveled to their country of birth.

Historical Malaria Data, Navy and Marine Corps, 2005-2014

Demographics of Navy and Marine Corps Malaria Cases, 2005-2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Service										
Marine Corps	5 (45)	7 (58)	3 (50)	5 (33)	0 (0)	7 (30)	14 (64)	2 (50)	1 (20)	7 (64)
Navy	6 (55)	5 (42)	3 (50)	10 (67)	15(100)	16 (70)	8 (36)	2 (50)	4 (80)	4 (36)
Age Group *										
18-25	5 (46)	9 (75)	3 (50)	5 (33)	6 (40)	15 (65)	6 (27)	1 (25)	3 (60)	6 (55)
26-35	2 (18)	2 (17)	1 (17)	4 (27)	7 (47)	5 (22)	11 (50)	1 (25)	0 (0)	2 (18)
36-45	4 (36)	0 (0)	1 (17)	6 (40)	1 (7)	2 (9)	4 (18)	1 (25)	2 (40)	1 (9)
46+	0 (0)	1 (8)	0 (0)	0 (0)	1 (7)	1 (4)	1 (5)	1 (25)	0 (0)	2 (18)
Sex										
Male	10 (91)	12 (100)	5 (83)	15 (100)	14 (93)	19 (83)	22 (100)	4 (100)	4 (80)	11(100)
Female	1 (9)	0 (0)	1 (17)	0 (0)	1 (7)	4 (17)	0 (0)	0 (0)	1 (20)	0 (0)
Birth Region										
Africa	4 (36)	1 (8)	1 (17)	3 (20)	7 (47)	5 (22)	2 (9)	0 (0)	3 (60)	3 (27)
United States	6 (55)	10 (83)	3 (50)	11 (73)	6 (40)	17 (74)	19 (86)	3 (75)	1 (20)	6 (55)
Other ^	1 (9)	1 (8)	0 (0)	0 (0)	1 (7)	1 (4)	1 (5)	1 (25)	0 (0)	1 (9)
Unknown	0 (0)	0 (0)	2 (33)	1 (7)	1 (7)	0 (0)	0 (0)	0 (0)	1 (20)	1 (9)

*1 case in 2007 was of unknown age.

^Other regions include the Caribbean, Europe, Middle East, and Asia.



Characteristics of Navy and Marine Corps Malaria Cases, 2005-2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Reason for Travel										
Duty	4 (36)	10 (83)	3 (50)	10 (67)	5 (33)	13 (56)	20 (91)	3 (75)	1 (20)	6 (55)
Personal	4 (36)	2 (17)	3 (50)	5 (33)	6 (40)	5 (22)	1 (5)	1 (25)	3 (60)	2 (18)
Unknown	3 (27)	0 (0)	0 (0)	0 (0)	4 (27)	5 (22)	1 (5)	0 (0)	1 (20)	3 (27)
Region of Travel										
Africa	3 (27)	6 (50)	4 (67)	8 (53)	14 (93)	14 (61)	11 (50)	2 (50)	5 (100)	9 (82)
Caribbean	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	7 (30)	0 (0)	1 (25)	0 (0)	0 (0)
Middle East	4 (36)	4 (33)	1 (17)	5 (33)	0 (0)	1 (4)	10 (45)	1 (25)	0 (0)	0 (0)
Southeast Asia	2 (18)	2 (17)	1 (17)	2 (13)	0 (0)	1 (4)	0 (0)	0 (0)	0 (0)	0 (0)
Unknown	2 (18)	0 (0)	0 (0)	0 (0)	1 (7)	0 (0)	1 (5)	0 (0)	0 (0)	2 (18)
<i>Plasmodium Species</i> *										
<i>P. falciparum</i>	5 (45)	5 (42)	2 (33)	7 (47)	9 (60)	14 (61)	10 (45)	2 (50)	2 (40)	3 (27)
<i>P. ovale</i>	0 (0)	0 (0)	2 (33)	0 (0)	1 (7)	0 (0)	1 (5)	0 (0)	0 (0)	0 (0)
<i>P. vivax</i>	4 (36)	5 (42)	2 (33)	3 (20)	1 (7)	1 (4)	4 (18)	1 (25)	0 (0)	0 (0)
Unspecified	2 (18)	2 (17)	0 (0)	6 (40)	4 (27)	8 (35)	7 (32)	1 (25)	3 (60)	8 (73)

*1 dual infection of *P. falciparum* and *P. vivax* (2008) was counted once for each species.



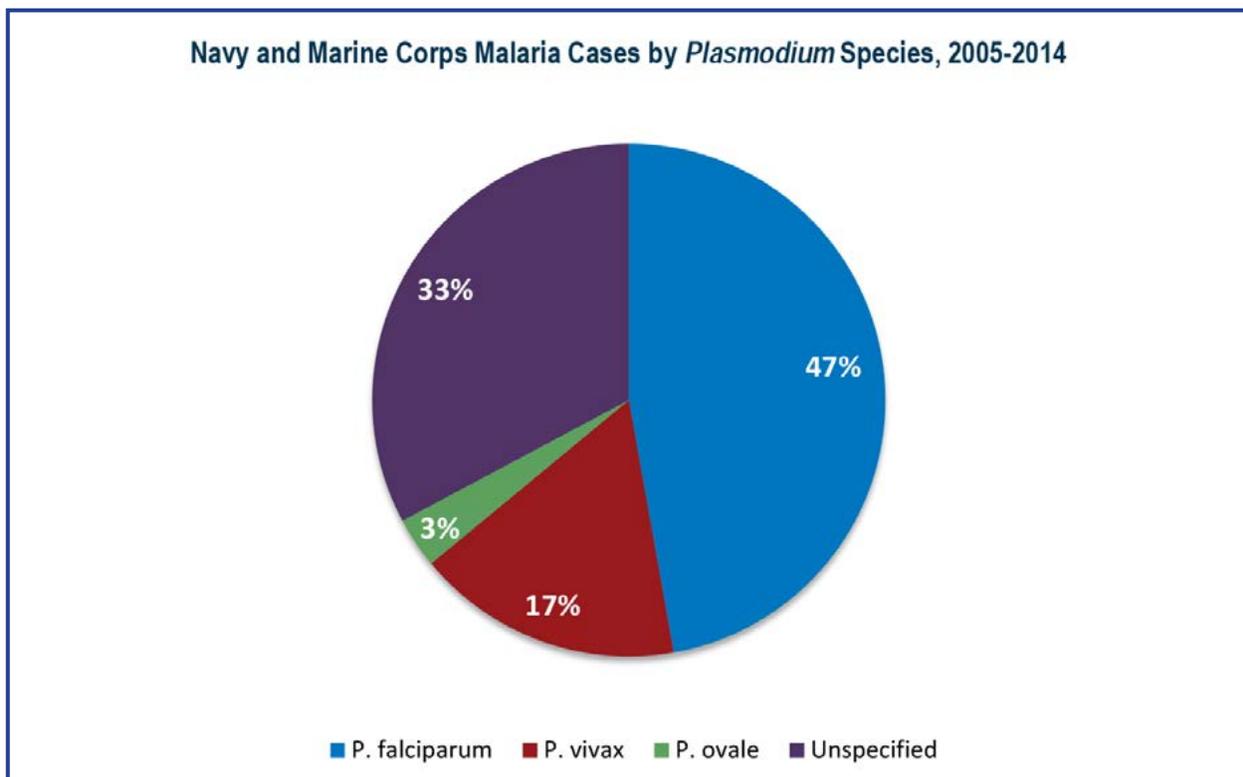
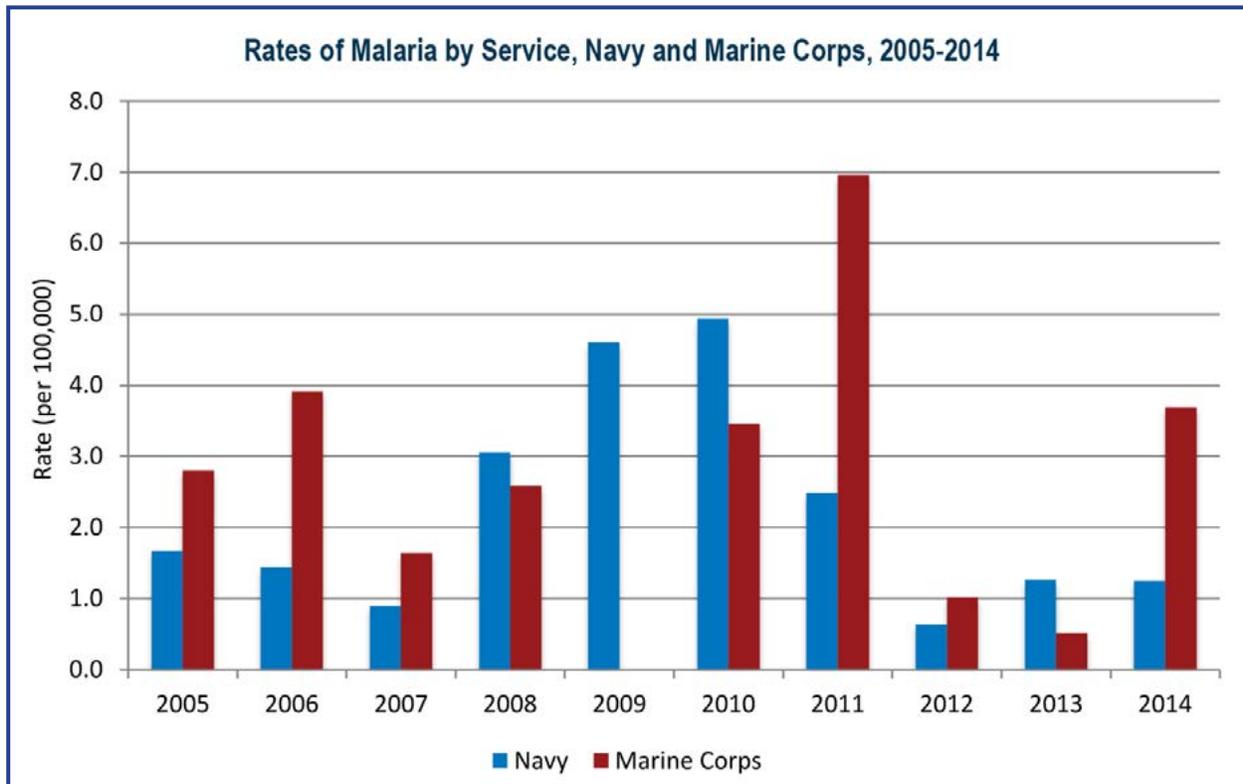
Rates of Malaria and Percent Change by Service, Navy and Marine Corps, 2005-2014

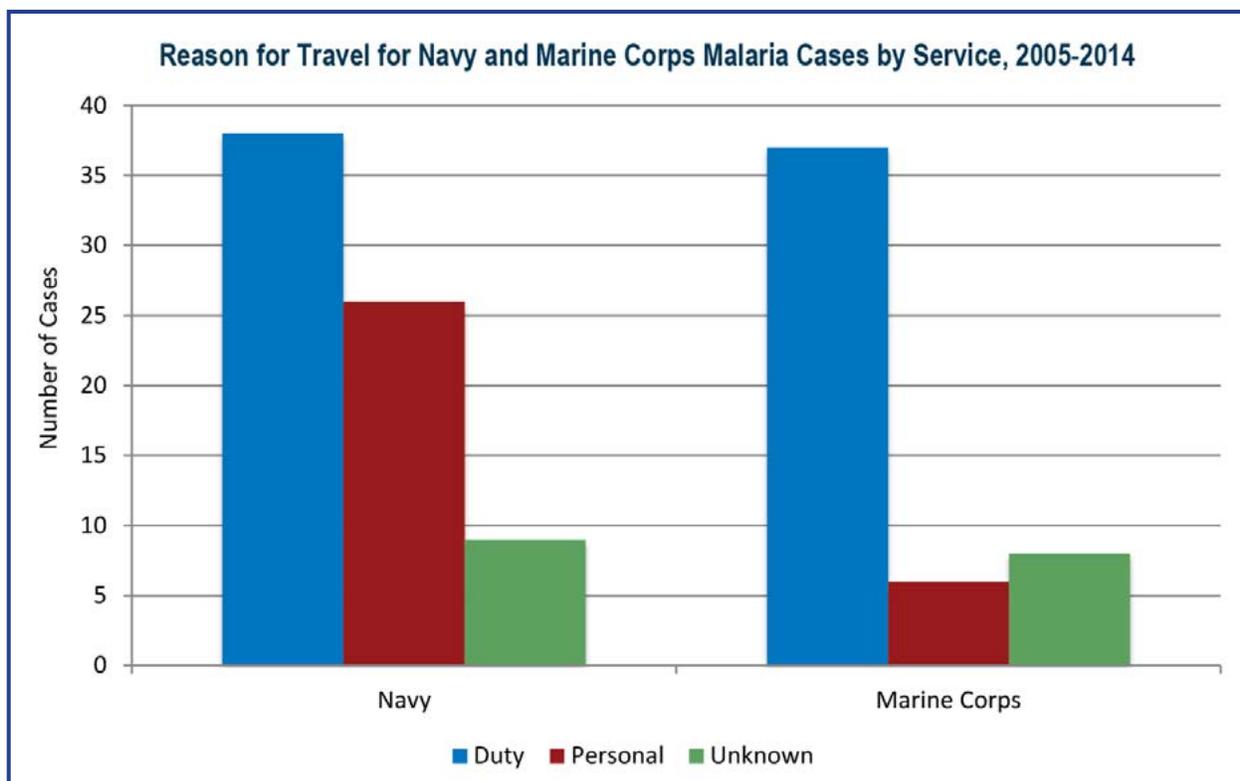
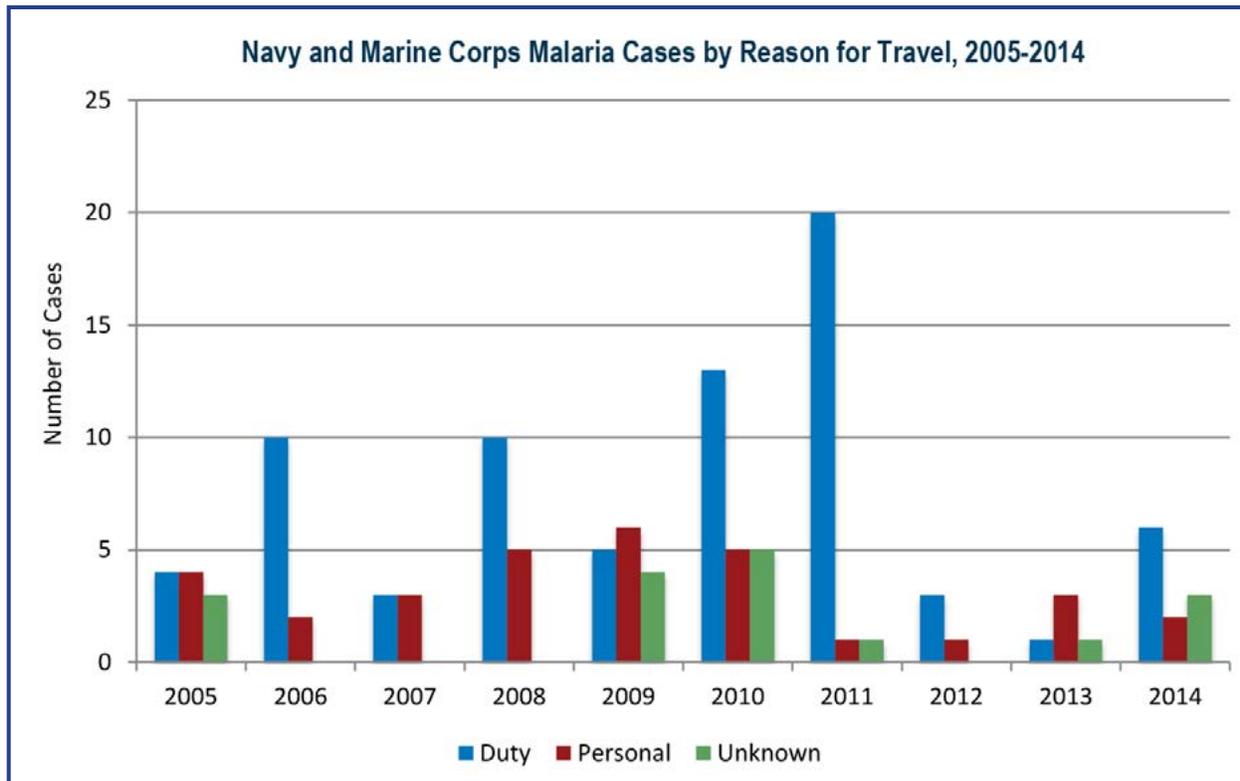
	Number of Cases	Rate (per 100,000)	Percent Change – Number *	Percent Change – Rate *
Navy				
2005	6	1.7	—	—
2006	5	1.4	-16.7%	-13.9%
2007	3	0.9	-40.0%	-37.7%
2008	10	3.1	233.3%	240.5%
2009	15	4.6	50.0%	50.4%
2010	16	4.9	6.7%	7.4%
2011	8	2.5	-50.0%	-49.6%
2012	2	0.6	-75.0%	-74.5%
2013	4	1.3	100.0%	99.2%
2014	4	1.2	0.0%	-1.1%
Marine Corps				
2005	5	2.8	—	—
2006	7	3.9	40.0%	39.6%
2007	3	1.6	-57.1%	-58.0%
2008	5	2.6	66.7%	57.1%
2009	0	0	-100.0%	-100.0%
2010	7	3.5	n/a	n/a
2011	14	7.0	100.0%	101.4%
2012	2	1.0	-85.7%	-85.5%
2013	1	0.5	-50.0%	-49.3%
2014	7	3.7	600.0%	619.0%

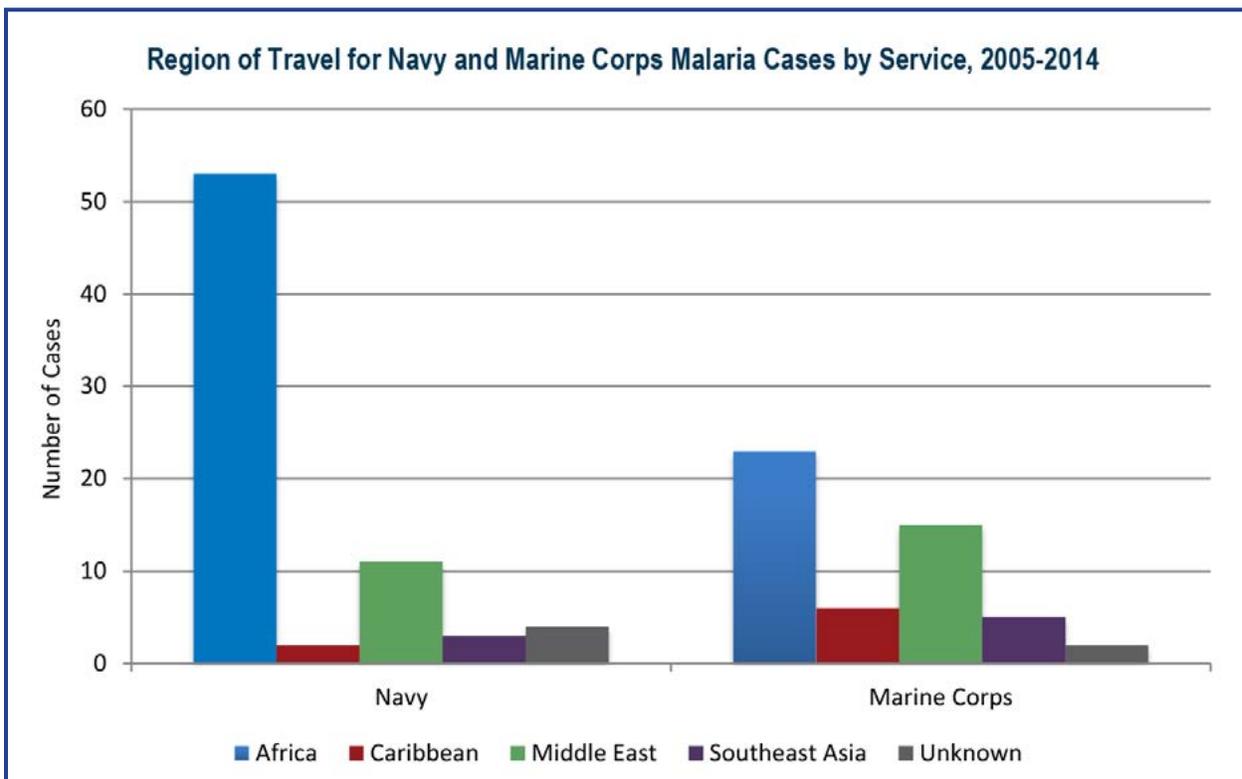
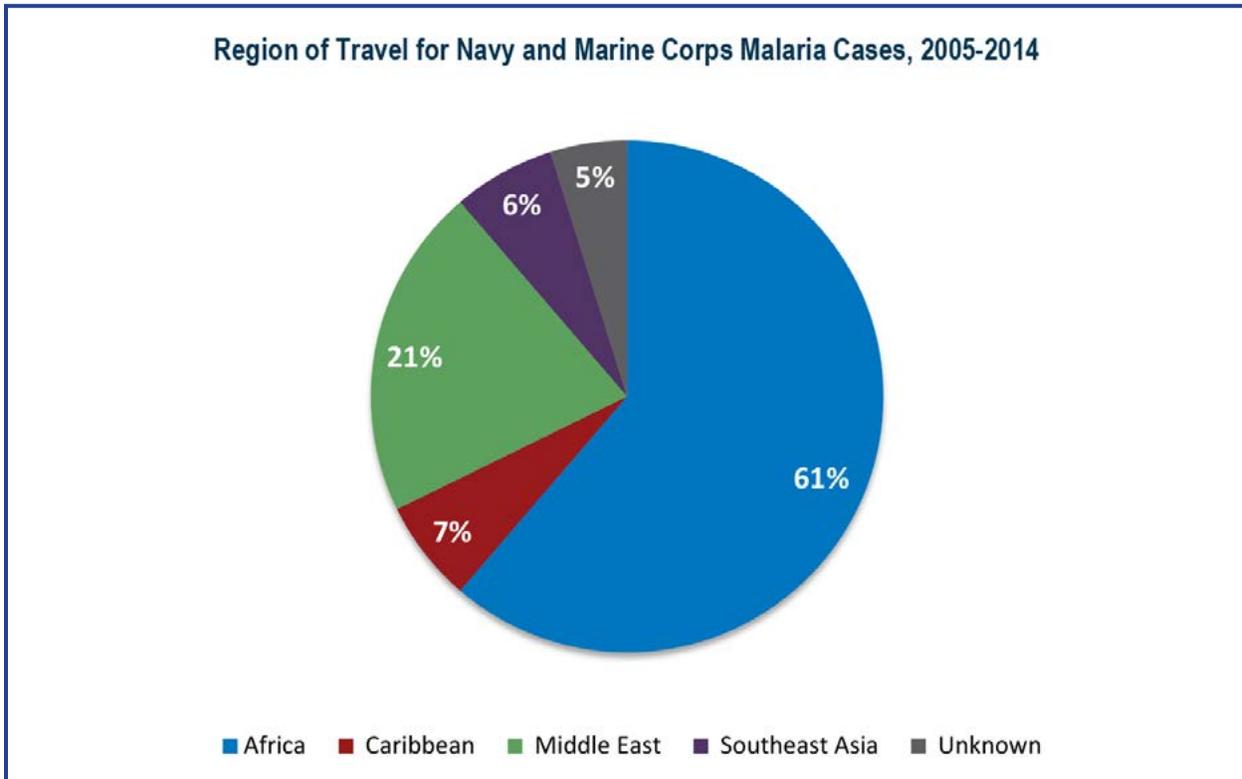
*Percent change compared to previous year.

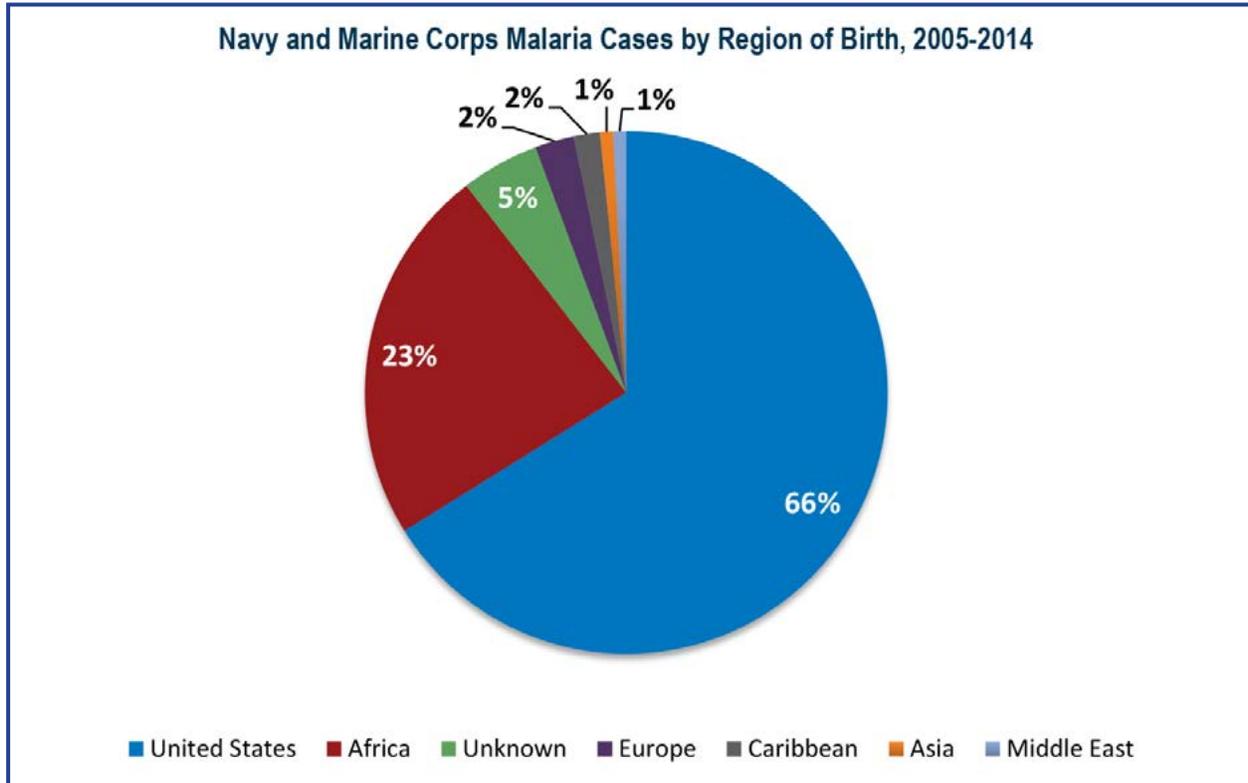
Region of Birth by Reason for Travel for Navy and Marine Corps Malaria Cases, 2005-2014

	Duty Travel		Personal Travel		Unknown Reason		Total
	Navy	Marine Corps	Navy	Marine Corps	Navy	Marine Corps	
US Born	33	34	4	1	4	6	82
Foreign Born	3	3	22	3	4	1	36
Unknown	2	0	0	2	1	1	6
Total	38	37	26	6	9	8	124











Contact Information

NEPMUs

Navy Environmental and Preventive Medicine Unit Number 2
(Atlantic and European regions)

COMM: (757) 953-6600; DSN: (312) 377-6600

PLAD: NAVENPVNTMEDU TWO NORFOLK VA

Web site: <http://www.med.navy.mil/sites/nmcphc/nepmu-2/Pages/default.aspx>

E-mail: usn.hampton-roads.navhospporsva.list.nepmu2norfolk-threatassess@mail.mil

Navy Environmental and Preventive Medicine Unit Number 5
(Pacific region)

COMM: (619) 556-7070; DSN: (312) 526-7070

PLAD: NAVENPVNTMEDU FIVE SAN DIEGO CA

Web site: <http://www.med.navy.mil/sites/nmcphc/nepmu-5/Pages/default.aspx>

E-mail: usn.san-diego.navenpvntmedufive.list.nepmu5-health-surveillance@mail.mil

Navy Environmental and Preventive Medicine Unit Number 6
(Pacific theater)

COMM: (808) 471-0237; DSN: (315) 471-0237

PLAD: NAVENPVTMEDU SIX PEARL HARBOR HI

Web site: <http://www.med.navy.mil/sites/nmcphc/nepmu-6/Pages/default.aspx>

E-mail: usn.jbphh.navenpvntmedusixhi.list.nepmu6@mail.mil

Navy Environmental and Preventive Medicine Unit Number 7
(European and African theaters)

COMM (international): 011-34-956-82-2230 (local: 727-2230); DSN: 94-314-727-2230

PLAD: NAVENPVNTMEDU SEVEN ROTA SP

Web site: <http://www.med.navy.mil/sites/nmcphc/nepmu-7/Pages/default.aspx>

E-mail: nepmu7@eu.navy.mil

NMCPHC

COMM: (757) 953-0700; DSN: (312) 377-0700

PLAD: NAVMCPUBHLHCEN PORTSMOUTH VA

Web site: <http://www.med.navy.mil/sites/nmcphc/program-and-policy-support/Pages/Malaria-Prevention-and-Control.aspx>

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