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2019 Report

Malaria Report

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

Malaria in the Navy and Marine Corps Active Duty Population

Contents

Index of Tables and Figures

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 2017 and 2018 and provides historical data from 2005 through 2018. In 2017 and 2018, there were six and four cases of malaria among active duty service members, respectively. The malaria rate among Sailors over these two years was 1.5 per 100,000 in 2017 and 1.2 per 100,000 in 2018, while the malaria rate among Marines was 0.5 per 100,000 in 2017 and 0 per 100,000 in 2018. Historically, the malaria rate among both Sailors and Marines has varied widely from year to year and across the entire 14 year timeframe included in this report. Rather than following a clear trend, increased rates of malaria 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. Only one of ten new cases in 2017 and 2018 was associated with deployment to the Middle East. Cases of malaria associated with deployments to Africa increased after 2008, peaking in 2011 with 10 cases. In 2017 and 2018, there were two cases that were associated with duty travel to Africa. The majority of cases in 2017 and 2018 were associated with personal travel, primarily among individuals traveling to their country of origin.

Overall, the burden of malaria in the Navy and Marine Corps is at baseline levels, with no significant change in overall risk patterns. 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 even 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 6230.16A, Malaria Prevention and Control (16 JAN 2018) 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 (2017) and is urgently reportable 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, Operation United Assistance (OUA) provided support to the US Agency for International Development (USAID) in efforts to contain the spread of Ebola virus disease (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 visiting friends and relatives (VFR). 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.

A key characteristic of malaria is that it is preventable. While it has the potential to cause severe morbidity and mortality, it can be prevented through personal protective measures including bed nets, topical and uniform impregnated repellents, and chemoprophylaxis. 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, 2017 and 2018, are summarized, while historical data from 2005 to 2018 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).

2017-2018 Summary

2017

There were six confirmed cases of malaria among Navy and Marine Corps active duty service members in 2017; five were Sailors and one was a Marine. The rate of malaria in the Navy in 2017 was 1.5 per 100,000, while the rate in the Marine Corps was 0.5 per 100,000. Four cases were 26-35 years old, one was 36-45, and one was older than 46. Three cases were foreign-born, from Africa (Cameroon, Liberia, and Nigeria). One was born in the US and the birth status of the remaining two were not available. Two cases were infected with *P. falciparum*, one with *P. malariae*, and the remaining three had unspecified *Plasmodium* species. Two cases were associated with duty travel (one to the Middle East, one to Africa) and four were associated with personal travel (all four to Africa). Of the four cases associated with personal travel, three had traveled to their country of birth.

2018

There were four confirmed cases of malaria among Navy and Marine Corps active duty service members in 2018; all four were Sailors. The rate of malaria in the Navy in 2018 was 1.2 per 100,000. One case was in the 26-35 age group, two cases were in the 36-45 age group, and one was in the 46+ age group. Two cases were foreign born and two were born in the US. Both foreign-born cases were born in Africa (one in Kenya, one in Niger). All four cases in 2018 were infected with *P. falciparum*, and all four cases were associated with travel to Africa (one duty-related and three for personal reasons). Of the cases associated with personal travel, one had traveled to their country of birth.

Historical Malaria Data, Navy and Marine Corps, 2005-2018

Table 1. Demographics of Navy and Marine Corps Malaria Cases, 2005-2018

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	N (%)	N (%)	N (%)	N (%)	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)	2 (100)	1 (33)	1 (17)	0 (0)
Navy	6 (55)	5 (42)	3 (50)	10 (67)	15(100)	16 (70)	8 (36)	2 (50)	4 (80)	4 (36)	0 (0)	2 (67)	5 (83)	4 (100)
Age Group *														
18-25	5 (46)	9 (75)	3 (50)	5 (33)	6 (40)	15 (65)	6 (27)	1 (25)	3 (60)	6 (55)	2 (100)	0 (0)	0 (0)	0 (0)
26-35	2 (18)	2 (17)	1 (17)	4 (27)	7 (47)	5 (22)	11 (50)	1 (25)	0 (0)	2 (18)	0 (0)	3 (100)	4 (67)	1 (25)
36-45	4 (36)	0 (0)	1 (17)	6 (40)	1 (7)	2 (9)	4 (18)	1 (25)	2 (40)	1 (9)	0 (0)	0 (0)	1 (17)	2 (50)
46+	0 (0)	1 (8)	0 (0)	0 (0)	1 (7)	1 (4)	1 (5)	1 (25)	0 (0)	2 (18)	0 (0)	0 (0)	1 (17)	1 (25)
Sex														
Male	10 (91)	12 (100)	5 (83)	15 (100)	14 (93)	19 (83)	22 (100)	4 (100)	4 (80)	11(100)	2 (100)	3 (100)	6 (100)	3 (75)
Female	1 (9)	0 (0)	1 (17)	0 (0)	1 (7)	4 (17)	0 (0)	0 (0)	1 (20)	0 (0)	0 (0)	0 (0)	0 (0)	1 (25)
Birth Region														
Africa	4 (36)	1 (8)	1 (17)	3 (20)	7 (47)	5 (22)	2 (9)	0 (0)	3 (60)	3 (27)	0 (0)	2 (67)	4 (67)	2 (50)
United States	6 (55)	10 (83)	3 (50)	11 (73)	6 (40)	17 (74)	19 (86)	3 (75)	1 (20)	6 (55)	2 (100)	1 (33)	1 (17)	2 (50)
Other ^	1 (9)	1 (8)	0 (0)	0 (0)	1 (7)	1 (4)	1 (5)	1 (25)	0 (0)	1 (9)	0 (0)	0 (0)	0 (0)	0 (0)
Unknown	0 (0)	0 (0)	2 (33)	1 (7)	1 (7)	0 (0)	0 (0)	0 (0)	1 (20)	1 (9)	0 (0)	0 (0)	1 (17)	0 (0)

*1 case in 2007 was of unknown age.

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

Table 2. Characteristics of Navy and Marine Corps Malaria Cases, 2005-2018

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	N (%)	N (%)	N (%)	N (%)	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)	2 (100)	1 (33)	2 (33)	1 (25)
Personal	4 (36)	2 (17)	3 (50)	5 (33)	6 (40)	5 (22)	1 (5)	1 (25)	3 (60)	2 (18)	0 (0)	1 (33)	4 (67)	3 (75)
Unknown	3 (27)	0 (0)	0 (0)	0 (0)	4 (27)	5 (22)	1 (5)	0 (0)	1 (20)	3 (27)	0 (0)	1 (33)	0 (0)	0 (0)
Region of Travel														
Africa	3 (27)	6 (50)	4 (67)	8 (53)	14 (93)	14 (61)	11 (50)	2 (50)	5 (100)	9 (82)	2 (100)	3 (100)	5 (83)	4 (100)
Caribbean	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	7 (30)	0 (0)	1 (25)	0 (0)	0 (0)	0 (0)	0 (0)	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)	0 (0)	0 (0)	1 (17)	0 (0)
Southeast Asia	2 (18)	2 (17)	1 (17)	2 (13)	0 (0)	1 (4)	0 (0)	0 (0)	0 (0)	0 (0)	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)	0 (0)	0 (0)	0 (0)	0 (0)
Plasmodium Species *														
P. falciparum	5 (45)	5 (42)	2 (33)	7 (47)	9 (60)	14 (61)	10 (45)	2 (50)	2 (40)	3 (27)	1 (50)	2 (67)	3 (50)	4 (100)
P. malariae	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (17)	0 (0)
P. ovale	0 (0)	0 (0)	2 (33)	0 (0)	1 (7)	0 (0)	1 (5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (17)	0 (0)
P. vivax	4 (36)	5 (42)	2 (33)	3 (20)	1 (7)	1 (4)	4 (18)	1 (25)	0 (0)	0 (0)	0 (0)	0 (0)	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 (50)	1 (33)	1 (17)	0 (0)

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

Table 3. Rates of Malaria and Percent Change by Service, Navy and Marine Corps, 2005-2018

	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%
2015	0	0	-100.0%	-100.0%
2016	2	0.6	n/a	n/a
2017	5	1.5	150.0%	150.0%
2018	4	1.2	-20.0%	-20.0%
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%
2015	2	1.1	-71.4%	-70.6%
2016	1	0.5	-50.0%	-50.0%
2017	1	0.5	0.0%	0.0%
2018	0	0	-100.0%	-100.0%

* Percent change compared to previous year.

Table 4. Region of Birth by Reason for Travel for Navy and Marine Corps Malaria Cases, 2005-2018

	Duty Travel		Personal Travel		Unknown Reason		Total
	Navy	Marine Corps	Navy	Marine Corps	Navy	Marine Corps	
US Born	36	36	5	1	4	6	88
Foreign Born	3	3	29	3	4	2	43
Unknown	2	1	0	2	1	1	8
Total	41	40	34	6	9	9	139

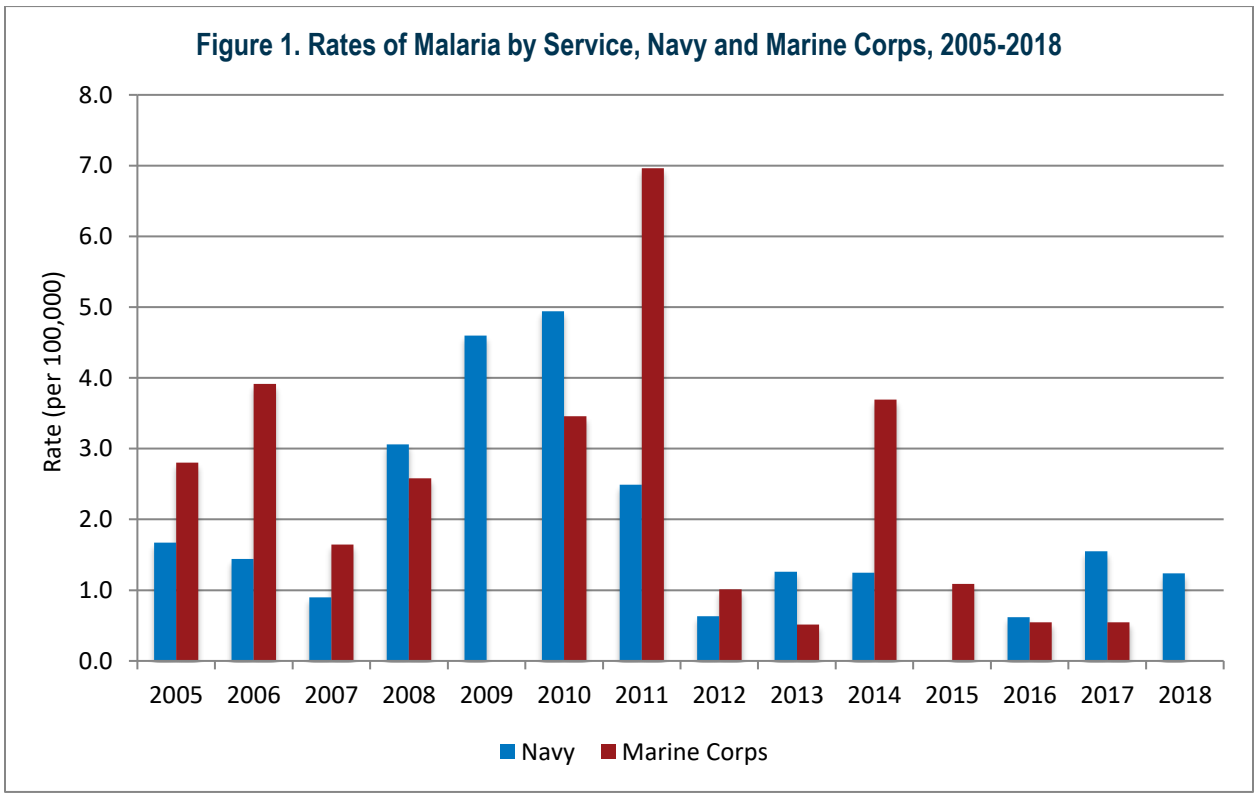


Figure 2. Navy and Marine Corps Malaria Cases by *Plasmodium* Species, 2005-2018

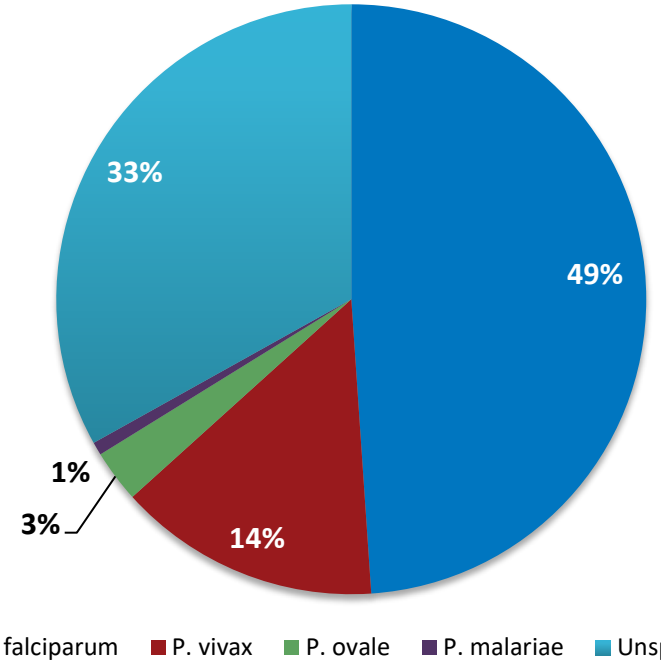


Figure 3. Navy and Marine Corps Malaria Cases by Reason for Travel, 2005-2018

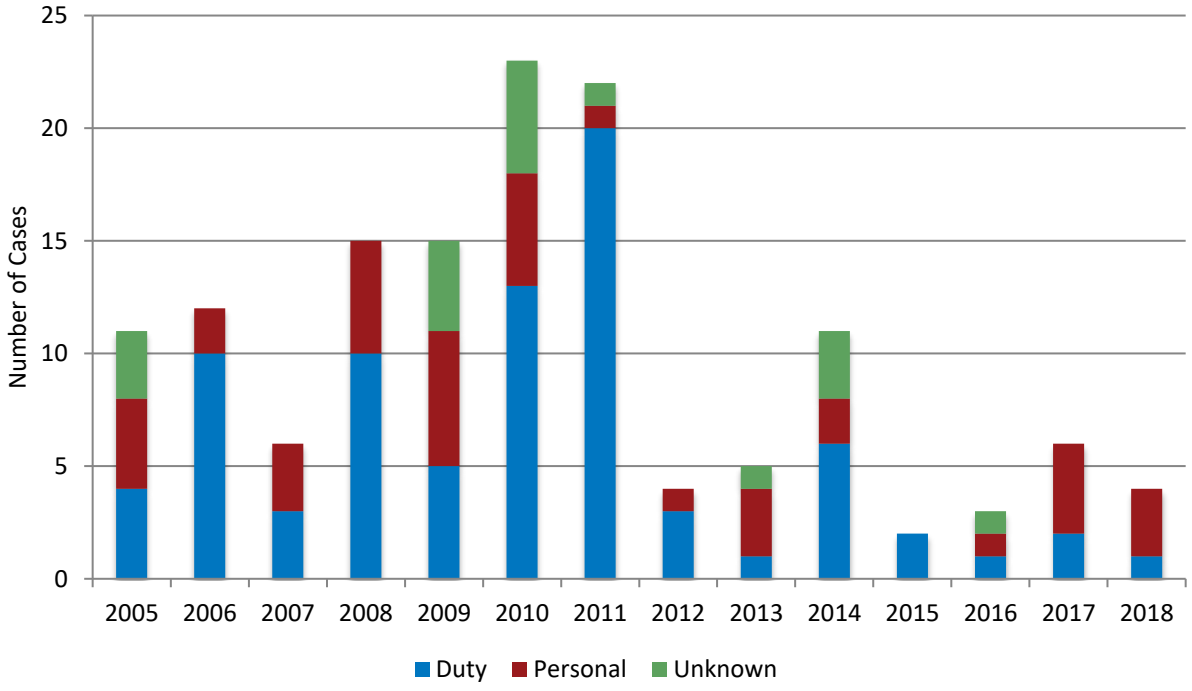


Figure 4. Reason for Travel by Service, Navy and Marine Corps Malaria Cases, 2005-2018

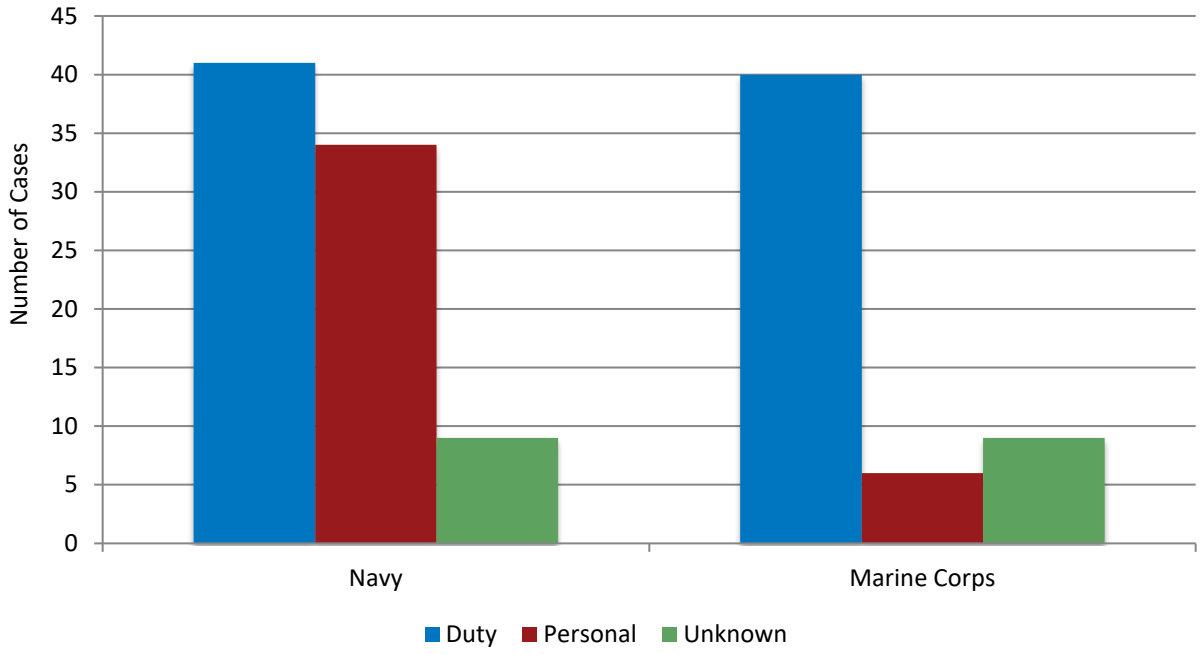


Figure 5. Navy and Marine Corps Malaria Cases by Region of Travel, 2005-2018

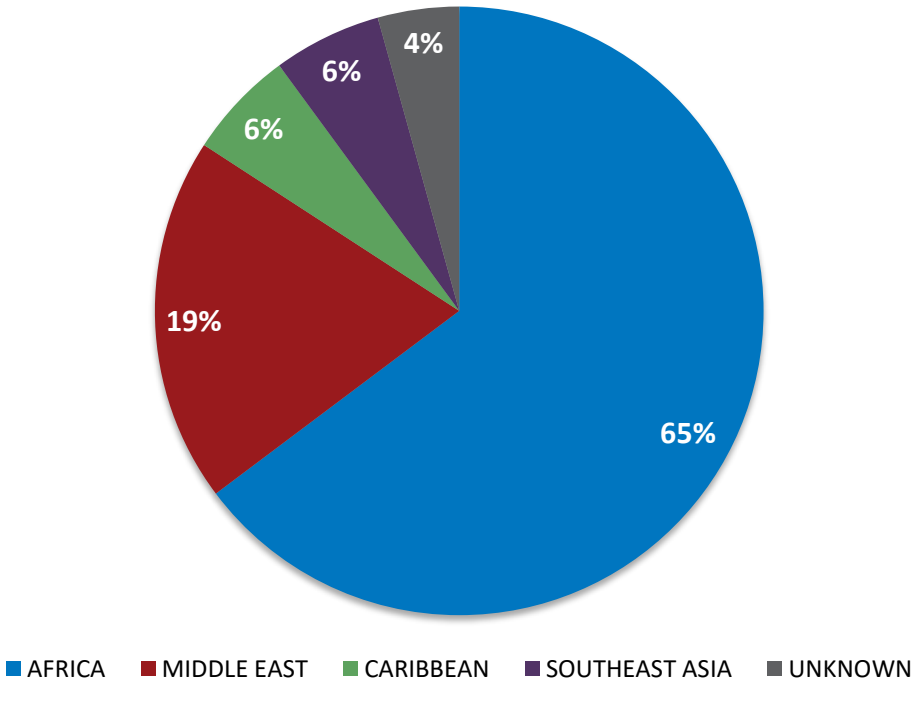


Figure 6. Region of Travel by Service, Navy and Marine Corps Malaria Cases, 2005-2018

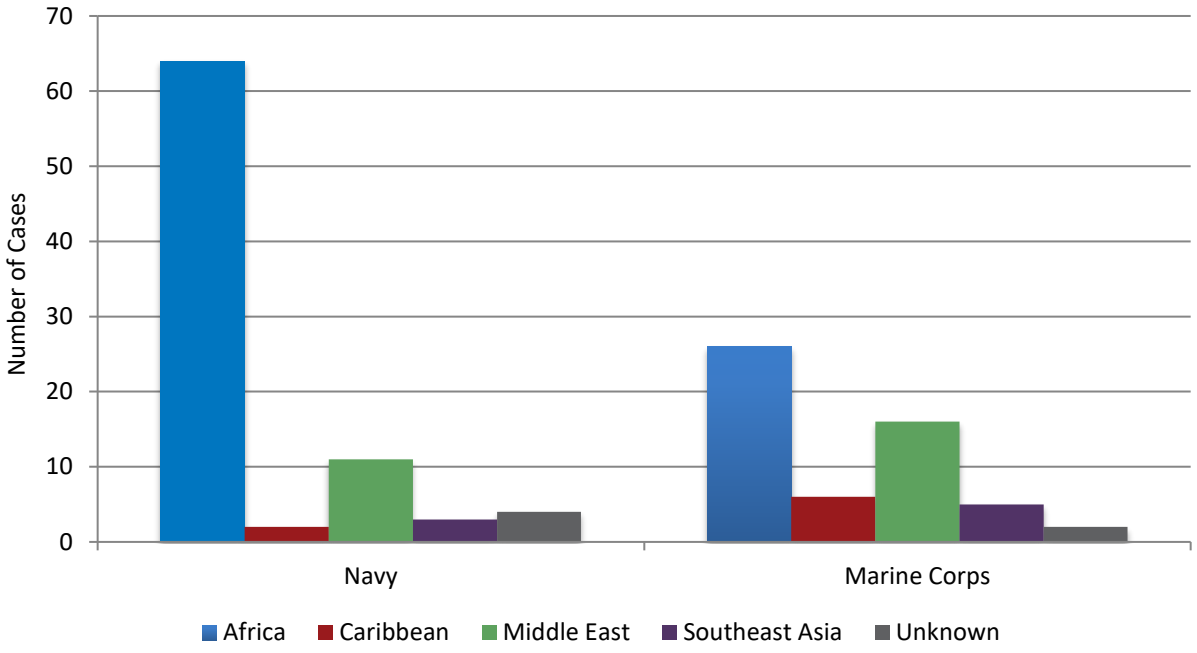
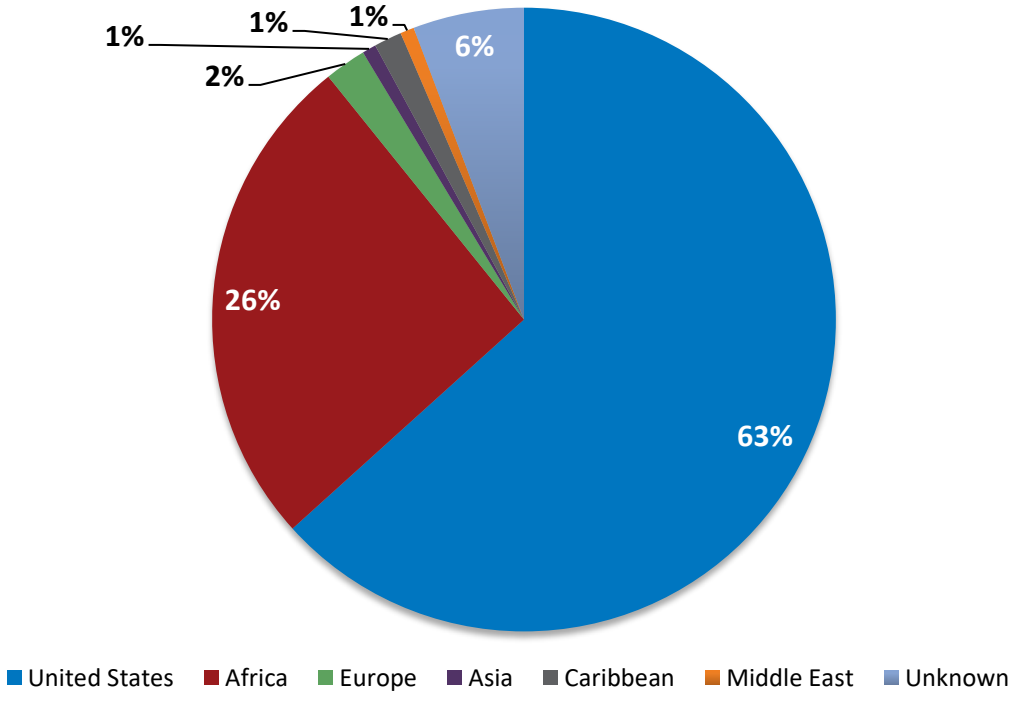


Figure 7. Navy and Marine Corps Malaria Cases by Region of Birth, 2005-2018



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