



# Tuberculosis Report



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## Tuberculosis in the Navy and Marine Corps

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## Executive Summary

Active pulmonary tuberculosis (TB) is uncommon within the Department of the Navy (DON) beneficiary population, particularly among active duty service members. Nevertheless, just one case can present unique challenges due to the nature of the military environment. It is important to monitor TB regularly to be aware of any changes in trends that could influence current preventive measures. This biannual report, produced in even-numbered years, summarizes TB cases among the Navy and Marine Corps population identified in the past two years (2016-2017) and provides historical trends from 2005 through 2017. Data in this report contribute to the overall knowledge of TB in the DON beneficiary population and inform program and policy decisions related to force health protection.

In 2016 and 2017, there were 11 and one cases of TB among DON beneficiaries, respectively. In 2016, the majority of cases were family members and retirees (82%) and the single case in 2017 was also in this category. Since 2005, the frequency of TB cases has remained relatively stable, with a substantial drop in cases from 2016 to 2017. For both the active duty and recruit populations, the burden of TB continues to primarily be among foreign-born Sailors and Marines, with 67% of active duty cases and 73% of recruit cases born outside of the U.S. across the 13 year timeframe.

## Background

Many risk factors for TB transmission, including close living quarters and closed ventilation systems, are common throughout naval environments. These unique environmental conditions place Sailors and Marines at increased risk for the transmission of TB when a case develops, with the potential for significant impacts on mission readiness. Several TB outbreaks aboard ships have previously been documented. Routine overseas travel to countries where TB is endemic also places service members at increased risk for acquiring infection. These high TB burden countries include Korea, Pakistan, Philippines, Thailand, Vietnam and multiple African nations.

BUMEDINST 6224.8C, [Tuberculosis Surveillance and Control Program](#) (25 Apr 2018) provides policy and procedures for screening, testing, treating, documenting and tracking DON personnel at risk for TB. Under this instruction, all Navy and Marine Corps accessions are tested for latent TB infection (LTBI) through the tuberculin skin test (TST) or interferon-gamma release assay (IGRA). Those with a history of active TB, a positive Tuberculin skin tests (TST) or Interferon Gamma Release Assay (IGRA), or previous treatment for LTBI must provide medical documentation of clinical evaluations, hospitalizations, diagnoses, and treatments. LTBI screening is also performed annually via questionnaire for all active and reserve component



personnel to determine TB exposure history and risk. Individuals identified at increased risk then require medical evaluation. Additional TB exposure risk screening and targeted LTBI testing may also be performed if directed by a Combatant Command Surgeon or recommended by the cognizant Navy Environmental Preventive Medicine Unit (NEPMU) during a TB contact investigation.

## Technical Notes

Tuberculosis cases were included in this report based on one or more of the following: 1) a medical event report for TB in the Disease Reporting System internet (DRSi) or 2) a positive laboratory result for *Mycobacterium tuberculosis* in electronic Military Health System (MHS) Composite Health Care System (CHCS) data. Additional details were collected from personnel data. These data are all received and stored by the Navy and Marine Corps Public Health Center (NMCPHC) EpiData Center (EDC) Department. All cases were verified and confirmed using provider notes from encounter records within the Armed Forces Health Longitudinal Technology Application (AHLTA).

## Medical Event Reports

BUMEDINST 6220.12C, [Medical Surveillance and Medical Event Reporting](#) (27 Sep 2011), requires that a medical event report be submitted to DRSi when a reportable medical event is suspected and/or confirmed. Pulmonary TB is a reportable event, per Armed Forces Reportable medical Event Guidelines (July 2017). All reports for tuberculosis in Navy and Marine Corps beneficiaries were reviewed and those with a case status of “confirmed” or those that also had an associated positive laboratory test for TB (regardless of report case status) were considered cases for this report.

## Laboratory Tests

Electronic laboratory records indicating identification of *M. tuberculosis* included the results of acid-fast cultures, DNA probes, or nucleic acid amplification tests from a sputum or bronchoalveolar lavage sample. Smears positive for acid-fast bacilli (AFB) that did not specifically identify *M. tuberculosis* were not considered to be indicative of a TB case for this report. Other laboratory results excluded from this report included positive tests for nontuberculous *Mycobacterium* and positive tests for *M. tuberculosis* from extrapulmonary sources.

## Data Limitations

Cases who sought care outside of the MHS were not captured in this report unless confirmatory laboratory tests were performed within the MHS or a medical event report was recorded in DRSi.



This limitation should have minimal impact on the analysis of active duty and recruit cases, as they would largely be expected to seek care within the MHS. It is difficult to quantify the impact on the analysis of family members and retirees, who may seek care within the MHS but may also seek care from civilian providers or the Veterans Administration (VA).

The electronic laboratory data used in this report do not include records from shipboard facilities, battalion aid stations or other deployed settings. However, cases identified in these settings would be reportable in DRSi and would still be captured in that system if reported.

## 2016-2017 Summary

### 2016

#### All DON Beneficiaries

In 2016, 11 confirmed cases of TB were identified among DON beneficiaries, which included active duty service members, recruits, retired service members and their families. Most cases were family members (5/11, 45%) followed by retirees (4/11, 36%). Among recruits and active duty service members, there was one case each. Most cases were diagnosed at NMC San Diego (4/11, 36%) followed by Tripler AMC (3/11, 27%).

#### Recruits

One confirmed case of TB was identified among DON recruits in 2016. The case was a Navy recruit born in the Philippines, identified based on a positive TST at accession.

#### Active Duty Service Members

One confirmed case of TB was identified among DON active duty service members in 2016. The case was an enlisted Sailor (E2) born in Haiti. The case presented with intermittent cough and sweats, but no fever, chills or weight loss. Acid-fast bacilli smears and a subsequent nucleic acid amplification test were all positive for TB. The case was assigned to a ship at the time of diagnosis and was diagnosed at Tripler Army Medical Center (AMC).

### 2017

#### All DON Beneficiaries

In 2017, one confirmed case of TB was identified among DON beneficiaries, which included active duty service members, recruits, retired service members and their families. The case was a retiree diagnosed at NH Camp Pendleton.



## Recruits

There were no confirmed cases of TB among DON recruits in 2017.

## Active Duty Service Members

There were no confirmed cases of TB among DON active duty service members in 2017.

# Historical Tuberculosis Data, Navy and Marine Corps, 2005-2017

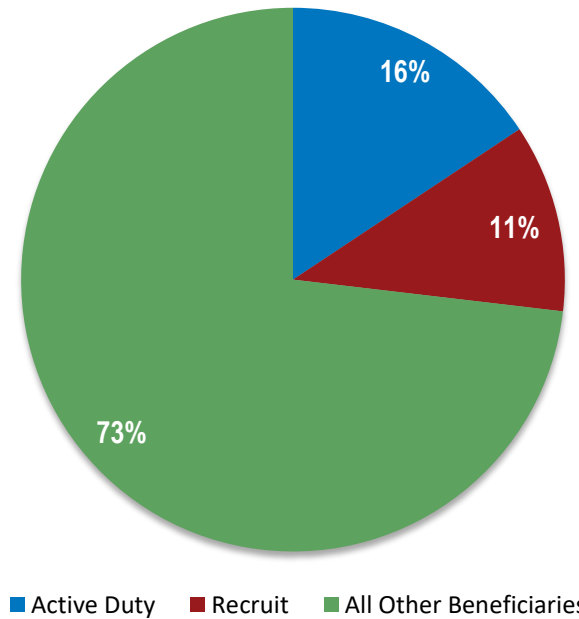
## Trends in All DON Beneficiaries

From 2005 to 2017, 134 confirmed cases of TB were identified among DON beneficiaries, which included active duty service members, recruits, retired service members and their families. Most cases were family members or retirees (73%), followed by active duty service members (16%) and recruits (11%). Overall, the medical treatment facility (MTF) with the highest percentage of overall cases was Navy Medical Center (NMC) San Diego (42%) followed by Tripler AMC (9%) and NMC Portsmouth (8%).

Table 1. Demographics of Navy and Marine Corps Tuberculosis Cases, All Beneficiaries, 2005-2017													
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
<b>Service</b>													
Marine Corps	3	2	1	1	2	3	3	1	1	3	4	1	0
Navy	8	9	9	10	12	8	10	7	7	7	11	10	1
<b>Age Group</b>													
<16	0	0	0	0	0	1	2	1	0	0	1	0	0
17-26	2	2	2	1	4	1	1	1	2	3	3	3	0
27-36	0	4	1	1	1	1	3	2	2	3	2	3	0
37-46	0	3	2	1	2	1	0	1	2	0	2	1	0
47-56	3	1	1	6	4	3	2	2	1	2	2	1	1
57+	6	1	4	2	3	5	5	1	1	2	5	3	0
<b>Beneficiary Status</b>													
Active Duty	1	3	0	4	3	1	1	1	4	0	2	1	0
Recruit	1	0	2	0	1	0	2	1	1	4	2	1	0
All Others	9	8	8	7	10	10	10	6	3	6	11	9	1

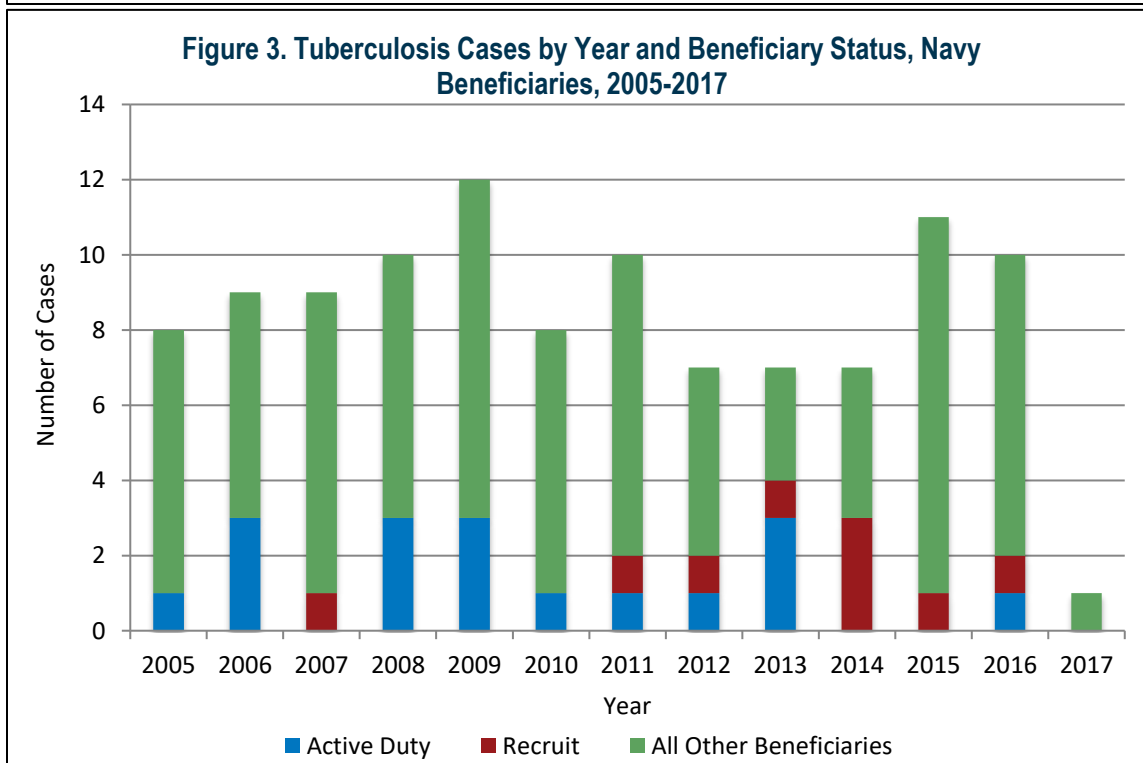
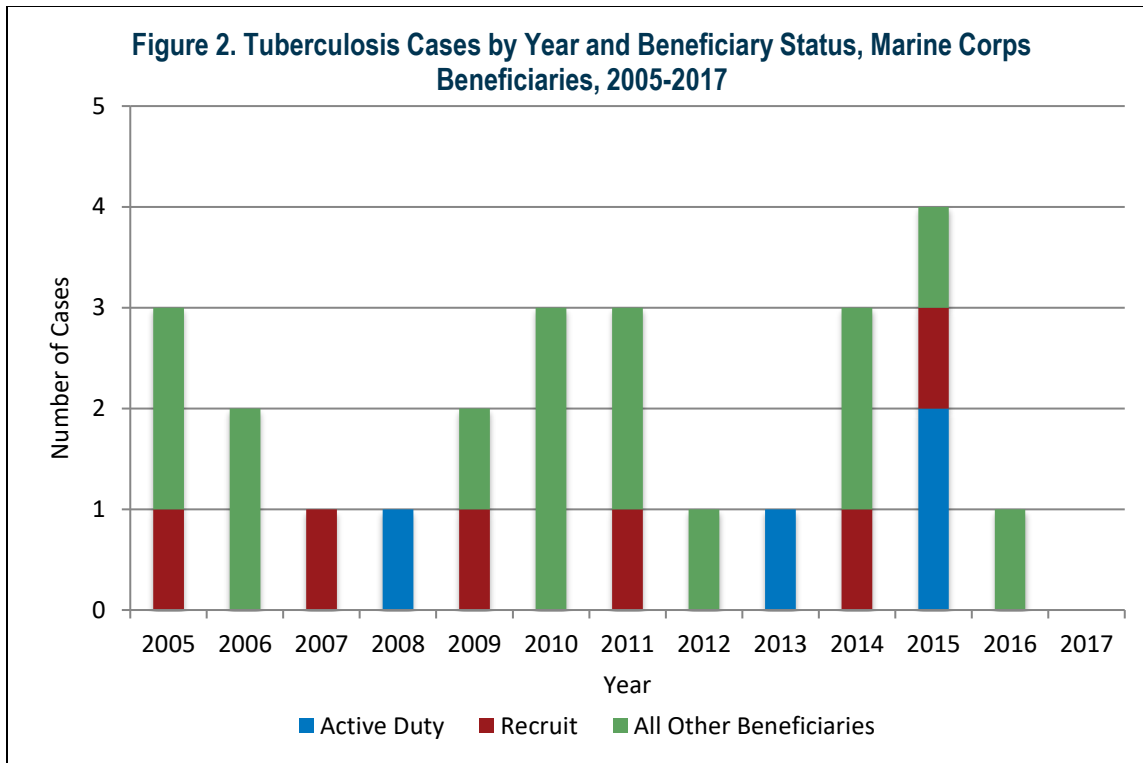


**Figure 1. Tuberculosis Cases by Beneficiary Status, DON Beneficiaries, 2005-2017**

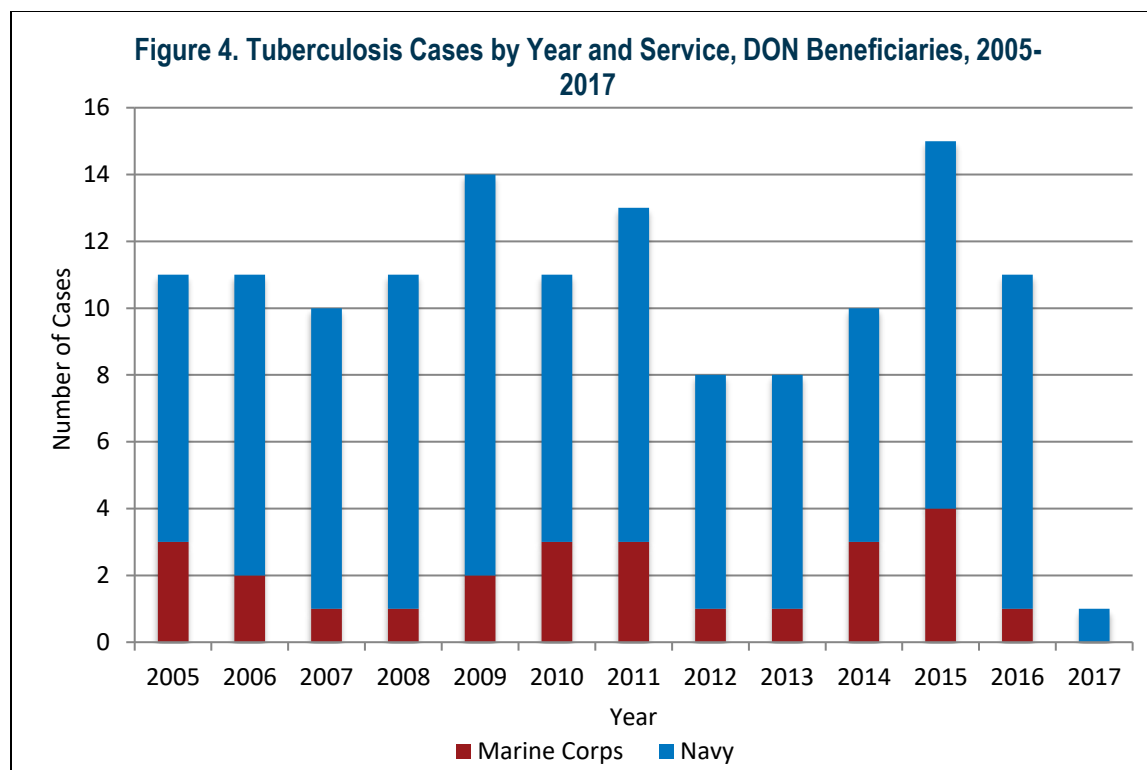


**Table 2. Tuberculosis Cases by Service and Beneficiary Status, DON Beneficiaries, 2005-2017**

Year	Marine Corps				Navy			
	Active Duty	Recruit	All Others	Total	Active Duty	Recruit	All Others	Total
2005	0	1	2	3	1	0	7	8
2006	0	0	2	2	3	0	6	9
2007	0	1	0	1	0	1	8	9
2008	1	0	0	1	3	0	7	10
2009	0	1	1	2	3	0	9	12
2010	0	0	3	3	1	0	7	8
2011	0	1	2	3	1	1	8	10
2012	0	0	1	1	1	1	5	7
2013	1	0	0	1	3	1	3	7
2014	0	1	2	3	0	3	4	7
2015	2	1	1	4	0	1	10	11
2016	0	0	1	1	1	1	8	10
2017	0	0	0	0	0	0	1	1
<b>Total</b>	<b>4</b>	<b>6</b>	<b>15</b>	<b>25</b>	<b>17</b>	<b>9</b>	<b>83</b>	<b>109</b>

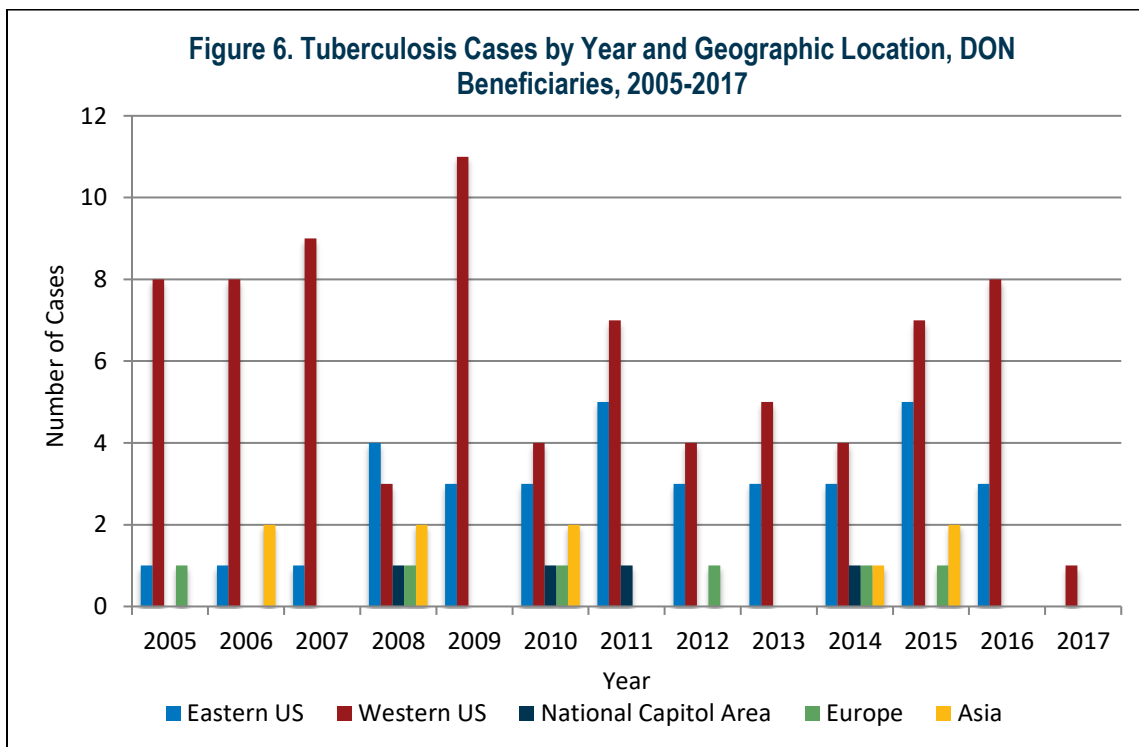
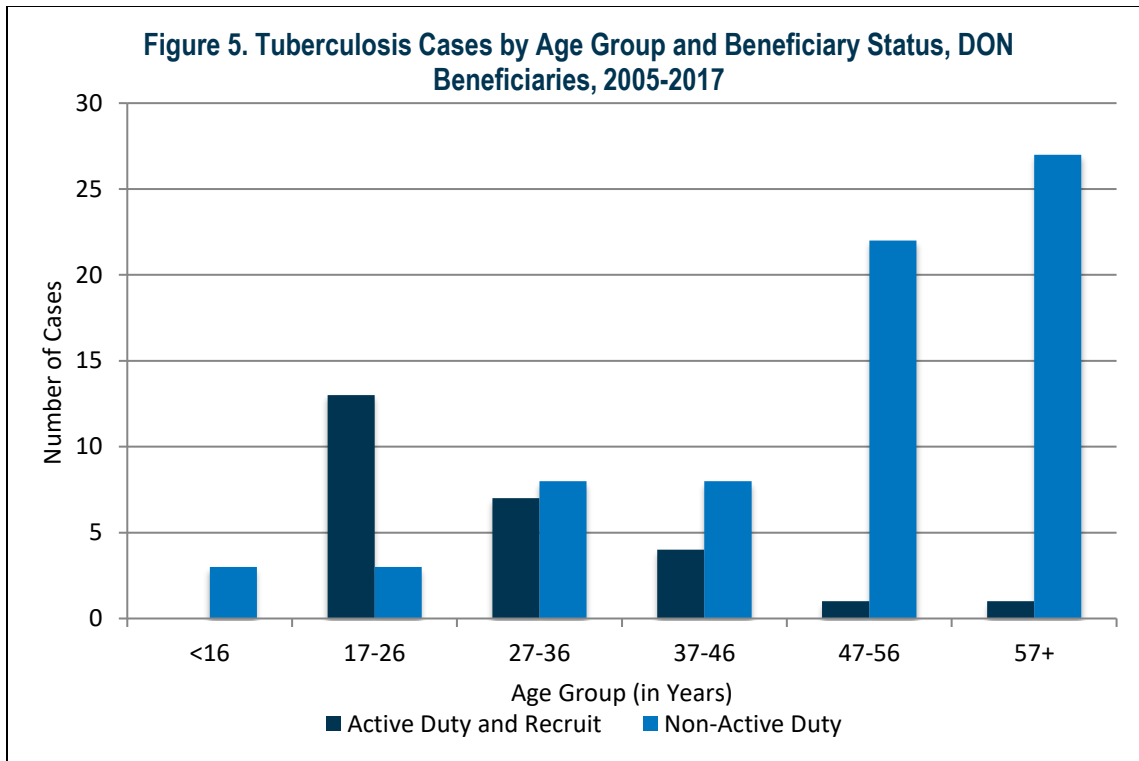






**Table 3. Tuberculosis Cases by Beneficiary Status and Age Group, DON Beneficiaries, 2005-2017**

	Age Group (in Years)					
	<16	17-26	27-36	37-46	47-56	57+
Active Duty	--	9	6	4	1	1
Recruit	--	12	3	--	--	--
All Others	4	4	14	11	28	37



**Table 4. Tuberculosis Cases by Geographic Location and Parent MTF\*, DON Beneficiaries, 2005-2017**

Geographic Location	Parent MTF	Count	Percent
Eastern US	NMC Portsmouth	11	8.2%
	James A Lovell FHCC	10	7.5%
	NH Pensacola	4	3.0%
	NH Beaufort	3	2.2%
	NH Jacksonville	3	2.2%
	Eisenhower AMC-Ft Gordon	1	0.7%
	L. Wood ACH-Ft Leonard Wood	1	0.7%
	NHC Patuxent River	1	0.7%
	William Beaumont AMC-Ft Bliss	1	0.7%
Western US	NMC San Diego	57	42.5%
	Tripler AMC-Ft Shafter	12	9.0%
	60th Med Grp-Travis AFB	2	1.5%
	NH Bremerton	2	1.5%
	NH Camp Pendleton	2	1.5%
	62nd Med Grp-McChord AFB	1	0.7%
	NH Lemoore	1	0.7%
	NH Oak Harbor	1	0.7%
	USS Peleliu (LHA 5)	1	0.7%
National Capitol Area	Walter Reed NMMC	3	2.2%
	Ft. Belvoir Community Hospital	1	0.7%
Europe	Landstuhl RMC	3	2.2%
	NH Naples	2	1.5%
	86th Med Grp-Ramstein AFB	1	0.7%
Asia	NH Okinawa	4	3.0%
	NH Guam-Agana	3	2.2%
	NH Yokosuka	2	1.5%
* 1 case from unspecified MTF			

### Trends in Recruits

Fifteen confirmed cases of TB were identified from 2005 to 2017 among DON recruits. Six of these were accessions to the Marine Corps and nine were accessions to the Navy. Country of birth was known for 14 cases; 11 were foreign-born (three from the Philippines, two each from Nigeria and Vietnam, and one each from Cameroon, China, Peru and Guyana) and three were born in the U.S.



Figure 7. Tuberculosis Cases by Region of Birth, DON Recruits, 2005-2017

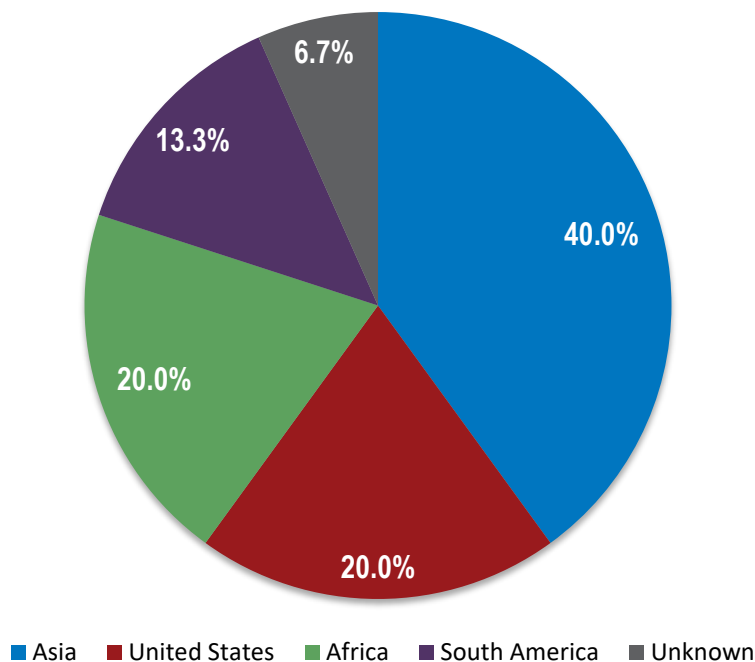
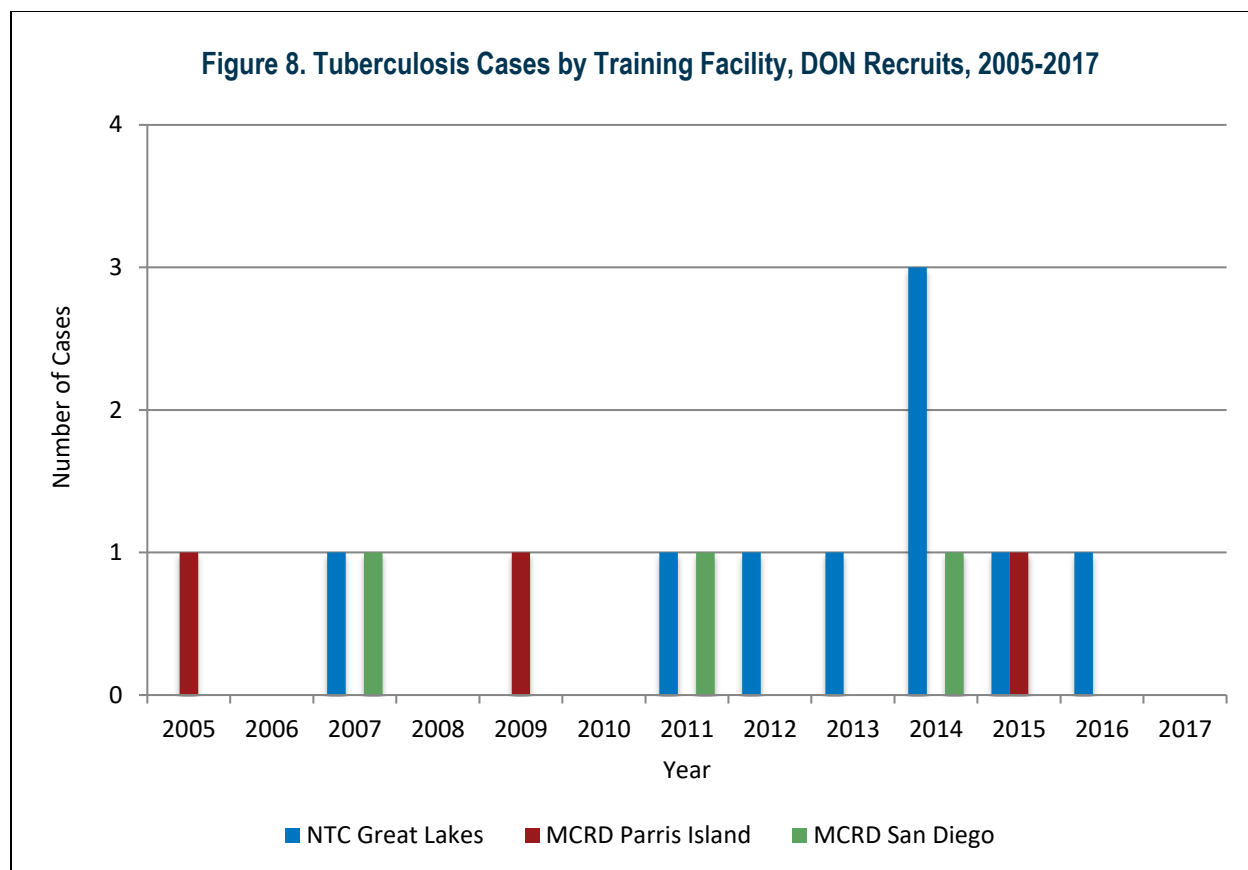


Table 4. Tuberculosis Cases by Year, Service, and Training Facility, DON Recruits, 2005-2017

Year	Marine Corps		Navy	Total
	MCRD Parris Island	MCRD San Diego	NTC Great Lakes	
2005	1	0	0	1
2006	0	0	0	0
2007	0	1	1	2
2008	0	0	0	0
2009	1	0	0	1
2010	0	0	0	0
2011	0	1	1	2
2012	0	0	1	1
2013	0	0	1	1
2014	0	1	3	4
2015	1	0	1	2
2016	0	0	1	1
2017	0	0	0	0
<b>Total</b>	<b>3</b>	<b>3</b>	<b>9</b>	<b>15</b>



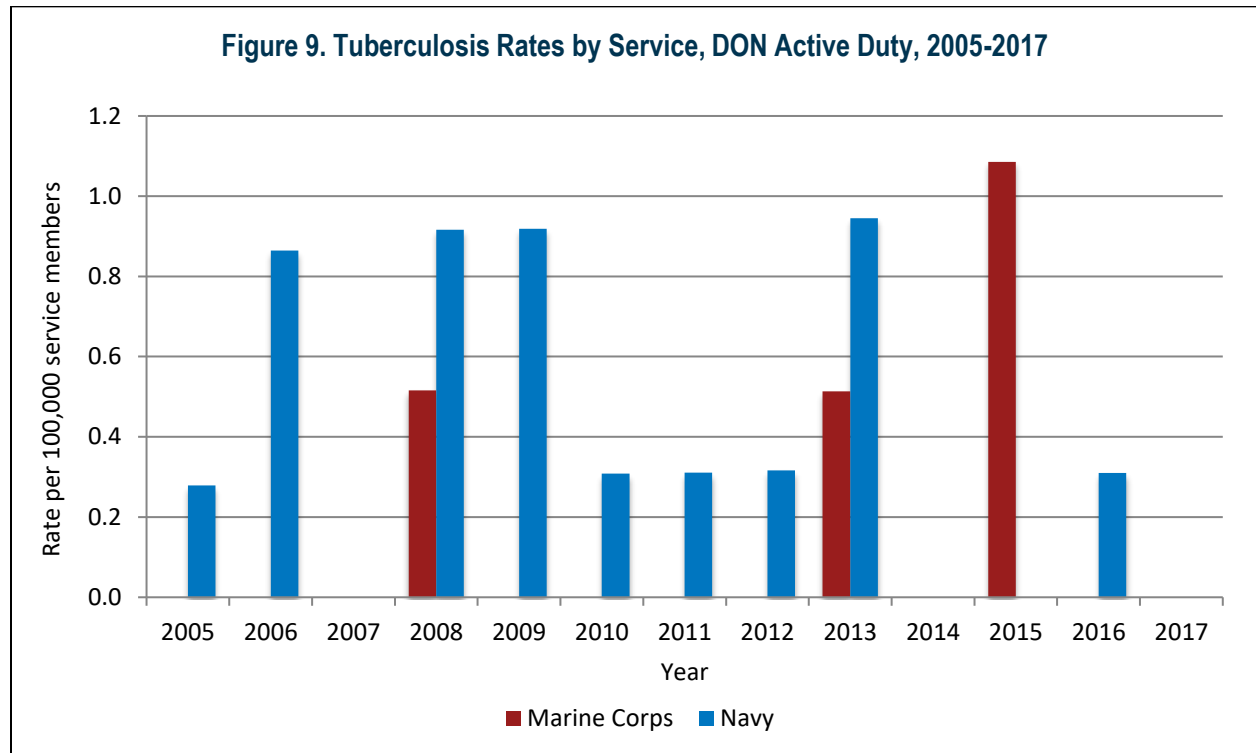
### Trends in Active Duty Service Members

There were 21 confirmed cases of TB among DON active duty service members from 2005 to 2017; 17 were Sailors and four were Marines. Rates in both services were below one per 100,000 service members for the entire timeframe, with the exception of 2015 when the rate for Marines slightly exceeded one per 100,000. Most cases were in the 17-26 year age group (see Table 3 above). Country of birth was available for 20 cases; of these, 14 were foreign-born and six were born in the U.S. Most of the foreign-born cases were born in the Philippines (15/21, 71%). The remaining foreign-born cases were born in Haiti, Korea, Mexico, Nepal, Peru, and Trinidad and Tobago (one each). Overall, 13 cases (62%) were known to have previous positive TST results (indicative of LTBI) and eight of these completed treatment at the time of the positive TST.

Most cases (15/21; 71%) were symptomatic, presenting with one or more of the following: cough, fever, chills, night sweats, weight loss, hemoptysis and/or headache. Eight cases had positive AFB smears, the remaining 13 cases had negative smears or unknown smear results. One case had evidence of drug resistant TB (resistant to INH). Additional active duty case information is further summarized in the case series in [Appendix A](#).

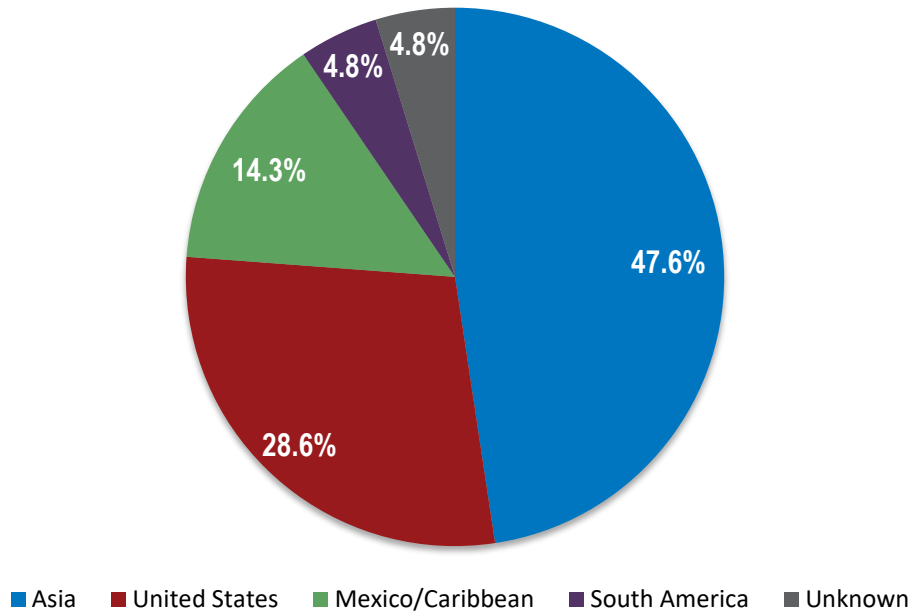


Most active duty cases (12/21; 57%) were assigned to a Contiguous United States (CONUS) shore duty station at the time of diagnosis. Seven cases (33%) were assigned to a ship, and the remaining two cases were assigned to Outside Continental United States (OCONUS) duty stations. Most active duty cases were diagnosed and treated at NMC San Diego.

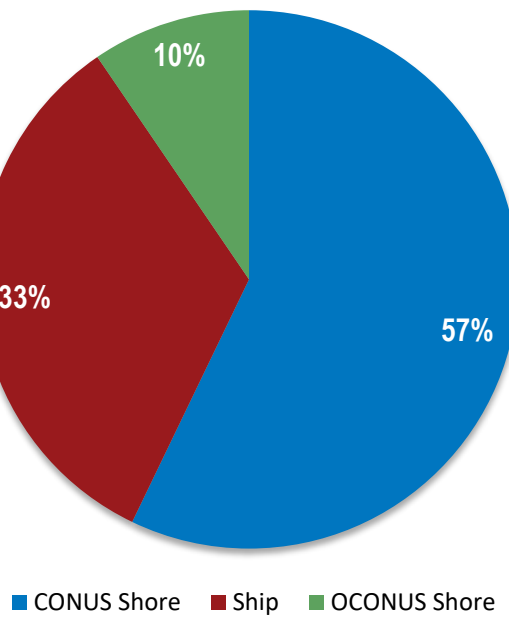




**Figure 10. Tuberculosis Cases by Region of Birth, DON Active Duty, 2005-2017**



**Figure 11. Tuberculosis Cases by Permanent Duty Station, DON Active Duty, 2005-2017**





## Tuberculosis Contact Investigations, 2005-2017

When a Navy Environmental and Preventive Medicine Unit (NEPMU) responds to a tuberculosis contact investigation, the NEPMU submits reports on these investigations to NMCPHC per NAVMCPUBHLHCENINST 6220.2, Medical Event Surveillance and Response Support (06 Oct 2016). These reports document the actions taken and lessons learned during the course of these investigations. Cases in these reports may not necessarily be active duty service members or other DON beneficiaries; therefore, not all contact investigation reports are associated with a confirmed case described earlier in this report. Information archived in these reports is variable and not all investigations require reports to be completed. The following conclusions describe common themes and lessons learned, as well as some unique items of note, across TB contact investigations from 2005 to 2017. Complete summaries of these reports are in Appendix B.

In some cases, typical CDC guidance for TB surveillance and control is not necessarily applicable to the military population. For example, one TB case was positive for LTBI at accession, but not treated, as consistent with CDC guidelines. This case went on to develop active TB a few months later. The case was not managed inappropriately, but it is an example where CDC guidance, as written for the general population, may not be fully applicable to the Navy given the unique population and exposure risks. The military environment also presents unique challenges that are not present in the general population. For example, five contact investigations conducted took place within the shipboard environment. Ships can offer unique challenges with TB control. Shared berthing and ventilation systems can lead to increased risk of exposure to a greater number of contacts.

Several contact investigations were conducted in response to TB cases that were civilian contractors, who fall under civilian guidance for tuberculosis. These investigations highlight the differences related to TB surveillance and control between active duty service members and civilian contractors, which often complicates TB contact investigations. While the Navy's TB instruction is quite clear for how it applies to active duty service members, its application to civilian contractors is less straightforward. Contractors do not typically need to share medical records or other medical documentation as a condition of employment, which can make gathering medical history and other pertinent information difficult in the middle of an investigation. TB screening is also not typically required for civilian contractor employment.

Some contact investigations covered unique situations that are worth noting. One contact investigation with a large number of contacts implemented the Pandemic Influenza Point of Distribution setup plan to facilitate the mass screening and testing event. This allowed for over 300 contacts to be screened for possible exposure and tested for infection within a six hour period. Another investigation was conducted as if the case had active TB, when they actually had





LTBI. In this case, the commanding officer requested a contact investigation be conducted. An OCONUS investigation also raised the issue of evaluating TB risk when the country itself is an intermediate risk category, but the local area has a higher rate of TB. Additional medical intelligence and surveillance may be necessary to fully assess TB risks in specific areas where service members are located.



## Appendix A: Active Duty Tuberculosis Case Series

Year	Service	Country of Birth	Duty Station	AFB Smear Results	Presentation	Reported in DRSi	Notes
2005	Navy	U.S.	OCONUS	Positive; 3+	Symptomatic: cough, fever, dyspnea. Chest x-ray with infectious process.	Yes	INH resistant TB. Prior converter in 2004; completed 9 months INH.
2006	Navy	Unknown	CONUS	Positive	Symptomatic: cough x5 weeks, weight loss, headache.	No	Unknown TB history.
2006	Navy	Philippines	CONUS	Positive; 4+	Symptomatic: cough x1 month. Suspicious chest x-ray.	Yes	Originally diagnosed with pneumonia. Prior converter in 1995; completed 6 months INH.
2006	Navy	Korea	OCONUS	Positive	Symptomatic: cough, fever, chills, night sweats. Granulomas noted on chest x-ray.	Yes	Prior converter as teenager; no notes on treatment. History of BCG vaccination. Household contact with active TB as a child.
2008	Navy	Philippines	CONUS	None	Symptomatic: cough. Abnormal chest x-ray.	No	Originally diagnosed with and treated for pneumonia. Prior converter at accession in 1987; completed 12 months INH. History of BCG vaccination.
2008	Navy	Philippines	CONUS	Negative	Asymptomatic. CT given for other medical issue was concerning for TB.	Yes	Prior converter at accession in 1990; completed 6 months INH.
2008	Marine Corps	U.S.	CONUS	Negative	Asymptomatic. Positive PPD at screening. Suspicious chest x-ray.	No	Prior converter in 2005; no notes on treatment.
2008	Navy	Philippines	Ship	Negative	Asymptomatic. Positive PPD and suspicious chest x-ray during deployment screening.	No	Prior converter at accession; no notes on treatment. History of BCG vaccination.
2009	Navy	U.S.	CONUS	Negative	Symptomatic: cough x5 months. Persistent infiltrate on chest x-ray x3 months.	Yes	No prior TB history.
2009	Navy	Philippines	Ship	Negative	Symptomatic: symptoms consistent with pneumonia.	Yes	Originally admitted for H1N1 pneumonia. Unknown TB history.



2009	Navy	Philippines	Ship	Negative	Asymptomatic. Suspicious chest x-ray at follow-up for previous abnormal chest x-ray	Yes	Diagnosed with LTBI at accession in 2007; completed 6 months INH. History of BCG vaccination
2010	Navy	Peru	Ship	Positive	Symptomatic: fever, chills, headache, cough, sinus congestion. Suspicious chest x-ray.	Yes	Prior converter in 2001; completed 6 months INH.
2011	Navy	Nepal	Ship	Negative	Symptomatic: cough, hemoptysis, fever, chills	No	Prior converter in 2005; completed 9 months INH.
2012	Navy	Philippines	CONUS	Negative	Asymptomatic. Positive PPD and suspicious chest x-ray during TB screening.	Yes	Prior converter in 2009; no notes on treatment.
2013	Navy	Mexico	CONUS	Positive; 4+	Symptomatic: cough x5 months, hemoptysis. Concerning chest x-ray & CT.	Yes	Originally diagnosed with and treated for pneumonia. Prior converter at age 16; treated for 6 months (treatment not specified)
2013	Navy	U.S.	CONUS	Negative	Symptomatic: fevers, night sweats, Positive QFT. Lesion on CT.	Yes	Originally diagnosed with and treated for pneumonia. Unknown TB history.
2013	Navy	Trinidad & Tobago	Ship	Positive	Symptomatic: cough, chest pain, chills, weight loss, night sweats.	Yes	No prior TB history. Last PPD within 2 years was negative.
2013	Marine Corps	U.S.	CONUS	Negative	Asymptomatic. Positive PPD and concerning CT & chest x-ray at physical.	Yes	No prior TB history. Exposure to foreign nationals with active TB during deployment.
2015	Marine Corps	Philippines	CONUS	Negative	Symptomatic: cough. Positive TST and concerning chest x-ray.	Yes	No prior TB history. Last PPD within 2 years was negative. BCG vaccination status unknown.
2015	Marine Corps	U.S.	CONUS	Negative	Symptomatic: hemoptysis. Positive IGRA. Concerning chest x-ray and CT.	Yes	No prior TB history. Deployed to Afghanistan in 2014.
2016	Navy	Haiti	CONUS	Positive	Symptomatic: cough, sweats. Concerning chest x-ray and CT.	Yes	Prior converter in 2015; did not appear to have risk factors and was not treated.



## Appendix B: Summary of Tuberculosis Contact Investigations, 2005-2017

### USS 2006

In 2006, an active duty Sailor assigned to a ship presented to medical with cough, fever, chills, headache and nausea. A chest radiograph taken at that time revealed a right upper lobe infiltrate and the Sailor was given a diagnosis of community-acquired pneumonia. Symptoms continued for several months and the Sailor was eventually confined to berthing and referred to a pulmonary clinic for further evaluation, where a diagnosis of pulmonary TB was made. This case was a native of the Philippines with 12 years of active duty service. The case had a history of LTBI since accession, including completion of six months of isoniazid (INH) therapy.

During the contact investigation, initial testing of 320 close contacts revealed 12 (3%) new positive TST results. Based on results of initial testing, and due to concerns specific to the shipboard setting, testing was expanded to all Sailors and civilians aboard the ship for at least 48 hours at any time during the case's infectious period. This investigation was further complicated by a high number of potential civilian contacts (n=1,225) during a Tiger Cruise that overlapped with the case's infectious period. Therefore, the investigation was conducted in conjunction with the Centers for Disease Control and Prevention (CDC). Testing in all 5,000 Sailors resulted in 139 (3%) new positive TST results. A case-control study was then used to prioritize civilian testing. This prioritization scheme identified 38 civilians who shared berthing with the case; all were subsequently tested.

### NH 2006

An active duty Sailor who was a healthcare worker at a naval hospital presented to medical in 2006 with a history of approximately four weeks of cough, night sweats and fatigue. Sputum collected at that time was AFB positive and the Sailor was immediately given presumptive treatment for TB with four-drug therapy. A positive nucleic acid amplification test for TB confirmed the diagnosis. The case was a Korean-born active duty service member with a history of exposure to active pulmonary TB as a child.

An initial investigation resulted in INH treatment of two contacts, one of which was a previous TST converter. A follow-up investigation included testing of 63 additional contacts; none of whom had a new positive TST result. Individuals tested included household and close work contacts, as well as patients of the case.



## USS 2008

Active pulmonary TB was identified in an asymptomatic active duty Sailor assigned to a ship during the course of routine deployment screening. When the Sailor had a positive TST, a chest x-ray was performed, which revealed scarring without lesions. The Sailor was referred to the regional medical center where a diagnosis of LTBI was made and treatment was initiated. Sputum AFB and polymerase chain reaction (PCR) tests taken at that time were negative, but a culture from the same specimen was later positive for TB. The case was referred to a pulmonology clinic for evaluation and treatment.

The case was a native of the Philippines who arrived in the U.S. in 2003 and lived in California, with travel to Manila in 2006 prior to joining the Navy in 2007. Medical history included the bacille Calmette-Guerin (BCG) vaccination, a pneumonia diagnosis in 2004 and a chest x-ray at accession with small residual left lung effusion. The case also recalled a slight TST reaction at accession, but it was recorded at zero mm.

The subsequent contact investigation identified 73 close contacts. Sixty-eight of these contacts had a previous TST reaction or had been previously given a chest x-ray as a previous reactor. No new latent infection or reactivation was found. The remaining five contacts were not available for testing.

## Joint Base 2010

In 2010, a family member of an active duty Sailor presented to civilian medical with symptoms including cough, sore throat, fever, nausea, fatigue and malaise. The patient was initially treated for a viral infection. A subsequent evaluation at a naval clinic included a chest x-ray that showed a cavitory lesion. The patient was then referred to seek inpatient care. The case was diagnosed with TB based on a TST result of ten mm and a positive sputum AFB smear.

The case was born in Liberia and immigrated to the U.S. in 1997. The case had a history of BCG vaccination and a negative TST result recorded in 2003. Travel history included travel with the active duty sponsor to multiple duty stations, including Puerto Rico and Italy.

The contact investigation was conducted by the cognizant NEPMU. The case was considered to be highly contagious with an infectious period of more than four months. The on-base portion of the investigation identified 23 close contacts, including family, close friends and healthcare contacts. Among the family, two new latent infections and one active case were identified. Among the close friends and healthcare contacts, there were no new positive TST results or new disease. The county public health department completed the off-base portion of the contact investigation.



## NSA 2011

A civilian employee of a child development center at an OCONUS command was diagnosed with active pulmonary TB in 2011. The case experienced symptoms including a productive cough, pleuritic chest pain and night sweats over a period of 18 months, and had multiple medical encounters during that time. The case was initially treated for upper respiratory infection, followed by diagnosis and treatment for pneumonia and then diagnosis and treatment for coccidioidomycosis after previous treatments failed. Subsequent positive AFB sputum smears and cultures were positive for TB which confirmed a diagnosis of pulmonary TB.

The case was a native of the Philippines and immigrated to the U.S. in the late 1980s with an active duty spouse. At that point, the case was diagnosed with LTBI and completed six months of INH therapy. The case began employment at the child development center in 2010 and had completed annual occupational screening twice since that time, with no abnormal findings.

The cognizant NEPMU began a contact investigation at the request of the commanding officer of the naval hospital and the public health services directorate. The infectious period was determined to be more than 21 months. The case also worked in the infant care room at the child development center, so there was concern for exposure to children less than one year of age. The investigation identified 119 high priority contacts, including infants under the care of the case, other staff members at the center, healthcare workers and family members. Of these, 118 were tested and two positive TST results were identified, both in infants. The investigation was then expanded to include an additional 322 low priority contacts. Of these, 239 were tested and there were no new positive TST results. Case finding and risk communication during this investigation were complicated by holiday leave and a highly mobile population. The international setting provided additional challenges, such as risk communication, case support in the small command community and distance from public health support.

## USS 2012

Two contract workers who worked onboard three ships (including one ship in common) were diagnosed with active TB, though the cases were unrelated. Patient A was diagnosed with active TB in November 2012 based on a positive AFB smear, infiltrates in the chest x-ray, and cavitary lesions in the chest CT. Patient A had become symptomatic in early October 2012 and the infectious period was determined to be July 1 to November 3, 2012. The patient had worked onboard Ship A from July 1 to August 14, 2012 and onboard Ship B from August 15 to November 3, 2012.



Patient B was diagnosed with active TB in November, with a positive AFB smear and cavitary lesions in the chest x-ray. The patient had worked onboard Ship A from May 1 to September 30, 2012 and on Ship C from October 1 to November 2, 2012; however, according to the patient's supervisor, the patient was only present for a total of 14 days on Ship C due to illness and absence from work. The infectious period was determined to be the previous six months, dating back to July 2012.

After notification by the local health department, the cognizant NEPMU launched a contact investigation in collaboration with local health officials and performed a site visit to Ship A. Due to the dispersed areas of the ship that Patient A worked and the poor ventilation system during the period of renovation, it was recommended to place TSTs on the whole crew (320 people) who were onboard from July 1 to August 14, 2012. This action also covered the time that Patient B was onboard Ship A. Tuberculin skin tests were placed on 298/320 crew members. Twenty-two members were prior converters and did not have a TST placed, but completed the annual screening which were all negative. Of the 298 TSTs, four (1.3%) had positive results. Chest x-rays were negative for all four and none reported TB symptoms. The individuals with a positive TST and negative chest x-ray were treated for LTBI.

Following a site visit to Ship B and discussions with ship leadership and medical personnel, it was determined that TST placement was not necessary due to the low risk of exposure to military personnel on the ship. This decision was based on several pieces of information. First, the senior medical officer said that at no point were contractors and military personnel within the same workspace. Second, the index patient worked night shifts when there were limited military personnel onboard. The size of the ship limited exposure time and the spaces where Patient A worked were not confined spaces. The ship had good ventilation and fans to increase air circulation. Finally, the crew and contractors also entered and exited the ship at two distinct locations, minimizing contact.

The site visit to Ship C assessed the risk of exposure to the active duty personnel. Based on the spaces that Patient B worked in, it was determined that TSTs would be placed on one department with 22 people, based on the close proximity of their workspaces to the area that Patient B worked in. A total of 18 TSTs were actually placed; results for 17 were negative. The last member missed the reading and was retested. The other four department members were prior TST converters and were given chest x-rays, which were all negative. All members of the department were asymptomatic.



## Lessons Learned

There were two features of this contact investigation report that are worth noting. The first is the difference in TB surveillance and control between active duty service members and the civilian contractors who work alongside them. The Navy has a comprehensive plan for TB surveillance and treatment for active duty service members, but its application to civilian contractors is not as clear. The second feature is the difference in the recommendations for TB control on each ship. These recommendations varied based on the accountability of the contractors, proximity of contractors' work to the ship's crew, the condition of the spaces and ventilation functionality.

## NH 2013

A family member of an active duty service member was suspected to have pulmonary TB at an OCONUS command in 2013. The case was primarily experiencing pleuritic chest pain and reported being "hot at night." A chest radiograph revealed an opacity in the left lower lobe consistent with atypical pneumonia and atelectasis (collapse of the lung). Following a positive IGRA test, it was recommended that the patient initiate four-drug treatment for presumptive primary active TB. When the case presented for follow-up, there was concern whether the infection was active disease or LTBI. Consultation with Infectious Disease led to the patient providing sputum samples for AFB staining and bronchoalveolar lavage was conducted for AFB culture and sensitivities. All sputum samples were ultimately negative for *M. tuberculosis* and the case was treated with INH for nine months for LTBI.

The case was a native of Ethiopia and arrived at the OCONUS command in 2011 to live with an active duty family member stationed there. The patient had received BCG vaccination while in Ethiopia.

A contact investigation was conducted at the request of the commanding officer of the naval hospital. The infectious period was determined to be four months in length based on the case's symptoms. Eighteen people were identified as high-priority contacts, three of which were family members. All 18 were in close proximity to the case for eight or more hours on any given day or for at least fifteen hours in any seven day period. There were seven low priority contacts, who were teachers that were in close proximity to the case for at least three hours or more in any seven day period. Seventeen of the 18 high priority contacts were tested, all had negative TST results. Three of the seven low priority contacts were tested and were negative; the remaining four declined screening and testing. In addition, 72 non-contacts (concerned students and teachers) were tested; eight of these had a positive TST result and received LTBI treatment.





## Lessons Learned

This was a unique situation as the case and subsequent investigation were treated as if active TB was diagnosed, though in time the case was ultimately diagnosed with LTBI and did not have active disease. There was also difficulty in communicating with contacts as several had returned to the U.S.

## USS 2013

In 2013, two Sailors assigned to the same ship were diagnosed with active TB. In April, Patient A reported to the emergency department with persistent cough, 10 pounds of unintentional weight loss, chest pain and night sweats. The case was initially admitted to the hospital for pneumonia and the diagnosis was changed to TB when a CT scan confirmed multiple miliary nodules. TB was confirmed by positive AFB sputum smears (4/5).

Patient A was a native of Trinidad, married with no children. The case had an extensive travel history including deployment to the Middle East in 2011 and time in Trinidad, the Bahamas, New York City, Georgia and Washington, D.C. The case worked primarily in an open bay area doing painting, chipping and sanding. Ear and eye protection were used but no respiratory protection.

Patient B had a history of seasonal allergies and asthma. In January 2013, symptoms began as cough and sneezing, which by February had become dry cough with occasional blood-tinged sinus discharge and sputum. The case sought care from the IDC for allergies in April. On April 28, 2013, Patient B reported the following additional symptoms: fever, chills, night sweats and severe chest pain with cough. On April 29, 2013, the case was treated in the emergency department for reactive airway disease. On May 2, 2013, Patient B was told to return to the emergency room after Patient A was diagnosed with TB. At that time, a TST was placed and sputum samples were taken for Patient B.

Patient B was also a native of Trinidad and a close friend of Patient A both on and off the ship. Patient B had made two trips to Trinidad in the previous year. Patient B had also made a trip to New York to visit family and had an uncle and grandmother in New York with symptoms.

The cognizant NEPMU initiated the outbreak investigation after being notified of the index case. They coordinated communication with the local MTF and public health department. The infectious period was determined to be three months before onset of symptoms starting in September 2012. The cognizant NEPMU visited the ship to do an environmental survey, a ventilation survey (conducted by an IHO), assist in placement of TSTs, and to identify high/low risk groups. Of the 253 individuals tested, 19 were TST positive (8.1%) and the second case was identified. An additional suspect case was also identified with a 12mm TST reaction and two week



history of cough. The suspect case was to be treated for LTBI if culture results were negative. Additionally, 18 personnel were no longer in military service. Follow-up on these individuals was attempted by letter and by the local health department. Forty-two personnel had changed duty stations during the infectious period; of these, 20 had negative TSTs, 20 were being assessed, one was IA and one was TAD.

## USS 2016

In July 2016, NEPMU (A) was notified by NEPMU (B) of a suspected case of active TB in an active duty Sailor onboard a ship docked in NEPMU (B)'s AOR. The patient presented to the emergency room on 10 July 2016 with chest pain, cough and shortness of breath. A chest x-ray showed a left upper lobe pulmonary nodule and was concerning for tuberculosis; the patient was then isolated off of the ship. AFB smears were ordered; the initial was negative but the second was positive on 15 July. On 18 July, TB was confirmed via NAAT and a contact investigation was initiated on 20 July.

The patient was born in Haiti, with no history of BCG vaccination. The patient moved to the United States in 2002 and had not been back to Haiti since that time. The ship was the patient's first duty station after completing recruit training in 2015. On in-processing, the patient was noted to have a reactive PPD of 11mm. After evaluation by preventive medicine it was determined that LTBI was not indicated and the patient did not receive treatment. It was unknown at this time that the patient had been exposed to a family member with active TB shortly before in-processing.

The exposure window was determined to be 08 April to 07 July 2016. During this time, the patient lived out in town with four roommates, and also within ship's berthing. The ventilation in close proximity to the patient's rack was equipped with HEPA filtration, removing matter down to 0.3 microns (*Mycobacterium* are between two and four microns). The patient's workspace aboard the ship was also investigated, where the patient spent 10-12 hours per day. This space was well ventilated, and the ventilation system was not shared with adjoining spaces.

High priority contacts were determined to be those that shared berthing and workspace with the patient. Ten contacts met this definition. Medium priority contacts were those who shared either berthing or workspace with the patient; 32 contacts met this definition. High priority contacts were seen in medical for TB education and "Q&A" regarding their risk and potential exposure. After interviews, PPDs were placed if appropriate and a chest x-ray was conducted if indicated based on symptoms.



No high priority contacts were TST converters. Two high priority contacts had a cough, though these were present in the context of general increased upper respiratory tract infections for many crew members during this period. Chest x-rays for the two contacts were clear. A plan was put into place to re-evaluate the high priority contacts with an additional TST placement at 8-12 weeks. The patient was also found to have two high priority contacts aboard different ships; these contacts were also not TST converters. There were also multiple civilian contacts during the exposure window; investigation into these contacts was managed by the civilian public health authorities.

### Lessons Learned

While the cognizant NEPMU is tasked with completing the contact investigation, involving shipboard PMTs at every phase of execution is vital to a successful outcome. A good understanding of the supporting role of the NEPMU for the ship's Senior Medical Officer (SMO) and Commanding Officer (CO) is also important for any external medical personnel that are involved. It should also be noted that at no point was the index patient managed inappropriately. The decision not to treat for LTBI at in-processing was consistent with CDC guidelines. However, adapting these guidelines to meet BUMED instruction needs could be considered, given that the population and exposure risk in the Navy vary widely from the general population.

### NSF 2016

In October 2016, the cognizant NEPMU of an OCONUS naval command was notified of a possible active TB case in a non-DoD civilian contractor. The patient's symptoms had started in June of that year, with a non-productive, persistent cough. The patient presented to a local civilian hospital where the chest x-ray showed a left upper lobe cavitory lesion, diffuse infiltrates, and bilateral peri-hilar consolidation. Sputum smears were AFB negative, and cultures were performed with results expected within 30 days. The hospital did not have the capability for NAAT, PCR or other molecular tests for more rapid detection or exclusion of TB. Given the suspicious radiographic findings and clinical history, the patient was admitted to an isolation room with presumptive active TB.

A follow-up chest CT showed results more suggestive of sarcoidosis and a much lower likelihood of TB. The patient was sent to another hospital for diagnostic bronchoscopy. These results were negative for TB, with evidence of sarcoidosis and severe fibrosis. The patient was declared non-contagious at this time.

The patient worked providing security in a vehicle on the perimeter of the base, with shifts of 12 hours on and 12 hours off. The patient lived in berthing areas known as "huts" which had 8-10 people assigned to each hut. Huts were not insulated and did not have separation walls; dressers,



lockers and bed sheets were used as room separators. Upon investigation, the room was very warm with stagnant air and the heat on.

At the time of the patient's admission, the cognizant NEPMU consulted with staff at the regional military medical center, and Navy radiologists reviewed the patient's chest x-ray images. The management plan as presumptive active TB was accepted given the clinical scenario and limited lab capability, and a contact investigation was initiated. The NSF medical staff interviewed the patient and screened close contacts identified as high priority.

The initial interview with the patient led to identifying 24 contacts, eight of which were deemed high risk due to living in the same hut as the patient or were specifically identified by the patient as close "friend" contacts. Three were medium risk due to increased exposure outside of household contact, and 12 were low risk. Risk categories were assigned based on CDC guidelines.

TSTs were placed on 13 of the 24 contacts as a precautionary measures for those who wished to have one placed after initial screening. One was positive in a low risk contact; the chest x-ray was normal. The contact was referred for LTBI treatment.

After the patient was found not to have TB, the Commanding Officer for the command held an all-hands acknowledging the investigation and confirming that the patient did not have TB. With the final diagnosis, the typical eight week follow-up for contacts initially testing negative was not held and the contact investigation was concluded.

### Lessons Learned

The lack of medical records for contractor staff made it difficult to assign risk categories and identify other potential health issues. During the investigation, a recommendation was made to the contract supervisor to educate personnel on maintaining a personal medical folder to use in case of emergency. Language barriers between medical providers and translators were present, but manageable. Concern was also raised about whether service members should be given a TST prior to arriving to the location and upon departure. While the country was an intermediate risk country, concern was raised by the pulmonologist about the high rate of TB in the local area which led to a quick TB diagnosis by local physicians. The current FHP requirement for the area is to receive a risk assessment upon arrival and as part of the PHA process. The 2016 TRAVAX medical summary for the country recommends pre-departure TSTs for travelers staying more than three months, and in travelers staying more than one month who will have with close contact with the local population. Service members are typically in the area for 6-12 months and are exposed to the local population. Additional medical intelligence and surveillance from the local health departments may be necessary to fully assess the TB risk in this area.



## SPAWAR 2017

In May 2017, a contract worker at a SPAWAR facility was diagnosed with active TB. In April 2017, the patient presented to a civilian hospital with fatigue, weakness, chronic cough, and hemoptysis. A chest x-ray was suggestive of TB and two of three sputum smears were AFB positive. The patient was diagnosed in 2017, but reported symptom onset in 2016.

The patient was a janitor at two different buildings from October 2016 to April 2017. Contact with employees occurred during the patient's daily duties of trash collection and cleaning of the common spaces. Given this and the patient's prolonged symptomatic period, all employees in those buildings were considered potential contacts. Employees were given questionnaires to determine if they worked in one of the buildings during the exposure dates of 1 October 2016-31 January 2017 for Building #1 and 1 February 2017-7 April 2017 for Building #2.

The naval hospital implemented the Pandemic Influenza Point of Distribution setup plan to facilitate the mass screening and testing event. Through this process, the average time for one person to complete the entire process was 10 minutes. Within a six hour period, more than three hundred people were screened for possible exposure and tested for TB infection. The scale of the event required coordination across several entities: SPAWAR, the local county public health department, the naval hospital, and the cognizant NEPMU.

Identified contacts born in the United States and employees born outside the United States with a history of a nonreactive TST were tested with a tuberculin TST. Employees born outside of the United States or with a history of BCG vaccination were tested with an IGRA. Employees with a history of LTBI were given chest x-rays. In total, 572 employees were tested, with an LTBI conversion rate of 1.53%. The patient's fellow contract janitors were also tested as a separate contact group. Of these 200 contractors, none tested positive for LTBI.

The number of possible contacts in this investigation exceeded the number typically seen in previous contact investigations, which were able to limit the exposed population by specific work centers. The nature of the patient's work meant the patient had access to most places within each building; in addition, positive AFB sputum smears made it difficult to exclude anyone from either building.



## Appendix C: Tuberculosis Case Definition, Armed Forces Reportable Medical Event Guidelines

EXCLUDES: LTBI when a person tests positive via Mantoux TST or via FDA-approved IGRA, but is without evidence of active disease (negative chest x-ray for presence of TB disease and asymptomatic)

### Clinical Description

An illness characterized by acute history of persistent cough, pain, or tightness in the chest, bloody sputum, weakness or fatigue, weight loss, loss of appetite, chills, fever or night sweats. The most common site of infection is the lung, though other organs can be involved.

### Case Classification

Suspected: A case that meets the clinical description as described above with imaging studies compatible with tuberculosis.

Confirmed: A case with any of the following:

- *M. tuberculosis* identified by culture from any clinical specimen\* or
- *M. tuberculosis* nucleic acid (DNA) detected by PCR from any clinical specimen or
- Microscopic identification of acid-fast bacilli from any clinical specimen when a culture has not been or cannot be obtained or
- A provider-diagnosed case with ALL of the following:
  - A positive TST or positive IGRA for *M. tuberculosis* and
  - Other signs and symptoms compatible with tuberculosis (example: abnormal chest radiograph, abnormal chest computerized tomography scan or other chest imaging study, or clinical evidence of current disease) and
  - Treatment with two or more anti-TB medications and
  - A completed diagnostic evaluation

### Critical Reporting Elements

- Document the circumstances under which the case patient was exposed including duty exposure, occupational activities, environmental exposures or other high risk activities.
- Document if the case patient works in, lives in, or attends a high transmission setting such as food handling, day care, school, group living, healthcare, training center or ship.
- Note the patient's BCG (tuberculosis vaccine) immunization history.
- Document evidence of drug resistance.



### Comments

\* Use of a rapid test (example: DNA probe, liquid chromatography) performed from the culture is acceptable for this criteria.



## Appendix D: Contact Information

### NEPMUs

#### **Navy Environmental and Preventive Medicine Unit Two**

(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](mailto:usn.hampton-roads.navhospporsva.list.nepmu2norfolk-threatassess@mail.mil)

#### **Navy Environmental and Preventive Medicine Unit Five**

(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](mailto:usn.san-diego.navenpvntmedufive.list.nepmu5-health-surveillance@mail.mil)

#### **Navy Environmental and Preventive Medicine Unit Six**

(Pacific theater)

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

PLAD: NAVENPVNTMEDU 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](mailto:usn.jbphh.navenpvntmedusixhi.list.nepmu6@mail.mil)

#### **Navy Environmental and Preventive Medicine Unit Seven**

(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](mailto:nepmu7@eu.navy.mil)

### NMCPHC

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

PLAD: NAVMCPUBHLTHCEN PORTSMOUTH VA

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

E-mail: [usn.hampton-roads.navmcpubhlthcenpors.list.nmcphc-threatassess@mail.mil](mailto:usn.hampton-roads.navmcpubhlthcenpors.list.nmcphc-threatassess@mail.mil)