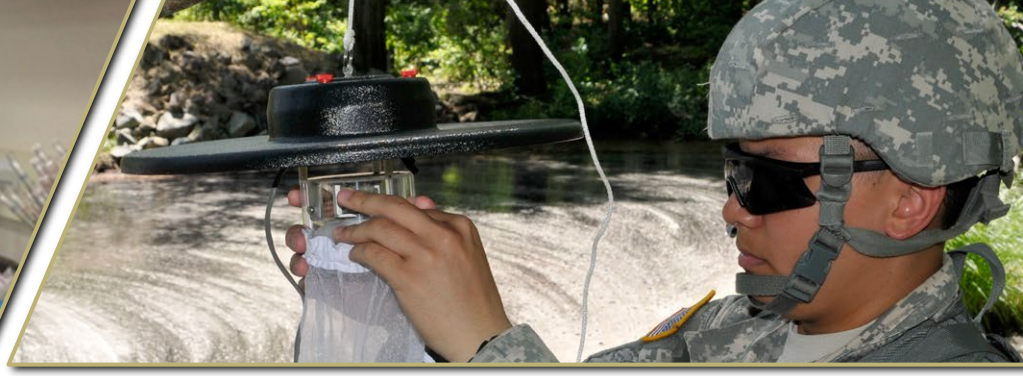

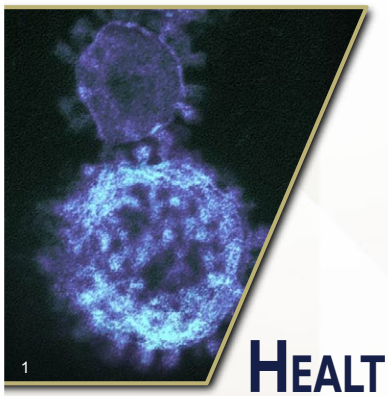

HEALTH SURVEILLANCE, ANALYSIS, AND INSIGHT FOR ACTION

AFHSB

ARMED FORCES HEALTH SURVEILLANCE BRANCH

2015/2016 REPORT

Vision

To be the central epidemiologic resource and a global health surveillance proponent for the U.S. Armed Forces.

Mission

Provide *timely*, *relevant*, *action-able,* and *comprehensive* health surveillance information to promote, maintain, and enhance the health of military and military-associated populations.

AFHSB critical functions are:

- Acquire, analyze/interpret, disseminate information, and recommend evidence-based policy.
- Develop, refine, and improve standardized surveillance methods.
- Serve as a focal point for sharing health surveillance products expertise and information.
- Coordinate a global program of militarily relevant infectious disease surveillance.

Friends and Colleagues

The Armed Forces Health Surveillance Branch (AFHSB) made major strides this year toward its vision of being the central, integrated, customer-focused epidemiologic and global health surveillance resource for the U.S. Armed Forces. This year's annual report describes new opportunities that AFHSB embraced to support public health surveillance for the Department of Defense, enhance health and readiness, and better support the Combatant Commands (CCMDs) and the U.S. military services as part of the priorities of the Defense Health Agency (DHA) Director Vice Admiral Raquel C. Bono.

Our name changed and AFHSB completed its merger into the DHA in August 2015. As part of the reorganization, AFHSB operates under DHA's Public Health Division within the Healthcare Operations Directorate. We also assumed responsibility for some of the health surveillance capabilities of the Service Public Health Hubs, which include personnel from the U.S. Army Public Health Center (Provisional), U.S. Air Force School of Aerospace Medicine, and the Navy and Marine Corps Public Health Center. AFHSB is currently organized into four sections: Integrated Biosurveillance (IB), Global Emerging Infection Surveillance (GEIS), Epidemiology and Analysis (E&A), and Data Management and Technical Support.

The IB section played a critical role in Department of Defense's efforts to respond to the Ebola outbreak in West Africa and the recent Zika virus epidemic spreading throughout the Americas, and threatening U.S. states and territories such as Florida and Puerto Rico. In addition to Ebola and Zika, the section's staff produced and distributed 236 disease-specific surveillance summaries on avian influenza A (H7N9), Middle East respiratory syndrome coronavirus (MERS-CoV), chikungunya in the Caribbean, dengue in Japan, and enterovirus-D68 (EV-D68), among other topics. The staff also developed up-to-date Department of Defense guidance for detecting and reporting Ebola, Zika, chikungunya, H7N9, and MERS-CoV.

As part of its efforts to enhance support to the CCMDs, IB staff participated as subject matter experts during major training events such as the U.S. European Command's Medical Readiness Exercise, U.S. Central Command's Eager Lion, U.S. Pacific Command's Pacific Angel (PACANGEL), the U.S. Strategic Command (USSTRATCOM) Biosurveillance Warfare Tabletop Exercise, and served as the Operations Cell for ABLE Response 2015 in the Republic of Korea.

In 2015, the GEIS section distributed $48.2 million to support two different kinds of surveillance activities—ongoing initiatives and new novel proposals. Approximately two-thirds of GEIS funding supported the ongoing initiatives to maintain a robust global emerging infectious disease (EID) health surveillance portfolio. The remaining one-third of funding was awarded to projects submitted in response to an annual request for proposals that address novel EIDs or surveillance efforts affecting the Department of Defense and global health communities. The section provided mid-year funding as MERS-CoV continued to be a threat in and near the Arabian Peninsula and for those traveling to and from these countries. In 2015, Naval Medical Research Unit 3 (NAMRU-3) continued to leverage prior work toward developing a reliable and specific serologic assay to detect novel coronavirus antibodies in at-risk populations. NAMRU-3 continues to conduct surveillance for MERS-CoV, with the goal of early detection, in sentinel sites throughout Egypt.

The section continued funding support of GEIS partners' ongoing surveillance to monitor the emergence and epidemiology of viruses transmitted by Aedes spp. mosquitoes, including dengue and chikungunya viruses in Kenya, Southeast Asia, and the Americas. These surveillance activities led to the first detection of Zika virus in Thailand and Cambodia and paved the way for detection and monitoring of Zika virus as it emerged in the Western Hemisphere.

The GEIS section also supported two events with U.S. Africa Command (AFRICOM) to facilitate discussion of the challenges associated with outbreak response, disease surveillance, risk communication, and laboratory capacities. GEIS provided subject matter expertise and technical logistics support to the inaugural AFRICOM African Partners Outbreak Response Alliance (APORA) Meeting in Accra, Ghana. Military members from 12 countries and multiple U.S. organizations convened. GEIS and AFRICOM co-hosted the second meeting of APORA in Ouagadougou, Burkina Faso. Forty-five participants from U.S. agencies and 11 countries participated in the event. As a result of these meetings, it was agreed that each partner country would commit at least 10 medical personnel to serve as rapid response capacity as well as to further refinement of communications plans, identification of gaps/priorities, and establishment of a social media (e.g., Facebook) site.

In 2015, the E&A section distributed 254 ad hoc analyses and more than 650 periodic reports that documented trends over time of diseases and injuries among service members on topics such as communicable diseases, training-related injuries, mental health issues, traumatic brain injury, and deployment health. E&A staff also revamped the Installation Injury Reports, which provide detailed counts and rates of the injuries to service members that occur at nearly 200 military installations each month. The section also supported 10 health-related investigations that requested the use of 8,021 serum specimens from the DoD Serum Repository. One study is investigating the capability of high-resolution mass spectrometry to detect low levels of environmental agents, metabolites, and inflammatory biomarkers in the serum of individuals potentially exposed to environmental hazards (e.g., burn pit smoke) during their deployment.

AFHSB's accomplishments result from the hard work and dedication of our staff and the support of our partners within the Department of Defense and the broader public health community. This collaboration produces a wealth of data and information that helps military commanders, Department of Defense policymakers, healthcare providers, public health officers, and researchers keep our men and women in uniform safe. There is no higher purpose for a health surveillance organization.

COL Michael Bell, U.S. Army, Chief

Contents

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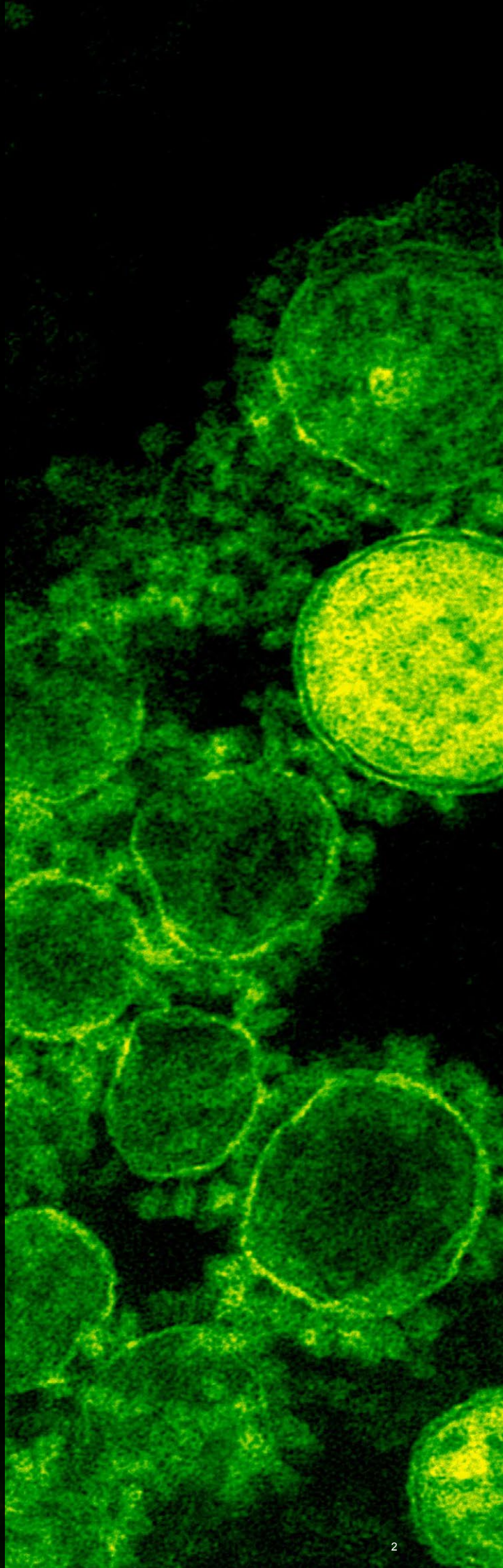
Cover/Front: (1) National Institute of Allergy and Infectious Diseases (NIAID) • *Page 2 (2)* NIAID • *Page 22 (3)* CDC/Dr. Richard Facklam • *Page 30 (4)* CDC/James Gathany *(5)* CDC/Frederick A. Murphy *(6)* CDC/Douglas E. Jordan *(7)* NIAID.



The History of AFHSB

The Origins of AFHSB

The Armed Forces Health Surveillance Branch (AFHSB) is the central epidemiologic health resource for the U.S. military. AFHSB joined the Defense Health Agency (DHA) in August 2015 and now operates under DHA's Public Health Division in its Health Operations Directorate.

AFHSB, which began in February 2008 as the Armed Forces Health Surveillance Center (AFHSC), merged the capabilities and resources of the Army Medical Surveillance Activity's Defense Medical Surveillance System (DMSS) and the Department of Defense Serum Repository (DoDSR), the Department of Defense Global Emerging Infections Surveillance and Response System (DoD-GEIS), and the Global Health Surveillance Activity from the Office of the Deputy Assistant Secretary of Defense for Force Health Protection and Readiness (OASD/FHP&R).

AFHSB manages the DMSS and the DoDSR. As the central repository of medical surveillance data for the U.S. Armed Forces, DMSS contains current and historical data on diseases and medical events (e.g., hospitalizations, ambulatory visits, reportable medical events [RMEs], laboratory tests, immunizations, and casualty data) affecting service members throughout their military careers. DMSS contains 2.5 billion data records on service members and other beneficiaries of the Military Health System (MHS).

The DoDSR was established in 1989 to store blood sera collected during the Department of Defense testing program for HIV infections and later was designated to receive serum specimens collected before and after operational deployments. With more than 60 million serial serum specimens from more than 10 million individuals, the DoDSR is the world's largest storage facility of its kind.

The Department of Defense mission was expanded through a presidential directive to include support of global surveillance, training, research, and response to emerging infectious disease (EID) threats, resulting in the establishment of DoD-GEIS in 1997. GEIS coordinates AFHSB's global EID surveillance and response initiatives among a network of partner organizations and executes a militarily relevant surveillance program involving respiratory infections, gastrointestinal infections, febrile and vector-borne infections (FVBIs), sexually transmitted infections (STIs), and antimicrobial-resistant organisms. The AFHSB also serves a key role integrating biosurveillance information to understand the threats from endemic and EIDs relevant to the military worldwide.

AFHSB publishes summaries of notifiable diseases, trends of illnesses of special interest, and field reports describing outbreaks and case occurrences in its peer-reviewed journal, *Medical Surveillance Monthly Report* (*MSMR*), which disseminates Department of Defense medical surveillance information. AFHSB also provides up-to-date information on diseases that could affect force health protection.

As part of its merger with DHA, AFHSB assumed responsibility from some of the health surveillance capabilities of the Service Public Health Hubs, which include personnel from the U.S. Army Public Health Command, U.S. Air Force School of Aerospace Medicine (USAFSAM), and the Navy and Marine Corps Public Health Center (NMCPHC). The Service Public Health Hubs' select surveillance personnel and assets are satellites of AFHSB.

AFHSB is currently organized into four sections: Data Management and Technical Support (DMTS), Epidemiology and Analysis (E&A), GEIS, and Integrated Biosurveillance (IB). ▲

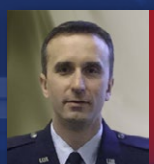
AFHSB Organizational Structure

Chief
COL Michael Bell

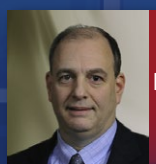
Deputy Director
Dr. Jose Sanchez

Executive Officer/ Chief of Staff
Mr. Robert Welch

Chief
Epidemiology and Analysis
COL Dana Dane



Acting Chief
Integrated Biosurveillance
Col. Paul Lewis



Chief
Data Management and Technical Support
Dr. Mark Rubertone

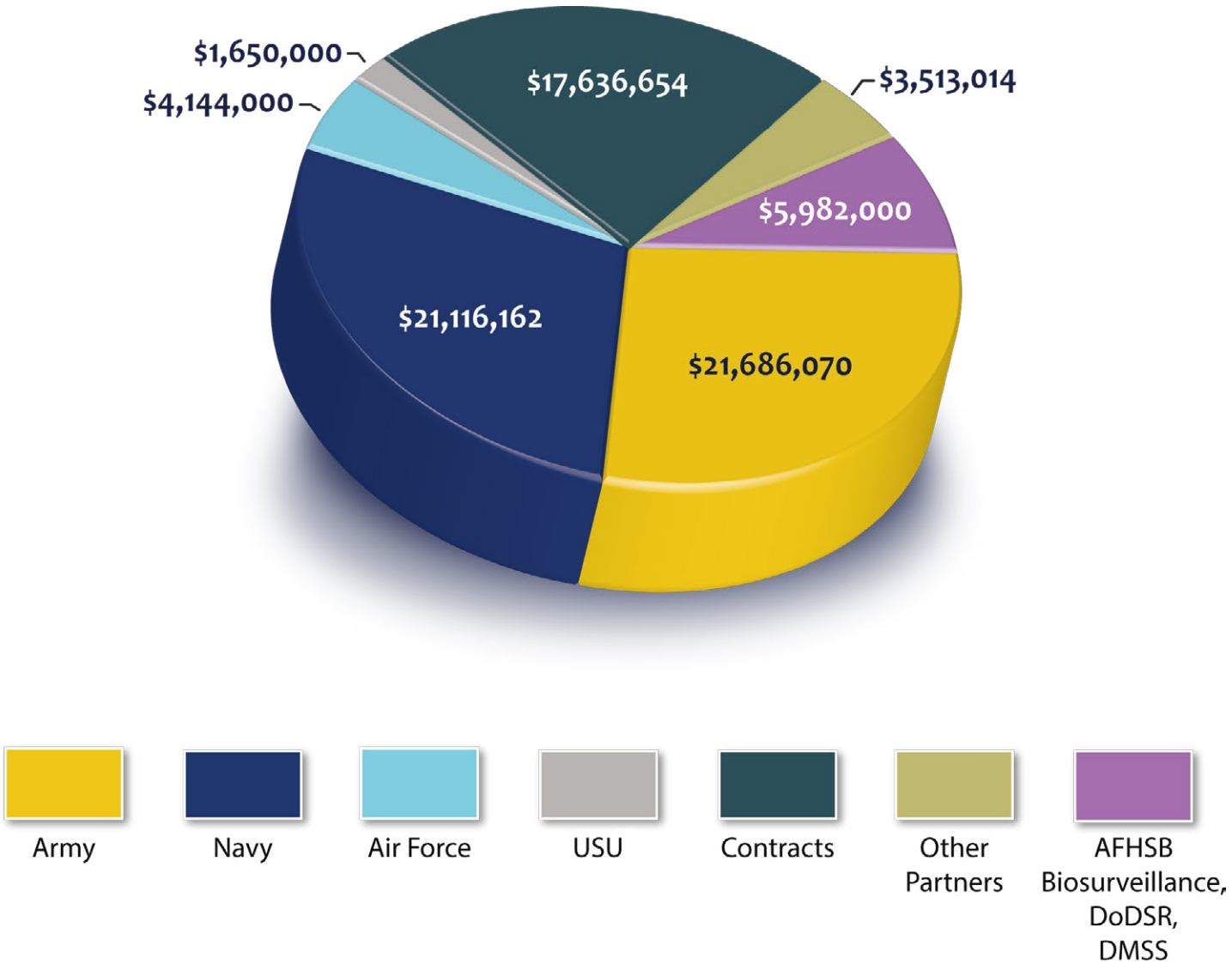
Chief
Global Emerging Infections Surveillance and Response
CDR Franca Jones

AFHSB Finances

The AFHSB budget was $75.7 million for fiscal year 2015. AFHSB distributed nearly 65 percent of its funds directly to laboratory partners through the GEIS program following an extensive internal and external proposal review process.

Funding recipients include the Army and Navy overseas laboratories such as the Armed Forces Research Institute of Medical Sciences (AFRIMS), U.S. Army Medical Research Unit–Kenya (USAMRU-K), Naval Medical Research Unit–Asia (NAMRU-A), NAMRU-3, and NAMRU-6. Several CONUS-based military and university partners include the Naval Medical Research Center (NMRC), Naval Health Research Center (NHRC), Walter Reed Army Institute of Research (WRAIR), USAFSAM, Uniformed Services University of the Health Sciences (USU), and which receive funding in support of their robust programs that benefit the Department of Defense and partners. The remaining funds support AFHSB divisions and headquarters, including biosurveillance initiatives, contracts, *MSMR*, DoDSR, and other infrastructure costs.

FY15 Financial Management and Accountability



The Elements of Military Health Surveillance

Tools of Surveillance

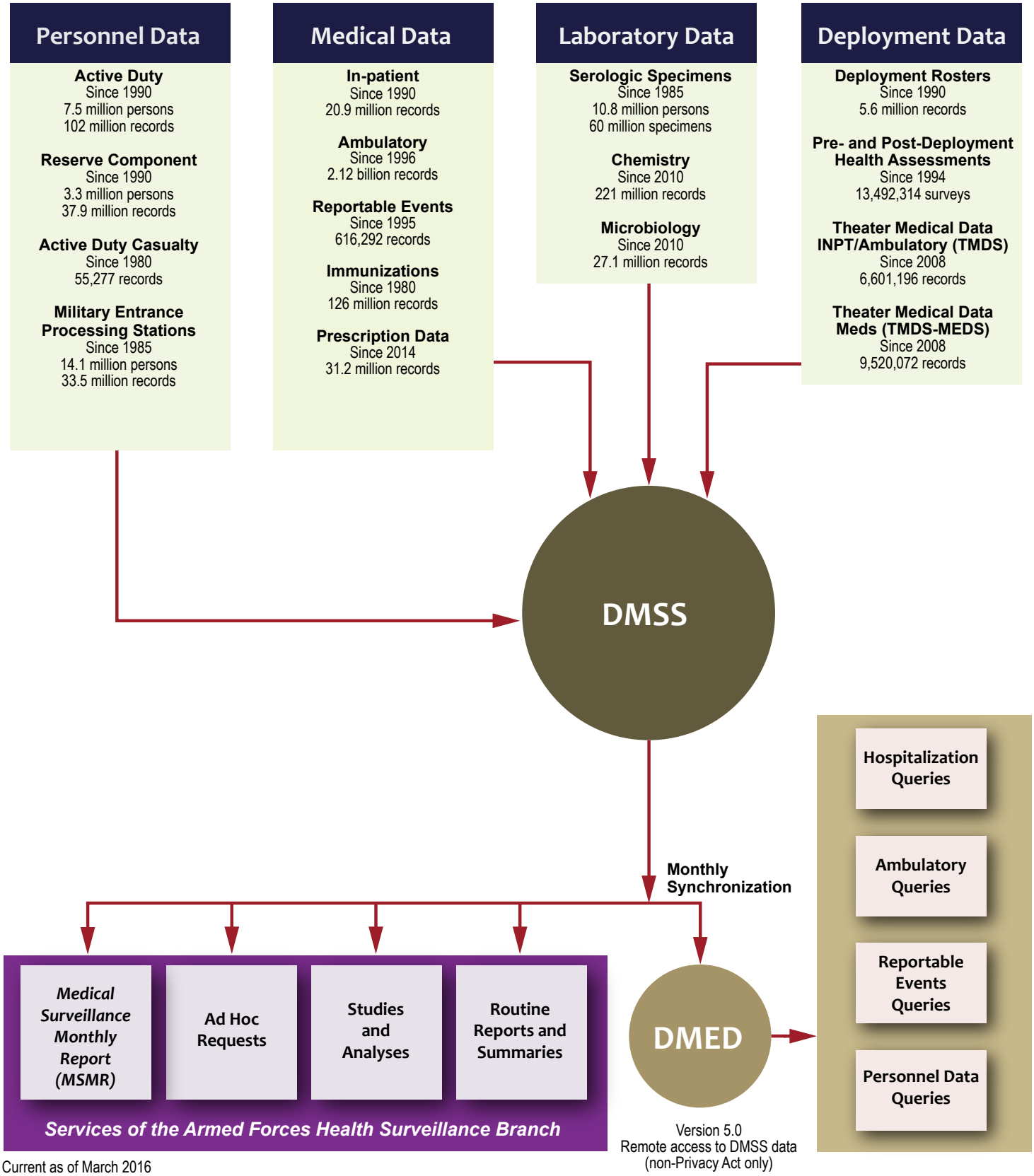
The DMSS and DoDSR are longstanding and vital assets to U.S. Armed Forces medical surveillance. The DMSS and DoDSR have their historic roots in routine HIV screening and surveillance. However, their functions were expanded in the early 1990s to encompass all diseases and injuries relevant to the protection of U.S. forces and deployment health.

The DMSS receives data from multiple sources and integrates these data in a continuously expanding longitudinal surveillance database for all individuals who have served in the military since 1990. DMSS records are maintained in person, place, and time of reference. The organization of the data facilitates efficient and powerful analyses of morbidity among service members using traditional epidemiologic practices.

The Defense Medical Epidemiology Database (DMED) is derived from DMSS, providing select data that are de-identified and remotely accessible to individuals. The purpose of DMED is to provide standard epidemiologic methodology used to analyze active duty personnel and medical event data. Users benefit from unprecedented access to tri-service epidemiologic data and can query large amounts of data in a timely and efficient manner.

DMED is available to authorized users—including U.S. military medical providers, epidemiologists, medical researchers, safety officers, or medical operations/clinical support staff—who are responsible for surveying health conditions in the U.S. military and conveying this information to commanders for monitoring and enhancing the health of the active duty component. With appropriate documentation, civilian collaborators in military medical research and operations may also have access to DMED. During 2015, AFHSB processed and dispensed more than 20,000 aliquots of serum specimens for serologic studies and analyses, making it one of the busiest years in the history of the DoDSR. The specimens are housed in state-of-the-art freezers with advanced cooling equipment and technology. The DoDSR contains more than 60 million serial blood-derived serum specimens collected from more than 10 million active duty and reserve service members throughout their careers. The DMSS database containing demographic, occupational, and medical information in longitudinal surveillance records links to the DoDSR specimens, which establishes a unique and powerful resource to support the conduct of military medical surveillance, clinical care, and seroepidemiologic investigations. ▲

DMSS Structure and Functional Relationship



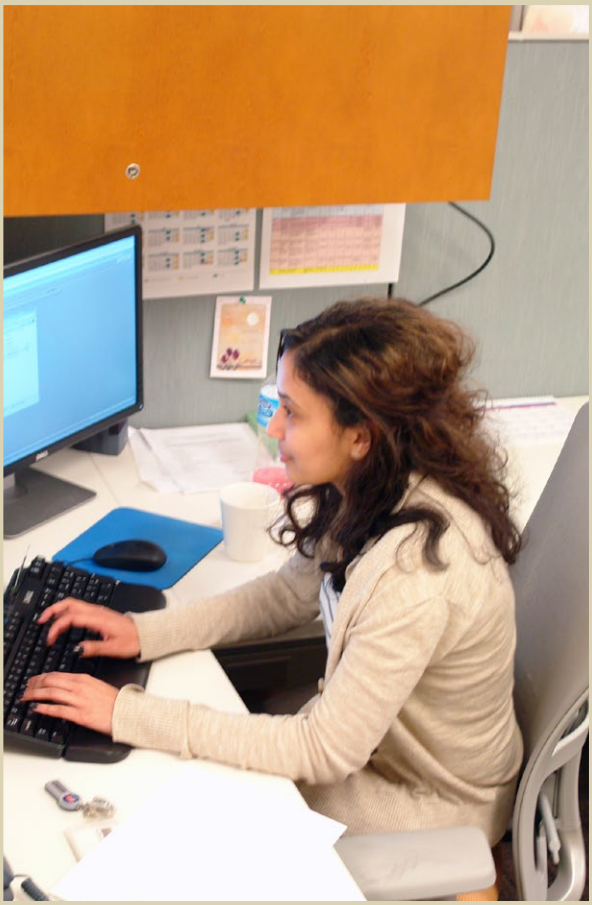
Current as of March 2016

Epidemiology Analyses and Reports

The E&A section integrates the expertise of epidemiologists, preventive medicine physicians, and data analysts to provide timely analyses and reports of actionable health information. The section uses AFHSB health surveillance tools—the DMSS and DoDSR—and provides surveillance products to Department of Defense policymakers, military commanders, healthcare providers, public health officers, and researchers. In addition, E&A staff analyze and interpret large datasets, publish the *MSMR*, develop and disseminate standards for case definitions, and train preventive medicine residents.

The section receives and responds to hundreds of health-related inquiries and investigations on the U.S. military with the intent of preserving the health of the U.S. Armed Forces. Many inquiries are initiated by key leaders throughout the Department of Defense and relate to military operations. Each analysis and report distributed by the section entails numerous hours of epidemiologic expertise and programming by analysts to extract relevant data from the billions of health records stored in the DMSS and blood sera in the DoDSR.

E&A staff prepare analyses that fall into two general categories: periodic and ad hoc reports. In FY15, the section distributed 254 ad hoc analyses and more than 650 periodic reports throughout the Department of Defense community. These routine and periodic reports look for trends over time of diseases and injuries such as communicable diseases, training-related injuries, mental health illnesses, traumatic brain injury (TBI), and deployment health. Routine and periodic reports have helped Department of Defense policymakers to shape their health protection programs, and healthcare professionals to develop preventive measures against diseases or injuries affecting U.S. service members and their beneficiaries.



AFHSB analysts combine epidemiologic and programming expertise to extract relevant data from billions of health records stored in the DMSS and DoDSR.

For example, E&A staff provide analyses and subject matter expertise for AFHSB's "DoD Seasonal Influenza Surveillance Summary" during the influenza season. This report contains weekly summaries of influenza activity among MHS beneficiaries by combatant command (CCMD). The influenza report uses outpatient medical encounters for influenza-like illness (ILI) diagnosed encounters, RME data for hospitalized influenza cases, and Health Level 7 data, provided by NMCPHC to assess weekly influenza activity in the Department of Defense. Launched in mid-2013, the Reportable Medical Events Monthly Report provides monthly summaries of RMEs among Department of Defense beneficiaries. The report summarizes counts of each RME for the current month and provides comparisons to average counts for the same month and 12-month period from data for the past five years. In 2015, E&A staff also revamped the Installation Injury Reports, which provide detailed counts and rates of injuries to service members that occur at nearly 200 military installations each month. These reports detail injuries by anatomical region, external cause of injury, and impact on service members' duty status.

The ad hoc analyses originate from health-related requests from operational taskers, congressional inquiries, global health surveillance, serum studies, and *MSMR* analyses. These tailored analyses consist of requests for health surveillance on topics such as mental and behavioral health, TBI, infectious diseases, vaccines, and deployment and training-related illnesses and injuries. Ad hoc analyses on trends in diseases and injuries that are considered special interest by military leaders may become routine and recurrent reports.

In 2015, the section completed multiple analyses in response to congressional inquiries and requests for reports. One such report provided an overview of women's health related to deployments, which

FY15 AFHSB Periodic Reports in One Year

Deployment Reports

- Deployment Health Compliance Report
- Deployment Health Report
- PostDeployment Health Assessment (DD2796) Summary Report
- PostDeployment Health Reassessment (DD2900) Summary Report
- PreDeployment Health Assessment (DD2795) Summary Report
- Army Disease & Injury Report
- U.S. Coast Guard Defense Health Agency Report

Disease Reports

- Respiratory Illnesses Report
- Influenza Surveillance Report
- Influenza Modeling Report
- Influenza-Like Illness Army Report
- Veterans Affairs Influenza Surveillance Report
- Department of Defense (DoD) Communicable Disease Report
- National Capital Region Medical Directorate Communicable Disease Report
- Malaria Case-Finding Report
- Reportable Events Monthly Report (REMR)
- Malaria Year-To-Date Korea
- Meningococcal Report
- Armed Forces Pest Management Board (AFPMB) Arthropod-Borne Hemorrhagic Fever Report
- AFPMB West Nile Fever Report
- AFPMB Mosquito Borne Encephalitis Report
- AFPMB Dengue/Hemorrhagic Fever Report
- AFPMB Leishmaniasis Report
- AFPMB Lyme Disease Report

Injury Reports

- Army Injury & Overuse Report
- Army Public Health Command 360
- U.S. Army Special Operations Command (USASOC) Special Reportable Events (Semi-Annual)
- DoD Eye Injury Quarterly Report
- DoD Hearing Injury Quarterly Report
- TRADOC Training-Related Injuries Report

Injury Reports (continued)

- Injury Installation Reports
- Reserve Lost Duty Metric
- U.S. Army Training and Doctrine Command (TRADOC) Cold Injury Report
- DoD Eye Injury Annual Report
- DoD Hearing Injury Annual Report
- TRADOC Heat Injury Report
- Army Annual Injury Report

Mental Health Reports

- Health Affairs (HA) TBI Report
- HA Mental Health Report
- Military Health System Dashboard Measures
- Air Force Special Operation Command (AFSOC) Mental Health and TBI Quarterly Report
- AFSOC Mental Health and TBI Annual Report
- HA PTSD Report
- Defense and Veterans Brain Injury Center TBI Screen
- Force Health Protection and Readiness (FHP&R) Mental Health Screen Report
- FHP&R Harm and Violence Report
- FHP&R PTSD Depression Screen Report
- USASOC Mental Health and TBI Monthly Report

Special Reports

- FHP&R QA Compliance Audits: Automated Neuropsychological Assessment Metrics (ANAM)
- U.S. European Command Reportable Medical Events Monthly Summary
- ANAM Report
- Smallpox Cardiac Adverse Event Report
- *Medical Surveillance Monthly Report (MSMR)* Deployment Health Assessment Summary
- Special Surveillance (*MSMR*): Motor Vehicle Accidents
- Special Surveillance (*MSMR*): Amputations, TBI, DVT, Leishmaniasis, Severe acute pneumonia, and heterotrophic ossification
- USCG Burden of Disease Report
- USCG Reportable Event Report

Total number of reports: 904

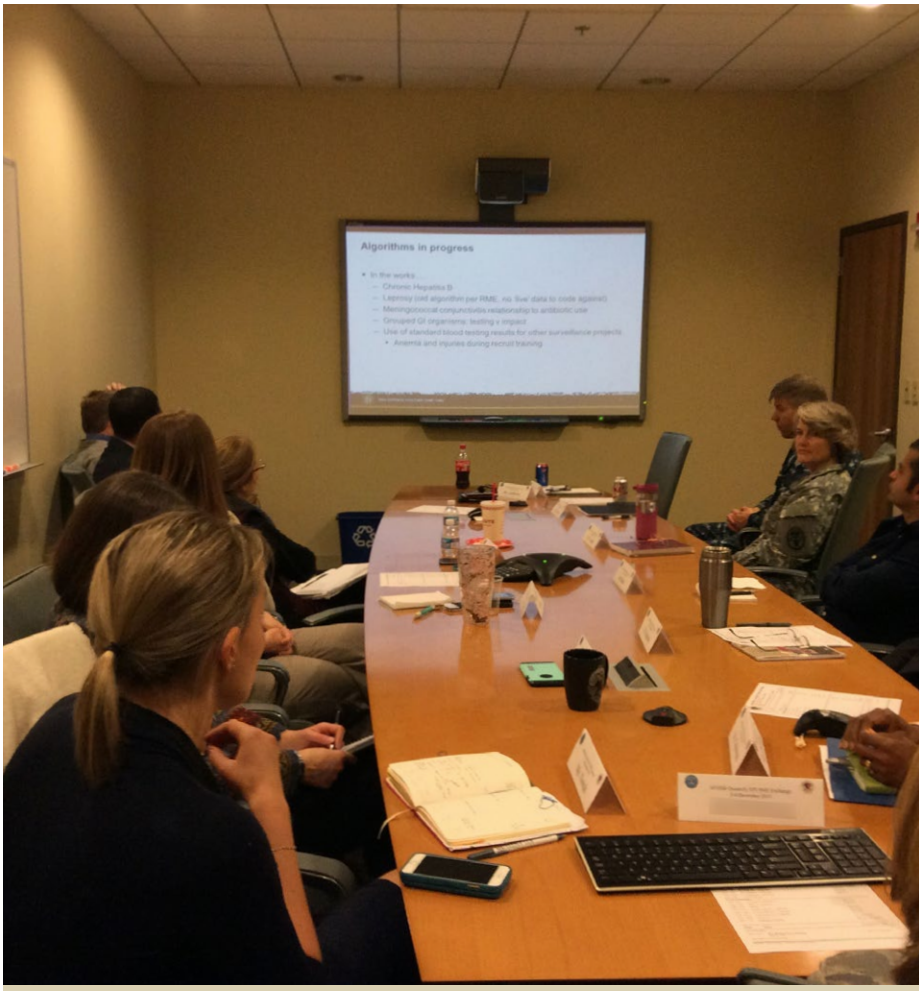
included analyses on the conditions most frequently diagnosed in women during and after deployment and the prevalence of contraceptive use during deployment.

In 2015, the section continued to improve on an analysis to assess the potential risk of adverse events following the use of mefloquine. Findings from this analysis have been briefed to senior Department of Defense policymakers, the U.S. Army Pharmacovigilance Center, and the Department of Veterans Affairs. Publications of these findings in the peer-reviewed literature are forthcoming. In collaboration with the GEIS section and Imperial College London, E&A staff completed an assessment of risk factors for severe outcomes among military service members hospitalized with pneumonia and influenza. The results provide evidence for the prioritization of specific risk groups within the military for influenza vaccination.

In 2015, the section supported 10 health-related investigations that requested the use of 8,021 serum specimens from the DoDSR. One study by the NHRC investigated immunity to a drifted influenza A/H3N2 virus that was circulating during the 2014–2015 influenza season. Another investigation utilized specimens from the DoDSR to determine exposure to melioidosis, an infectious skin disease, among Marines deployed to Darwin, Australia. E&A surveillance data and specimens continue to support a study investigating the capability of high-resolution mass spectrometry to detect low levels of environmental agents, metabolites, and inflammatory biomarkers in the serum of individuals potentially exposed to environmental hazards (e.g., burn pit smoke), during their deployment.

AFHSB Satellites

As part of the merger with the DHA, AFHSB assumed responsibility for some staff from the public health operation within the Army, Navy, and Air Force to serve as liaisons to the AFHSB. Staff from the AFHSB satellites contribute unique expertise in areas such as influenza surveillance, laboratory data analysis, behavioral and social health, and reportable medical event surveillance, to the overall AFHSB mission. Army satellite staff are located at the Army Public Health Center, Aberdeen Proving Ground, Md.; Navy satellite staff are housed at the NMCPHC in Portsmouth, Va.; and Air Force satellite staff are located at Wright-Patterson Air Force Base in Dayton, Ohio. Satellite staff support their respective service epidemiology centers, coordinating their data requests through the E&A Request Approval Process (RAP) meeting. Satellite staff are vital members of the RAP and other E&A and AFHSB working groups representing their respective services.



Staff from AFHSB headquarters and its satellites coordinate their work through the E&A section, and meet quarterly to discuss issues related to analysis.

Standard and Surveillance Practices

AFHSB's Surveillance Methods and Standards (SMS) working group documents, develops, and publishes standard surveillance case definitions and methodologies. The working group includes representatives from all services in consultation when needed with experts from the Department of Defense during the case definition development process. These case definitions allow Department of Defense public health practitioners to measure disease trends and related biological phenomena in different environments and situations over time.

The ongoing documentation of AFHSB's case definitions and methodologies promotes internal consistency and credibility of its surveillance efforts and promotes consistency and comparability of public health information and data across multiple agencies. The AFHSB case definitions also serve as guidelines for other Department of Defense health surveillance and research organizations. The AFHSB case definitions are designed for use with administrative healthcare data derived from the U.S. military electronic health record and contained in the DMSS and other available datasets. The definitions primarily use *International Classification of Diseases, 9th and 10th Revisions, Clinical Modification* (ICD-9-CM and ICD-10-CM) codes to identify conditions of interest diagnosed in the MHS.

In 2014, the working group continued its efforts to develop ICD-10 code sets for its existing case definitions in preparation for the switch from ICD-9 codes in October 2015. These efforts primarily focused on creating code sets for conditions frequently used in AFHSB reports. To date, there are 84 condition-specific case definitions in 18 categories available on the AFHSB website. Of these, approximately 75 include proposed ICD-10 code sets. In 2015, the working group produced an approved case definition and ICD-10 code set, to include severity categories, for the Department of Defense TBI surveillance case definition. The updated TBI case definition was developed jointly with the Defense and Veterans Brain Injury Center and the U.S. Centers for Disease Control and Prevention (CDC). In addition, the working group developed condition-specific ICD-10 code sets for priority mental health conditions, various cancers, and ILI; approved new case definitions for the vaccine preventable diseases, measles, mumps, and pertussis.

AFHSB also maintains and publishes the Armed Forces Reportable Medical Events Guidelines and Case Definitions. The guidelines were revised in 2012—the first time since 2009. Additional revisions are planned for FY16. The Department of Defense uses these guidelines to help military public health officers, healthcare providers, and laboratories to identify and report specific diseases and conditions that are reported to civilian authorities.

Members of AFHSB's Surveillance Methods and Standards Working Group meet to discuss health surveillance case definitions for Department of Defense public health practitioners.

Categories for Case Definitions for Data Analysis and Health Reports

Allergy
Allergic Rhinitis*

Cardiovascular
Deep Vein Thrombophlebitis

Dermatology
Plant Dermatitis*

Ear, Nose, Throat
Noise-Induced Hearing Loss, Obstructive Sleep Apnea*, Hearing Injuries; Noise-Induced*

Endocrinology
Diabetes Mellitus; I&II*, Gestational Diabetes

Gastorenterology
Gastroesophageal Reflux Disease (GERD)*

Genitourinary
Urolithiasis*

Gynecology
Menorrhagia*, Pelvic Inflammatory Disease*, Polycystic Ovarian Syndrome*, Uterine Leiomyomas*

Hematology
Anemia, Iron Deficiency*

Infectious Disease
Arthropod Borne Hemorrhagic Fever*, Chlamydia*, Coccidioidomycosis*, Dengue Fever*, Diarrhea; Unspecified*, Gastroenteritis; Bacterial*, Gastroenteritis; Protozoa-Related*, Gastroenteritis; Viral*, Gonorrhea*, Gonorrhea, Proposed*, Helminthiases; Proposed*, Hepatitis A*, Hepatitis B*, Hepatitis C*, Herpes Simplex Virus Genital*, Herpes Zoster*, Human Papilloma Virus*, Influenza-Like Illness (Ili)*, Leishmaniasis*, Lyme Disease*, Malaria*, Measles*, Mosquito Borne Viral Encephalitides*, Mumps*, Pertussis*, Pneumonia & Influenza (P&I)*, Pneumonia & Influenza (P&I); Hospitalized*, Salmonella*, Syphilis, Proposed*, Tuberculosis, Typhoid Fever*

Mental Health
Adjustment Disorders*, Alcohol Related Disorders*, Anxiety Disorders*, Bipolar Disorders*, Depressive Disorders*, Factitious Disorders*, Personality Disorders*, Psychoses*, Ptsd*, Schizophrenia*, Substance Related Disorders*, Suicide

Neurology
Epilepsy, Guillain-Barré*, Migraine Headache, Multiple Sclerosis, Traumatic Brain Injury (TBI)

Oncology
Breast Cancer*, Cervical Cancer*, Colorectal Cancer*, Leukemia, Lung Cancer*, Malignant Brain Tumor*, Non Hodgkin's Lymphoma, Prostate Cancer*, Testicular Cancer*

Ophthalmology
Eye Injuries*

Orthopedics
Amputation; Deployment-Related, Carpal Tunnel Syndrome*, Cruciate Ligament Injuries, Heterotopic Ossification*, Injuries; By Anatomic Region, Low Back Pain; Mechanical, Osteoarthritis, Spondylosis, Tendon Rupture

Pulmonology
Asthma*

Surgical Procedures
Appendicitis and Appendectomy

Miscellaneous
Cold Weather Injuries, Heat Injuries, Hyponatremia; Exertional, Insomnia*, Overweight/Obesity, Rhabdomyolysis; Exertional

Note: Beginning October 1, 2015, the International Classification of Diseases, 10th Revision, Clinical Modification (ICD-10-CM) will replace ICD-9-CM for coding of morbidity data. In preparation for this transition, AFHSB has developed proposed ICD-10 code sets for many of Center's surveillance case definitions. If available*, the proposed ICD-10 code set is included in the code table within the condition-specific case definition. The validity of these code sets will be evaluated after ICD-10 coding is implemented.

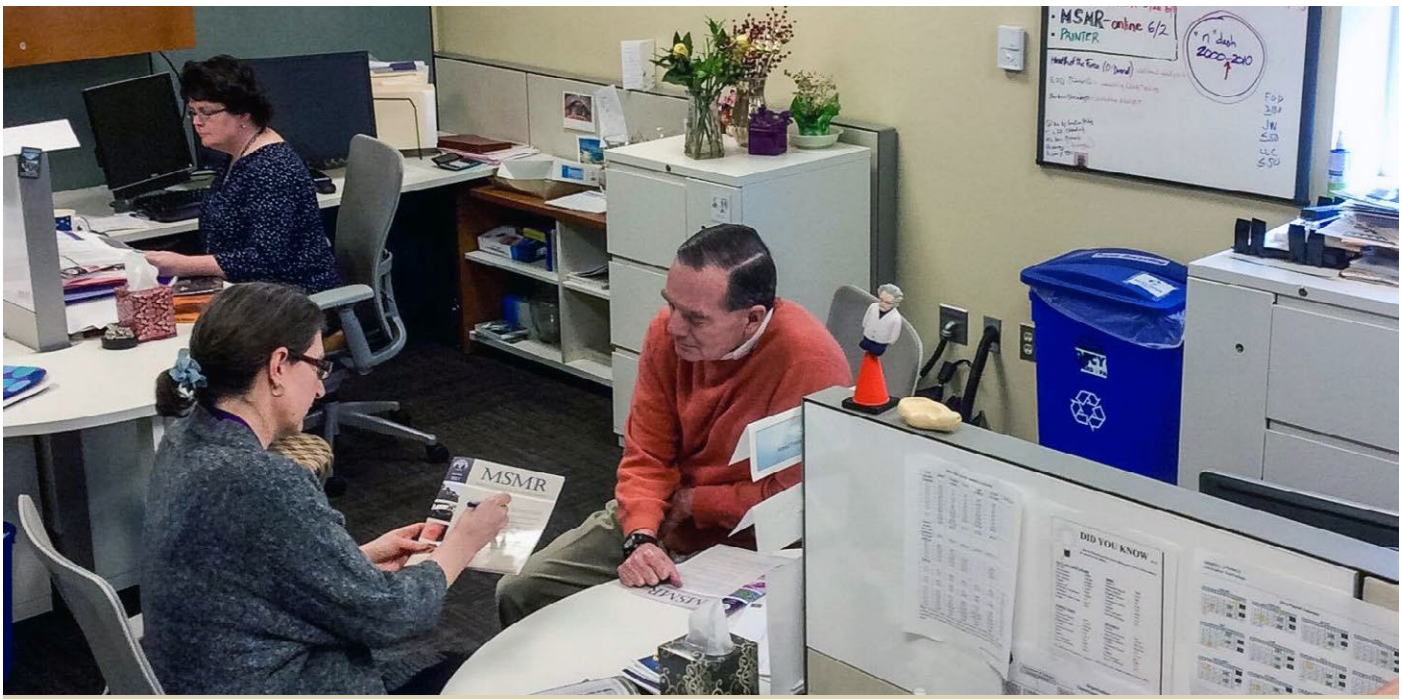
*Case definition includes proposed ICD-10 code set; validity will be evaluated after ICD-10 coding is implemented.

Medical Surveillance Monthly Report

Launched in 1995, the *MSMR* is the flagship publication for AFHSB. The peer-reviewed journal's articles provide evidence-based estimates of the incidence, distribution, impact, and trends of illness and injuries among U.S. military service members and associated populations. The *MSMR's* target readership is professionals throughout the MHS, including public health officials, clinicians, researchers, academicians, healthcare planners, policymakers, and analysts. The publication has more than 1,500 subscribers (66 percent email, 34 percent print), a 1.2 percent increase from FY14). The *MSMR* is indexed on MEDLINE®, averaging about 712 online hits per month on PubMed (a 42.4 percent increase from FY14).

Articles published in the *MSMR* have generated media coverage in diverse publications, including *The New York Times, Nature Magazine, USA Today, The Kojo Nnamdi Show, The Standard, The Daily Record, Infection Control Today, Medical Express, the Examiner, the Fayetteville Observer, International Business Times, LidTime, The Los Angeles Times, The Washington Post, The Times News,* and Military Times Newsweekly Group.

In FY15, the *MSMR* published a total of 50 articles, including 31 original full reports, seven updates of previously published data analyses, four brief reports, and eight surveillance snapshots. Twenty-two (44 percent) of the articles were submitted by authors not affiliated with the *MSMR* editorial staff. Two issues had special themes: heat injuries, and burden of disease and injury. The most frequent subjects of the original articles and updates in 2015 were infectious diseases and immunizations, injuries sustained by service members, the healthcare burden of diseases and injuries, chronic diseases, mental health, and causes of death. The *MSMR* continues to welcome manuscript submissions for relevant articles on topics in military public health, epidemiology, surveillance, and disease and injury prevention. ▲



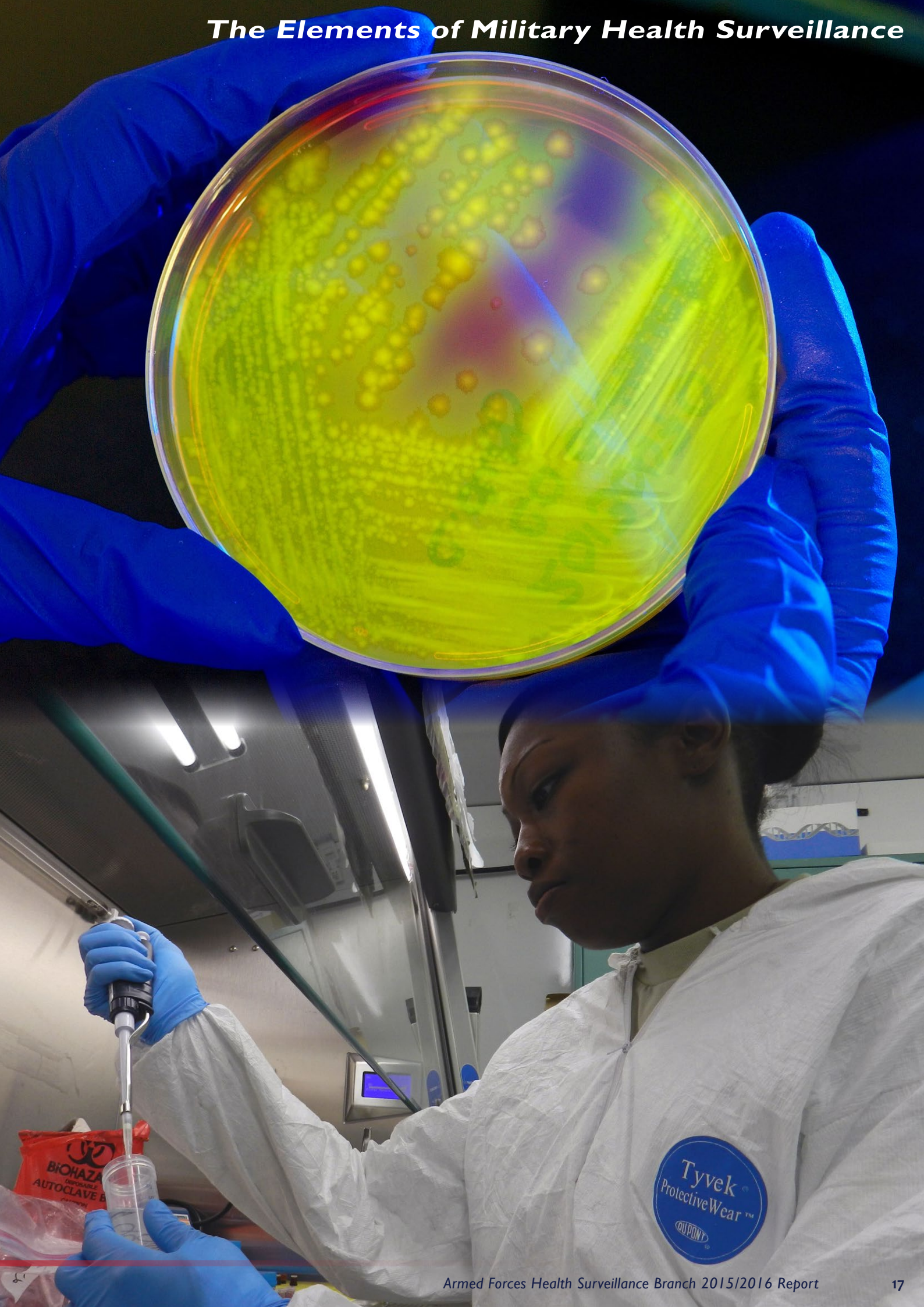
The MSMR staff produce the monthly peer-reviewed journal that publishes articles on incidence, distribution, impact, and trends of illnesses and injuries among U.S. service members and associated populations.

Residency Training

As a key Department of Defense source for health surveillance and epidemiologic training, AFHSB hosts preventive medicine residents from WRAIR and USU for a four- to six-week practicum rotation under the supervision and mentorship of senior staff. Residents enhance their understanding of the complexities of health surveillance systems, knowledge and application of epidemiology, and critical analytical skills. They also are exposed to AFHSB daily operations and initiatives. Central to their rotation, residents design and execute a data analysis project using the DMSS. Residents begin with a hypothesis and design an epidemiologic study in which they analyze and interpret data and generate a publishable manuscript and oral presentation.

Since 2008, AFHSB has trained 57 residents from the three services (28 with Army, 15 with Navy, and 14 with Air Force). Resident projects have examined such topics as the impact of installation alcohol bans on the subsequent number of alcohol misuse medical diagnoses, incident illness and injury diagnoses among U.S. Armed Forces air crew during the 12 months prior to retirement, and the protective association between influenza vaccination and adverse cardiovascular events in active component service members. More than half of the completed resident projects are published in the *MSMR* or other peer-reviewed journals and presented at the American College of Preventive Medicine or the American Public Health Association meetings. Additionally, the E&A section offers additional rotation and practicum opportunities for occupational and environmental medicine residents and master of public health and master of science in public health degrees at USU.

Preventive medicine residents from USU and WRAIR participate in a four- to six-week epidemiology rotation at AFHSB. Residents design an epidemiologic study in which they analyze and interpret data, and generate a publishable manuscript and oral publication.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Global Emerging Infections Surveillance Network

GEIS Network and Major Laboratory Partners

- Armed Forces Research Institute of Medical Sciences (AFRIMS) – Thailand
- Walter Reed/AFRIMS Research Unit (WARUN) – Nepal
- Naval Medical Research Center (NMRC-Asia) – Singapore
- Naval Medical Research Unit 2 (NAMRU-2) – Cambodia
- Naval Medical Research Unit 3 (NAMRU-3) – Egypt
- NAMRU-3 Ghana Detachment – Ghana
- Naval Medical Research Unit 6 (NAMRU-6) – Peru
- 65th Medical Brigade – Republic of Korea
- U.S. Army Medical Research Directorate (USAMRD-K) – Kenya
- U.S. Army Medical Research Directorate (USAMRD-G) – Republic of Georgia
- Landstuhl Regional Medical Center (LRMC) – Germany
- Public Health Command – Europe (PHC-E) – Germany
- Naval Health Research Center (NHRC) – California
- U.S. Air Force School of Aerospace Medicine (USAFSAM) – Ohio
- Navy and Marine Corps Public Health Center (NMCPHC) – Virginia
- U.S. Army Public Health Center (USAPHC) – Maryland
- Walter Reed Army Institute of Research (WRAIR) – Maryland
- Naval Medical Research Center (NMRC) – Maryland
- Navy Environmental and Preventive Medicine Unit 2 (NEPMU-2) – Virginia
- Navy Environmental and Preventive Medicine Unit 5 (NEPMU-5) – California
- United States Army Medical Research Institute of Infectious Diseases (USAMRIID) – Maryland
- Uniformed Services University of the Health Sciences (USU) – Maryland
- Public Health Command District-Korea (Provisional) – Republic of Korea

Managing the Global Emerging Infections Surveillance and Response System

The GEIS section continues to develop, implement, support, and evaluate an integrated global emerging infections surveillance and response network. The strategic focus of its initiatives is the force health protection of U.S. service members and those of their allies. But GEIS also recognizes adequate global public health provides for country-level and regional stability critical to U.S. national security interests.

GEIS and its network of partners inform force health protection decision making and enhance global health security by preventing, detecting, and responding to infectious disease threats through strengthening surveillance, and outbreak response efforts while enhancing coordination and collaboration across the network. The section receives strategic guidance on its surveillance efforts from various U.S. government agencies, such as Office of the Assistant Secretary of Defense for Health Affairs (OASD/HA) and the CCMDs. Its surveillance efforts are guided by the National Defense Authorization Act (NDAA), Presidential Decision Directive NSTC-7, Presidential Policy Directive 2, Homeland Security Presidential Directive 21, and National Strategy on Biosurveillance, and the Global Health Security Agenda.

In 2015, GEIS network surveillance efforts reached 62 countries. AFHSB effectively communicates information from its surveillance activities to increase public awareness of important global issues and help shape public health decisions. Surveillance findings are routinely shared with the respective ministries of health and defense departments of the host partner countries. GEIS encourages its partners to present and publish their findings in medical journals and at scientific meetings.

GEIS Section Chief Navy Commander Franca Jones (third from right) meets with the Viral Hemorrhagic Fever (VHF) Unit team during a visit at the USAMRD-K laboratory in Nairobi, Kenya.

The GEIS network engagements are organized around five disease-focused program areas: antimicrobial resistance, enteric infections, FVBIs, respiratory infections, and sexually transmitted infections. The key GEIS network partners are the six Department of Defense overseas research laboratories—AFRIMS, NMRC-A, NAMRU-3, NAMRU-6, USAMRU-G, and USAMRU-K, each operating a regional disease surveillance network, and the four U.S.-based Department of Defense reference laboratories—NMRC, NHRC, USAFSAM, and WRAIR. These 10 Department of Defense laboratories conduct endemic and global emerging disease surveillance and response missions through regional partnerships with local ministries of agriculture, defense, and health. The military organizations that use GEIS disease surveillance information are the Deputy Assistant Secretary of Defense (DASD)/HA, the Defense Health Board, CCMDs, service public health assets, and interagency collaborators that include the U.S. national security staff, the U.S. Department of Health and Human Services, and the World Health Organization.

In FY15, GEIS distributed $48.2 million to support two different kinds of surveillance activities—ongoing initiatives and new novel proposals. Approximately two-thirds of GEIS funding supports the ongoing initiatives to maintain a robust global EID surveillance portfolio. The remaining one-third of funding is awarded to projects submitted in response to an annual request for proposals that address novel EIDs or surveillance efforts affecting the Department of Defense and global health communities. Each year, proposals for both types of support undergo rigorous evaluation by internal and external review committees.

Surveillance Activities

GEIS activities enable the partner network to provide military decision makers with relevant information that informs disease prevention and treatment policies. The following are key FY15–16 accomplishments for surveillance activities within each of the GEIS pillars:

SIGNIFICANT ACCOMPLISHMENTS FOR 2015–2016

- Represented the Department of Defense at the FDA's mid-season Vaccines and Related Biological Products Advisory Committee (VRBPAC) meeting for influenza by providing vaccine effectiveness and virology data to support future influenza vaccine development (March 2015).
- Supported AFRIMS surveillance that demonstrated substantial disease burden due to respiratory pathogens, namely influenza, within the Mongolian Armed Forces and influenced the MAF to incorporate ILI surveillance nationally in their "Health Monitoring Policy." These data are important epidemiologic and geographical information for force health protection against ILI at regions that border China.
- Supported USU's Infectious Disease Clinical Research Program collaboration with WRAIR's Multidrug-resistant Repository and Surveillance Network (MRSN) to identify and characterize five carbapenem-producing *Klebsiella pneumoniae* isolates out of 4,090 Enterobacteriaceae isolates collected from injured U.S. service members injured during deployment in Iraq and Afghanistan from June 2009 through March 2015.
- Supported MRSN collection and testing of more than 5,000 targeted multidrug resistant organisms – such as methicillin-resistant *Staphylococcus aureus* (MRSA), and multidrug-resistant *Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, and *Acinetobacter baumannii*) isolates – at more than 40 military treatment facilities and civilian collaborators worldwide. The epidemiologic information allowed participating hospitals to save costs through optimized empirical antibiotic selection, earlier detection of outbreaks and emerging pathogens.
- Supported AFRIMS and MRSN in collection and testing of 30 carbapenem-resistant gram-negative isolates from a healthcare facility in Thailand for carbapenemase genes. Advanced characterization revealed multiple carbapenemase genes, including bla_{NDM} and bla_{OXA}-48-like genes, which were associated with members of the Enterobacteriaceae, and bla_{IMP} and $bla_{VIM,}$ which were associated with non-fermentative gram-negatives.
- Supported USU establishment of the DoD Sensitivity Testing Capability and Gonococcal Isolate Repository to identify the prevalence of gonorrhea resistance among U.S. military and comparing this with similar data from symptomatic non-U.S. military and civilian populations. To date, 86 specimens have been received from overseas sites, including 12 from Haiti, 17 from the Republic of Georgia, and 50 from Peru.
- Supported the Global Travelers' Diarrhea (GTD) Study, a multisite protocol assessing the epidemiology and etiology of acquired diarrhea among U.S. military and civilian travelers. More than 650 archived and prospective specimens have been collected from six laboratories worldwide. Specimens underwent standardized testing for norovirus, *Shigella*, *Salmonella*, *Campylobacter*, EAEC, EHEC, EIEC, EPEC, and ETEC, revealing an overall positivity rate of 53.9 percent for pathogens of interest.
- Continued support of molecular, in vitro and in vivo surveillance, for emergence of antimalarial drug resistance globally, including for artemisinin-based combination therapies, the first-line treatment for uncomplicated *Plasmodium falciparum* malaria. The activities are ongoing in regions with known artemisinin resistance and regions at high risk for introduction and spread to inform malaria therapeutics for the Joint Force.
- Continued support of GEIS partners' ongoing surveillance to monitor the emergence and epidemiology of viruses transmitted by Aedes mosquitoes, including dengue and chikungunya viruses in Kenya, Southeast Asia, and the Americas. These surveillance activities led to the first detection of Zika virus in Thailand and Cambodia and paved the way for detection and monitoring of Zika virus as it emerges in the Western Hemisphere.
- Supported GEIS partners' expanded acute febrile illness surveillance in West Africa in the wake of the Ebola epidemic. Ongoing surveillance projects in Ghana, Liberia, Sierra Leone, and Cote d'Ivoire will provide crucial data about vector species and emerging vector-borne and zoonotic pathogens in a region of the world with underdeveloped public health infrastructure.
- Supported the Walter Reed Biosystematics Unit to map the diversity and prevalence of mosquito and sand fly vectors, and associated pathogens, in and around refugee camps along the Syrian border, in northern Jordan and southern Turkey. These data will improve risks maps that will be of immediate utility to regional health officials and to inform force health protection for Department of Defense personnel. ▲

Antimicrobial Resistance

Through the GEIS Antimicrobial Resistance (AMR) program, network partners conduct global surveillance of antibiotic-resistant pathogens. The program helps public health authorities to identify and respond to resistance threats; helps Department of Defense policymakers to develop both infection control policy and therapy recommendations; and supports research and development of new vaccines, therapeutics, and diagnostics—all with the goal of preventing further illness and disease from resistant bacterial pathogens.

The program emphasizes surveillance of organisms responsible for healthcare-associated infections (HAIs) and wound infections such as *Clostridium difficile*, methicillin-resistant *Staphylococcus aureus*, and the ESKAPE (*Enterococcus faecium, S. aureus, Acinetobacter baumannii, Klebsiella spp., Pseudomonas aeruginosa*, and *Enterobacter spp.*) pathogens. These pathogens are particularly important because of their impact on human illness, and the limited available data about the frequency and nature of drug resistance in many regions of the world. By enhancing HAI surveillance capabilities, the U.S. military gains valuable information on resistant pathogens that may affect its personnel during overseas military exercises and deployments. In addition, HAI surveillance information helps track the spread, and related mechanisms, of some of the most virulent resistance genes. The host country ministries of health also gain information to help shape local infection control programs to treat patients more effectively.

3

In the past year, GEIS funded AMR surveillance efforts in Peru, Jordan, Cambodia, Thailand, the Philippines, Kenya, and Uganda. In addition, GEIS also supported the work of the MRSN laboratory and USU. These activities demonstrated value for ongoing surveillance and infection control efforts in their respective regions as well as more globally with the MRSN.

There are multiple ongoing AMR surveillance efforts from the GEIS partners outside the contiguous United States (OCONUS). In Thailand, AFRIMS finalized and implemented study protocols for the detection of carbapenemase genes bla_{KPC} and $bla_{NDM.}$ Of the 146 archived carbapenem-resistant Enterobacteriaceae (CRE) isolates tested for bla_{KPC} and $bla_{NDM,}$ 11 strains were found to carry bla_{NDM} and none were found to carry $bla_{KPC.}$ Additional protocols are now in place to begin testing for other resistance genes. USAMRU-K has implemented surveillance at three hospitals in Kenya, collecting and testing 186 specimens to date. Of the isolates tested, *S. aureus* was most predominate (33 percent), followed by *Escherichia coli* (19 percent) and *Pseudomonas* spp. (9 percent). More extensive regional coverage of prevalence, distribution and determinants of resistance of these organisms will allow for better preparedness for military personnel deployed to Kenya. In Uganda, a total of 407 isolates have been tested for susceptibility. Susceptibility patterns of the isolates obtained from both sites continue to indicate high resistance. GEIS support for AMR surveillance in HAIs in Ugandan civilian and military populations will ultimately enable clinicians to make informed and timely patient treatment decisions based on AST results. The MRSN has continued to enhance its ability to collect and characterize relevant multidrug-resistant pathogens throughout the MHS, as evidenced by the 5,331 isolates collected and tested in FY15. Significant publications that resulted from this GEIS-supported work include the following:

- Efficacy of humanized high dose meropenem, cefepime and levofloxacin against Enterobacteriaceae isolates producing Verona integron-encoded metallo-β-lactamase (VIM) in a murine thigh infection model
- A fatal outbreak of an emerging, highly virulent, and extensively drug-resistant clone of *Acinetobacter baumannii*
- War wound treatment complications due to transfer of an IncN plasmid harboring $bla_{OXA-181}$ from *Morganella morganii* to CTX-M-27-producing sequence type 131 *E. coli*.

By enhancing U.S. military and partner nation surveillance capabilities, valuable information on resistant pathogens is gathered that aids in early detection, prevention, and timely response to limiting the spread of disease and illness from resistant pathogens. The GEIS partner network is poised to further AMR surveillance within its expansive international coverage. Also, as a principal member of the Department of Defense participation in the National Action Plan for Combating Antibiotic-Resistant Bacteria effort, and the Global Health Security Agenda. GEIS's AMR surveillance work aims to take action against the threat of AMR. With ever-expanding international travel and commerce, AMR is truly a global health threat, requiring a concerted response between the U.S. and governments worldwide.

Febrile and Vector-Borne Infections

During FY15, GEIS funded more than 40 surveillance initiatives to better inform U.S. force health protection measures against FVBI risks and to identify the public health needs of partner nations. Although traditional vector-borne infections such as malaria continue to cause substantial morbidity and mortality, other newly emerging and re-emerging infectious causes of acute febrile illness, such as chikungunya and Zika viruses, require further characterization to better determine health risks. Surveillance activities for FVBI seek to integrate human, vector, animal, and ecologic data to support greater awareness of disease risks and threats, primarily through the generation of mapping and modeling tools to help determine the disease transmission risk for relevant geographic areas.

GEIS partners support several FVBI outbreak response efforts. Several GEIS collaborators remained involved in the 2015 Ebola virus outbreak response in West Africa. Local capabilities continued to be heavily leveraged to support the Ebola outbreak response effort, with the Liberia Institute for Biomedical Research (LIBR) serving as a central hub for Ebola diagnostic testing in support of Operation United Assistance. GEIS has supported collaborations between the Armed Forces of Liberia, LIBR, and NAMRU-3 since 2010, when an outbreak of malaria among U.S. service members deployed to Liberia required a joint response from the Department of Defense and local agencies. More recently in 2015, efforts shifted toward supporting routine febrile surveillance activities in countries within the region, including Liberia, Sierra Leone, Cote d'Ivoire, and Ghana.

In addition, GEIS-funded support to NAMRU-3 facilitated ongoing acute febrile illness surveillance in Egypt and entomological surveillance in Egypt and Nigeria. GEIS also supported malaria surveillance and outbreak response efforts in Egypt, Sudan, Morocco, and Afghanistan in the past year.

During 2015, USAMRU-K continued to provide regional support for malaria surveillance with the USAMRU-K Malaria Diagnostic Center as the leading malaria diagnostic training center in East Africa. As lack of adherence to treatments poses an emerging threat to artemisinin combination therapy effectiveness, GEIS maintained support of ongoing prospective surveillance studies at USAMRU-K, in partnerships with regional militaries, to determine patterns and trends in malaria drug resistance across Kenya using in vitro testing and molecular marker analyses. Additionally, USAMRU-K continued to conduct surveillance throughout Kenya for etiologic agents of acute febrile illness, such as West Nile virus, hepatitis E virus, and dengue virus.

In South America, NAMRU-6 maintained acute febrile illness surveillance in clinics and hospitals throughout the region, and studied the prevalence of pathogens in reservoir animals and arthropod vectors. NAMRU-6 explored the epidemiology of hantaviruses in the Peruvian Amazon and studied the role of habitat perturbation on pathogen transmission and emergence. NAMRU-6 also continued to provide relevant information regarding sand fly distribution in the effort to characterize leishmaniasis and bartonellosis risk for civilian and military populations in Peru and Ecuador, thus defining the most prevalent sand fly species in the specific regions. During 2015, NAMRU-6 reported the identification and characterization of a novel orthobunyavirus associated with febrile illness in Peru. To combat malaria, NAMRU-6 worked to identify the major circulating subtypes and to assess the extent and type of drug resistance in the Peruvian regions of Loreto and Madre de Dios.

Through GEIS support, partners in Southeast Asia were able to identify infections by a variety of vector-borne pathogens, including dengue virus serotypes, chikungunya virus, Zika virus, and Rickettsia spp. Vector-borne pathogen surveillance was conducted by NMRC-A at 13 sites in six provinces of Cambodia, and by AFRIMS in the Philippines and southern Thailand. NMRC-A vector surveillance activities documented

the presence of insecticide-resistant *Aedes aegypti* and identified 12 species of *Anopheles* mosquitoes in study sites across Cambodia, while AFRIMS identified the prevalence of 20 species of Anopheles mosquitoes in Thailand. AFRIMS surveillance for vector-borne pathogens in rodent reservoirs demonstrated a high prevalence of *Bartonella* species, exceeding 25 percent in some cases. The Greater Mekong Subregion is an area with emerging resistance to artemisinin, a compound that forms the basis for first-line antimalarial treatments. Both NMRC-A and AFRIMS have active GEIS-supported malaria surveillance programs in the Greater Mekong Subregion, including Cambodia, Thailand, and Vietnam, and collaborate extensively with local civilian and military institutions. These ongoing studies continued to monitor the therapeutic efficacy of artemisinin combination therapies by utilizing clinical efficacy trials, in vitro phenotypic tests, and molecular assays.

GEIS-funded surveillance efforts also strove to enhance the detection and characterization of novel pathogen threats globally. In 2015, the WRAIR Viral Diseases Branch (VDB) assisted partners across the GEIS network with sequencing and pathogen identification expertise, including providing bioinformatics support to NAMRU-6, USAMRU-K, and AFRIMS. WRAIR VDB identified novel viral pathogens in field-caught mosquitoes trapped in and around U.S. facilities in South Korea and a novel *Bartonella* species from Peru. As part of their program, WRAIR VDB utilized sequencing resources to generate comprehensive dengue virus and chikungunya virus sequence datasets in collaboration with colleagues at AFRIMS. Furthermore, WRAIR VDB continued to establish xenosurveillance capabilities, taking advantage of arthropod vectors to remotely sample human or animal blood specimens for circulating pathogens.

Another critical objective for FVBI surveillance was the development of accurate disease risk maps in important geographic areas, a crucial tool used to inform public health decision-making within the Department of Defense and the global health community. GEIS supported collaborative disease and vector mapping initiatives that integrate data streams and outputs from across the partner network. When conducting vector collections, GEIS network partners entered and collated global positioning system data within VectorMap, a mapping tool that determines vector location and disease transmission risks through an intuitive geographical interface. In 2015, the Walter Reed Biosystematics Unit initiated an Entomological Surveillance Working Group with the goal of synchronizing vector surveillance methodology and improving data management practices across the GEIS network.

A NAMRU-6 mosquito catcher searching for Aedes aegypti larvae and pupae inside of a house in Iquitos, the largest city of the Peruvian Amazon.

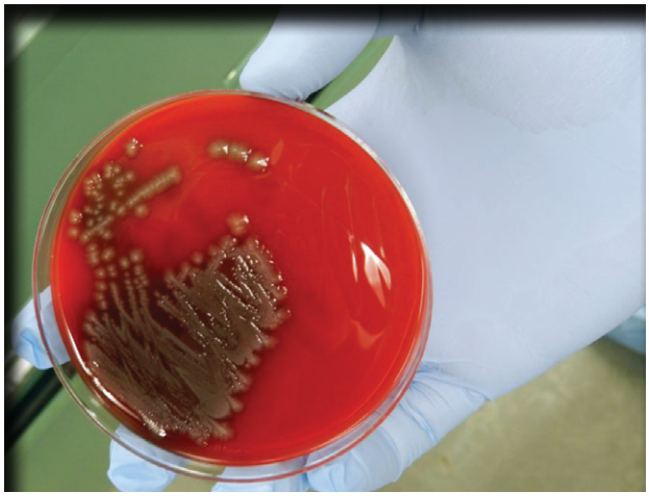
A NAMRU-6 physician takes a convalescent sample from a subject enrolled in the acute febrile surveillance program in Puerto Maldonado, Peru, on the border with Brazil.

VHF Unit team Chief Principal Investigator Dr. Rosemary Sang (third from right) and her team discuss projects implemented in Nairobi, Kenya.

Enterics

Enteric infections are a threat to maintaining the operational readiness of U.S. military personnel, and have the ability to affect the political and economic stabilities of U.S. military partner nations. The aim of the GEIS division's gastrointestinal infection surveillance program is to provide actionable information to Department of Defense personnel and related populations. The GEIS partner network conducts activities that inform regional infectious disease threat assessments and contribute to an epidemiologic understanding of pathogens that can affect the U.S. military and its allies.

GEIS supports surveillance in host nation civilian and military populations to assess the prevalence, burden, and risk factors for infections through the Department of Defense overseas laboratories. These laboratories have long-established enteric surveillance studies in Bhutan, Cambodia, Kenya, Peru, and Thailand, and work with the appropriate local and national health authorities to generate data that can be used to develop disease prevention and mitigation strategies in the respective populations. The overseas laboratories have also partnered together to conduct harmonized surveillance in U.S. military and Western adult traveler populations. Efforts to integrate standard case definitions, data elements, and laboratory procedures across all participating study sites will increase understanding of the burden of infection and disease severity across regions over time. Standardized methods for surveillance of norovirus and enterotoxigenic *E. coli* were implemented in 2014, and standardized testing for *Salmonella*, *Shigella*, *Campylobacter*, and additional diarrheagenic *E. coli* was implemented in 2015.



Within the U.S., GEIS supports acute gastroenteritis clinic-based surveillance in U.S. military recruits through the NHRC. Over the past three years, NHRC has applied an enhanced pathogen screening protocol on diarrheal samples that previously tested negative for norovirus, *Salmonella*, *Shigella*, *Campylobacter*, and Enterotoxigenic *E. coli*. They found that 22 percent of the samples could be attributed to a pathogen in the enhanced screening panel (e.g., adenovirus, astrovirus, sapovirus), a significant improvement over prior years' rates (8.0 percent and 7.1 percent in FY13 and FY14, respectively). Given that more than 90 percent of acute diarrheal samples remain pathogen negative, advanced molecular characterization methods were optimized and used to identify potential etiologic causes of acute diarrhea. The ability to identify and understand the causes of acute gastroenteritis within the recruit population will facilitate development of targeted disease intervention policies, including development of pathogen-specific prophylactics.

Based on the need to improve identification of existing and emerging enteric pathogens, AFRIMS has worked on the optimization of polymerase chain reaction and sequencing methods to improve identification of Campylobacter species and differentiate them from closely related microorganisms such as Arcobacter spp. and Helicobacter spp. These results help identify potential under-recognized causes of acute diarrhea from *Campylobacter coli* and *Campylobacter jejuni*. Additionally, AFRIMS also developed a candidate diagnostic assay for salivirus detection to facilitate studies on the epidemiology and presentation of salivirus.

USAMRU-K's Microbiology Hub in Kericho, Kenya, provides enteric disease surveillance and clinical diagnostic support.

Respiratory Pathogens

The respiratory pathogen surveillance program monitors the incidence and types of pathogens that have a deleterious effect on U.S. military forces and global public health. The program identifies changes in circulating influenza virus subtypes and genotype strains, and assesses their impact on disease severity, transmissibility, and treatment and prevention effectiveness across time and geographic areas. The program also seeks to support the conduct of zoonotic influenza studies that elucidate its risk, transmission modes, and risk factors in the human–animal interface.

GEIS partners continue to detect emerging pathogens that may be of threat to force health protection. During the surge of human H5N1 infections in Egypt from November 2014 to May 2015, NAMRU-3 played a pivotal role as a regional Department of Defense H5 reference laboratory, providing avian influenza outbreak support to the government of Egypt by diagnosing human cases. Also, NAMRU-3's outbreak response included a rapid onsite genomic characterization of the surge virus. The gene sequencing evolution revealed noticeable drift in the virus, forming a distinct monophyletic group closely related to concurrent circulating H5 strain in commercial and backyard poultry in Egypt. NAMRU-3's assessment of the outbreak, including genomic characterization, concluded that the surge was not a result of re-introduction of a new strain, and the virus did not pose any increased threat in the country; as the virus remained susceptible to the neuraminidase class of drugs including Tamiflu® (the drug of choice), and virus associated mortality (31 percent) was below the global H5N1 mean mortality rate.

In collaboration with the CDC, GEIS, USAFSAM and AFHSB's E&A section worked to evaluate vaccine effectiveness for children specifically related to the live attenuated influenza vaccine (LAIV) used during the 2014–2015 influenza season. The findings of this study supported CDC's findings of low vaccine effectiveness for LAIV in children during the H1N1 dominated flu season.

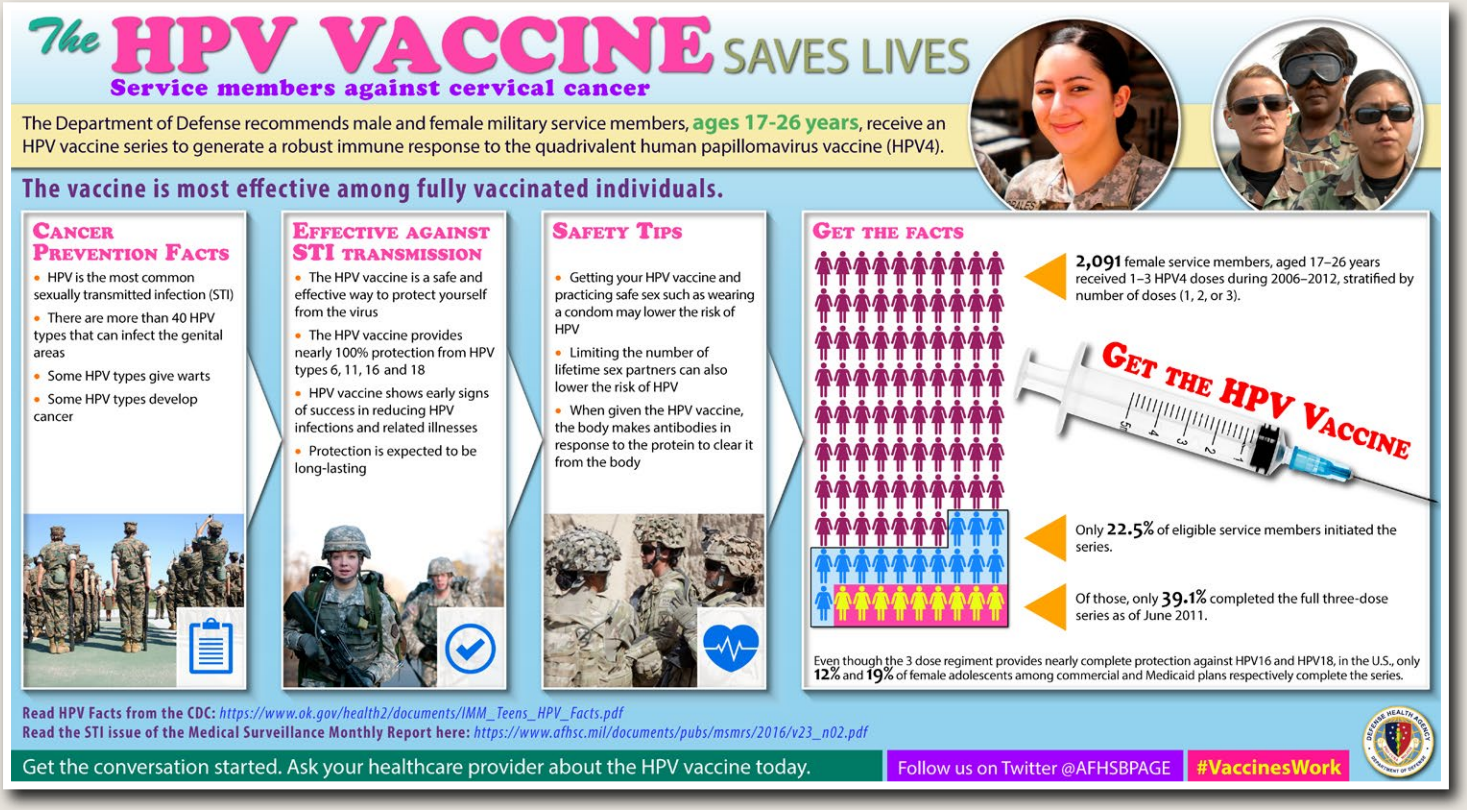
Middle East respiratory syndrome coronavirus (MERS-CoV) continues to be a threat in and near the Arabian Peninsula and for those traveling to and from these countries. In FY15, NAMRU-3 continued to leverage prior work toward developing a reliable and specific serologic assay to detect novel coronavirus antibodies in at-risk populations. NAMRU-3 continues to conduct surveillance for MERS-CoV, with the goal of early detection, in sentinel sites throughout Egypt. ▲

Sexually Transmitted Infections

GEIS continues to support surveillance of STIs of relevance to service members and associated populations. With a young adult population and frequent deployment of U.S. military personnel, STIs have a significant impact on military personnel. Chlamydia and gonorrhea are the two most commonly reported infections in the MHS. In recent years, GEIS has continued to broaden its STI surveillance worldwide due to the threat of antibiotic-resistant *Neisseria gonorrhoeae* (NG) as well as the recognition of human papilloma virus (HPV) and herpes simplex virus type 2 (HSV-2) as significant infections among military personnel. In FY15, surveillance and response efforts focused particularly on antibiotic-resistant NG, HPV, and HSV.

GEIS continued to support NG surveillance activities with Department of Defense U.S.-based and overseas laboratory partners and international military and civilian partners worldwide during 2015. Surveillance activities were conducted in at least 33 sites in eight countries: U.S. (six), Haiti (four), Peru (six), Honduras (one), Ghana (five), Kenya (seven), the Republic of Georgia (one), and Thailand (nine). Data continue to show widespread penicillin, tetracycline, and fluoroquinolone resistance, and potential emerging resistance to extended-spectrum cephalosporins and azithromycin in Ghana and Kenya.

GEIS continues to fund an enhanced laboratory NG strain reference capacity within the U.S. military with a Department of Defense Gonorrhea Reference Laboratory and Repository housed at USU, which was inaugurated in 2014. The repository will continue to allow U.S. military health officials to better monitor NG resistance worldwide in support of its mission in protecting military personnel and securing global health. These GEIS-sponsored NG drug resistance surveillance efforts continue to be coordinated with the CDC, the University of Washington's *Neisseria* Reference Laboratory as part of the Gonococcal Isolate Surveillance Project, and the World Health Organization's (WHO's) Gonococcal Antimicrobial Susceptibility Program in support of routine monitoring of NG strain resistance worldwide. ▲



CCMD Engagements

April 20–22, 2015: At the request of the U.S. Africa Command (AFRICOM), GEIS provided subject matter expertise and technical logistics support to the inaugural AFRICOM African Partners Outbreak Response Alliance Meeting in Accra, Ghana. Military members from 12 countries (Senegal, Cote d'Ivoire, Liberia, Ghana, Togo, Benin, Burkina Faso, Niger, Nigeria, Mali, Cameroon, and Gabon) and multiple U.S. organizations convened to discuss specific challenges associated with outbreak response, disease surveillance, risk communication, and laboratory capacities. Assessments of the performance of epidemic and pandemic preparedness and outbreak response initiatives by partner militaries were conducted for each country represented. This alliance is part of an ongoing effort that aims to reduce the risks of disease outbreak(s) through a reliable and validated response plan that includes detection, response and recovery.

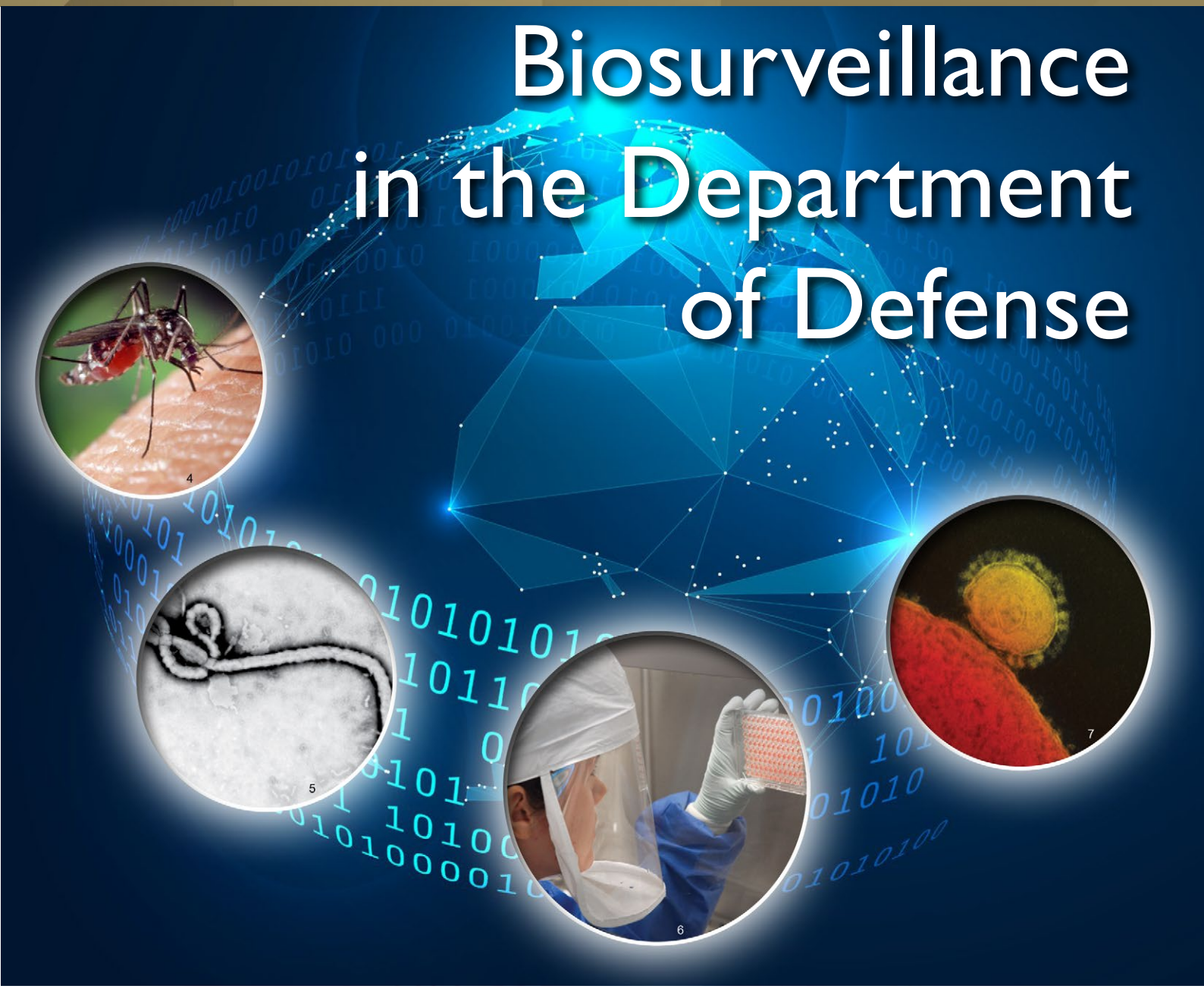
August 11–13, 2015: GEIS and AFRICOM co-hosted the second meeting of the AFRICOM African Partners Outbreak Response Alliance in Ouagadougou, Burkina Faso. Attendance included 45 participants from the U.S. agencies such as USAID, AFHSB, USAMRIID, USU's Center for Disaster and Humanitarian Assistance Medicine and NAMRU-3, the Burkina Faso Ministry of Health as well as military members from the 11 countries (Senegal, Cote d'Ivoire, Sierra Leone, Liberia, Ghana, Togo, Benin, Burkina Faso, Nigeria, Mali, and Gabon).

The meeting continued the efforts established during the inaugural meeting. Highlights included information exchange through a gap priority and assessment tool, summaries of the regional military's strengths and gaps in outbreak preparedness, disease surveillance, risk communication and laboratory capacities, and the launch of an established networking and communication plan for information sharing in between formal meetings. The ideas developed and discussed among military members, ministries of health representatives, and U.S. partners help continue the synergistic effort to better plan, prepare, and act in the face of an outbreak.

GEIS and AFRICOM co-hosted several CCMD events to provide subject matter expertise and technical logistics support to help African member countries improve their response to disease threats within their communities.

Military members, ministries of health representatives, and U.S. partners developed and discussed ideas to continue the synergistic effort to better plan, prepare, and act in the face of an outbreak.

Biosurveillance in the Department of Defense



Integrated Biosurveillance

AFHSB plays a key role in supporting, promoting, improving, and coordinating biosurveillance activities within the Department of Defense and across the interagency. AFHSB leadership, in coordination with OASD/HA, created the IB section in April 2012.

The driving U.S. government policy document on biosurveillance is the National Strategy for Biosurveillance, signed by President Barack Obama on July 31, 2012. This document urgently calls for a coordinated approach across all levels of government to achieve a well-integrated national biosurveillance enterprise. The U.S. Armed Forces promote health security by improving relations with partner nations, increasing overall global stability, and augmenting the situational awareness of health threats at all levels of government. Given this backdrop, federal officials determined that a robust framework to organize biosurveillance activities was required within the Department of Defense.

Biosurveillance in the Department of Defense focuses on awareness and understanding of the potential threats from EIDs and other hazards relevant to the military. The Health Affairs contribution to biosurveillance consists of force health protection and readiness, as well as comprehensive health surveillance. Department of Defense components conduct comprehensive military health surveillance using technologies, practices, and procedures in a manner relatively consistent across

the services. The gap, or challenge, is largely related to the coordination and integration of these efforts.

A key finding of the July 2010 USSTRATCOM Global Synchronization Conference was that there are multiple Department of Defense components, federal agencies, allies, and non-governmental organizations conducting biosurveillance with no single coordinating body to synchronize these activities. In early 2012, the Joint Staff, its Force Structure, Resources, and Assessment Directorate, and the Joint Requirements Office for Chemical, Biological, Radiological and Nuclear Defense conducted a Joint Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, Facilities, and Policy Change Request (JDCR) to document and implement non-material actions to improve the current Department of Defense biosurveillance capability. The completed JDCR resulted in a number of actions to be executed.

One action called for a joint baseline operational assessment (BOA) TTX that could elucidate the communication and information gaps existing between the disparate offices involved in Department of Defense biosurveillance. The biosurveillance BOA was held at USSTRATCOM headquarters in February 2014, and it was attended by a dozen major Department of Defense offices with more than 100 participants. The outcome of the BOA TTX was an official report from STRATCOM that highlighted the strengths and weaknesses in the current Department of Defense biosurveillance framework.

The need for a common Department of Defense biosurveillance lexicon was one of the most important findings of the BOA. This is being addressed through a new Department of Defense Instruction (DoDI) for Biosurveillance. The IB team is the lead office for drafting and coordinating the DoDI with the Office of the Assistant Secretary of Defense for Nuclear, Chemical, and Biological Defense Programs (OASD(NCB)), Office of the Undersecretary of Defense for Intelligence (OUSD(I)), OASD(HA), Office of the Undersecretary of Defense for Policy (OUSD Policy), and the individual service branches. The biosurveillance DoDI will be the official road map for how biosurveillance is conducted within the Department of Defense. It is currently in the draft stages and is due to be published in 2016.

IB staff members have a wide variety of skills in the fields of infectious disease epidemiology, preventive medicine, family medicine, veterinary epidemiology, and occupational and environmental health. The staff lends its expertise by collaborating with many other offices in the Department of Defense, as well as external U.S. government agencies. Those agencies include the White House National Security Staff and Office of Science and Technology Policy, the Department of Homeland Security's Science and Technology Directorate and Office of Health Affairs, OUSD Policy, and the Office of the Joint Staff.

IB continues to engage with its Department of Defense and interagency partners to be the focal point for biosurveillance information in the Department of Defense with the following objectives:

- Help AFHSB accomplish its mission of comprehensive health surveillance for the Department of Defense
- Augment existing Department of Defense biosurveillance capabilities to meet the needs of the Geographic Combatant Commands and other Department of Defense components
- Reduce fragmentation and synchronize biosurveillance efforts across Department of Defense programs
- Provide near real-time surveillance situational awareness for Department of Defense customers
- Provide a resource within the Department of Defense to link medical, public health, and medical intelligence data.

IB is primarily organized into two offices: Office of Alert and Response Operations (ARO) and Office of Innovation and Evaluation (IE).

ARO monitors biosurveillance data sources and communicates routinely with Department of Defense, U.S. government interagency, and non-governmental and international partners to detect and report all-hazard events (e.g., emerging and re-emerging infectious diseases, environmental incidents) relevant to the health of all Department of Defense personnel, including dependents and beneficiaries. ARO develops timely and relevant products based on the data and information; provides expertise on issues relevant to the health of Department of Defense populations; and coordinates information gathering and resource leveraging, as available. ARO disseminates information through various communication channels depending on urgency.

ARO FY15 accomplishments include:

- Producing and distributing 236 disease-specific surveillance summaries on topics, including avian influenza A (H7N9), MERS-CoV, chikungunya in the Caribbean, the Ebola outbreak in West Africa, dengue in Japan, and EV-D68
- Developing fully unclassified Section 508–compliant versions of surveillance summaries to place on the AFHSB website

and share with non-governmental organizations and foreign nations

- Producing and distributing 14 executive summaries and 29 spot reports for relaying quick information on topics including the WHO Emergency Committees, MERS-CoV, polio, several types of influenza, chikungunya, Zika virus, severe fever with thrombocytopenia syndrome-unaccompanied migrant children at the U.S. border, migrant influx into Europe, measles, and other events
- Researching, writing, and presenting weekly reports on current health events being tracked, RMEs, and global health items of interest
- Developing a pair of animated maps for our website on the outbreaks of chikungunya in the Western Hemisphere and Ebola in West Africa
- Creating an award-winning interactive web map of the highly pathogenic avian influenza outbreaks in North America in 2014–2015
- Participating on the steering committee of the Biosurveillance Indications and Warnings Analytic Community (BIWAC) with interagency partners. BIWAC manages the WILDFIRE web-based discussion portal for relaying and requesting information from U.S. government sources. In FY15, ARO posted nine queries and made two responses on disease-specific topics
- Developing up-to-date guidance for detecting and reporting chikungunya, Ebola, H7N9, and MERS-CoV. ARO distributed this guidance to our partners and it is available at www.health.mil/AFHSB
- Answering numerous requests for information on specific diseases as well as laboratory testing information and processes for detecting and reporting specific diseases
- Participating in the ABLE Response 2015 exercise in the Republic of Korea with ARO's Chief participating in country as a subject matter expert
- Supporting CCMD exercises as a subject matter expert at U.S. European Command's Medical Readiness Exercise, U.S. Central Command's Eager Lion, and U.S. Strategic Command's Biosurveillance Warfare Table Top Exercise
- Participating in interagency policy committees, including the Biosurveillance Sub-Interagency Policy Committee, the Biological Defense Research and Development Subcommittee, and the Foreign Animal Disease Threats Working Group
- Collaborating daily with the Department of Homeland Security's National Biosurveillance Integration Center on health events. Those interactions included participating in their daily and weekly working calls and quarterly meetings, and helping to create and distribute a global Ebola Persons under Investigation Report issued daily to the White House during the height of the outbreak
- Presenting several posters on ARO activities at four scientific meetings; two on chikungunya, one on MERS, and one on the ARO biosurveillance process.

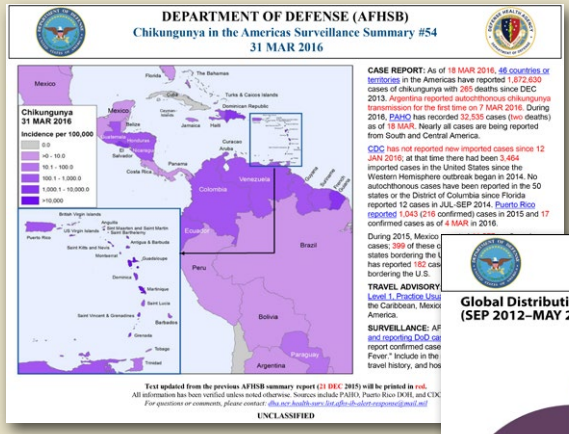
The Office of IE assesses biosurveillance needs through evaluation and consultation on the use of existing and potential development of new biosurveillance systems, data, and data sources. Within IE, the Epidemiology Investigations team provides expertise and coordination for large scale public health investigations and consultations that utilize the expertise of AFHSB's other divisions and collaboration among partners within the interagency such as the CDC, WHO, U.S. Department of Homeland Security, U.S. Department of Agriculture, other Department of Defense organizations, and non-government U.S. organizations.

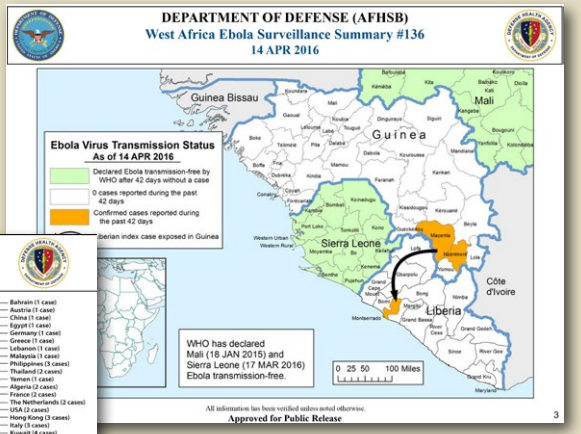
IE's FY15 accomplishments include:

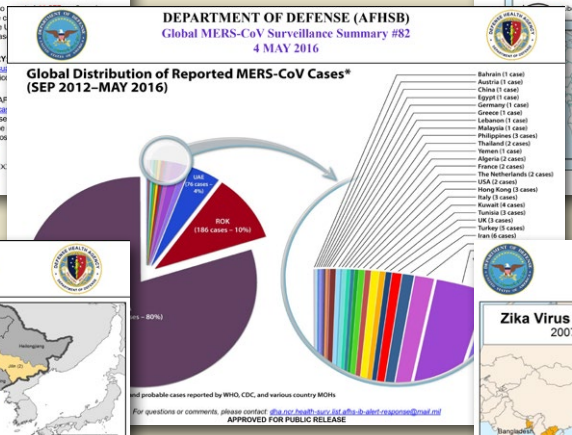
- Creating and piloting tools and conducting technical assessments to improve real-time biosurveillance capabilities at AFHSB, including a browser-based tool to pull and visualize open-source disease case counts from ministry of health disease websites; a browser-based tool to visualize RME data and outpatient data from the DMSS; a developmental tool to extract Department of Defense outpatient data from the CDC National Syndromic Surveillance Platform environment and automatically display disease and syndrome trends; and evaluation of AFHS data quality and usefulness (e.g., investigation of coding errors and mapping of codes across the transition from ICD-9 to ICD-10)
- Achieving substantial progress in enhancing the Department of Defense Electronic Surveillance System for the Early Notification of Community-based Epidemics (ESSENCE), including an analysis of alternatives in coordination with DHA and multiple live demonstrations of an alternative (civilian) version of ESSENCE for service and DHA public health personnel, resulting in a recommendation of the Defense Electronic Medical Surveillance Systems Advisory Working Group to implement civilian ESSENCE for a comprehensive evaluation; coordination across services to define DHA ESSENCE investment requirements; and collaboration on CDC civilian ESSENCE evaluation and training as a step

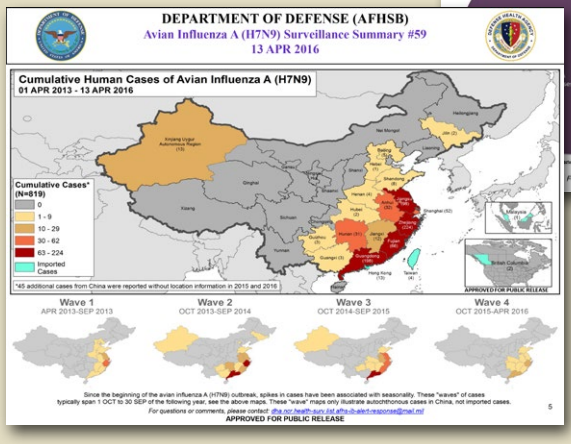
toward joint Department of Defense and CDC implementation

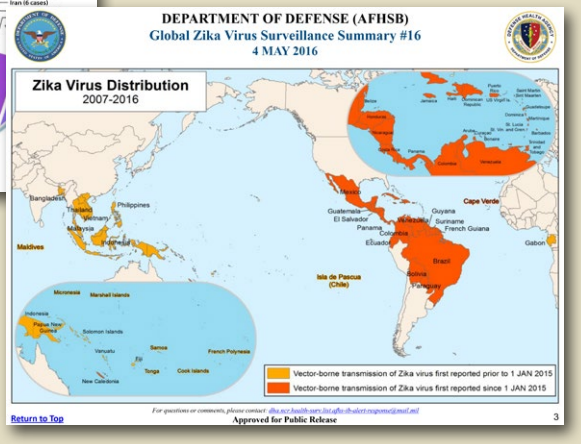
- Serving as the primary Department of Defense source of public health expertise in the DoD–Defense Threat Reduction Agency Biosurveillance Ecosystem development effort by coordinating technical-functional collaboration discussions; and providing feedback on the practical utility of analytic apps, data visualization apps, and possible improvements to analyst workflow
- Advancing the operational use of epidemiologic modeling and forecasting by helping to lead the development of a national strategy for infectious disease forecasting on the interagency Pandemic Prediction and Forecasting Science and Technology Working Group of the White House's National Science and Technology Council); and leading a collaboration with Department of Defense and interagency partners to develop and distribute a periodic forecasting/risk communication product for climate-sensitive infections globally
- Leading and contributing to scholarly activities to advance the field of biosurveillance, including analysis for an AFHSB study on geographic variation of gastrointestinal illness incidence among MHS users; a panel for the International Society for Disease Surveillance's R Group for Disease Surveillance; presentations on event-based surveillance evaluation and epidemiological forecasting at the Digital Disease Detection conference; analysis of all ~1,000 infectious disease cases recorded in the Department of Defense Telemedicine and Teleconsultation Program to inform training curricula for military medical personnel and peer-reviewed papers on DoD-VA biosurveillance integration, climate change implications for force health protection, El Niño impacts on global infectious disease risks, and quantitative forecasting and modeling of the 2014–2015 West Africa Ebola epidemic
- Serving on WHO expert advisory committees for emerging infectious disease vaccine investment prioritization and establishment of new global norms for data-sharing during public health emergencies.











Spreading the News on Medical Surveillance

AFHSB Publications

Publications and presentations are used to communicate important findings and occurrences to peers and policymakers, to archive data and information for future reference, and to teach resident physicians and developing scientists. AFHSB staff and partners are strongly encouraged to submit the results of their work to professional meetings and journals, particularly those that are peer reviewed, and to use the development of abstracts, oral presentations, posters, and manuscripts as teaching vehicles. Each year, AFHSB partners submit proposals for collaboration and these usually provide the background and the basis for the development of internal reports, abstracts, and manuscripts.

In 2014, AFHSB staff and GEIS partners prepared and published manuscripts in peer-reviewed journals and posters for international and national conferences. These papers and presentations helped further our understanding of the risk regarding disease transmission and severity, as well as disease prevention. AFHSB reports and publications may be viewed at www.health.mil/AFHSB.

A large number of AFHSB projects and protocol studies are initiated in response to specific questions or needs for data. Many of these projects are done by junior staff members with supervision by senior managers.

Because some of the work done by the AFHSB staff is of great interest to Department of Defense and other government agencies, AFHSB staff are encouraged to consider submission of selected reports to the Defense Technical Information Center, which serves the Department of Defense community as a central resource for scientific and technical information. ▲

FY15 GEIS and GEIS Partner Publications

The following is a partial list of articles published by the staff of GEIS and its partner network in FY15:

1. Blackburn JK, Diamond U, Kracalik IT, et al. Household-level spatiotemporal patterns of incidence of cholera, Haiti, 2011. *Emerg Infect Dis.* 2014;20(9):1516–1519.
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5. Obenauer PJ, Wright JA, Diclaro J. Malaria capacity building in Liberia: The U.S. Navy joins forces to defeat a deadly foe. *Wing Beats*. 2014;25:25–29.
6. Rahman M, Jubair M, Alam MT, et al. High-frequency rugose exopolysaccharide production by *Vibrio cholerae* strains isolated in Haiti. *PLoS One*. 2014;9(11):e112853.
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16. Odhiambo AM, Maina AN, Taylor ML, Jiang J, Richards AL. Development and validation of a quantitative real-time polymerase chain reaction assay specific for the detection of *Rickettsia felis* and not *Rickettsia felis*-like organisms. *Vector Borne Zoonotic Dis*. 2014;14(7):476–481.
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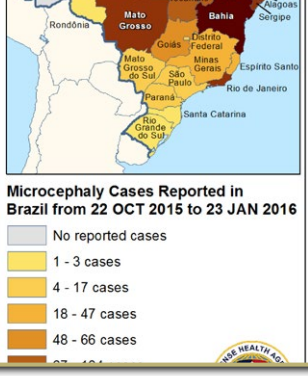
Acronyms

AFHSB	Armed Forces Health Surveillance Branch
AFHSC	Armed Forces Health Surveillance Center
AFRICOM	U.S. Africa Command
AFRIMS	U.S. Army Armed Forces Research Institute of Medical Sciences
AMR	antimicrobial resistance
AMSA	Army Medical Surveillance Activity
ARI	acute respiratory illness
ARO	Alert and Response Operations
AST	antimicrobial susceptibility testing
BIWAC	Biosurveillance Indications and Warnings Analytic Community
BOA	Joint Baseline Operational Assessment
CCMD	Combatant Command
CDC	Centers for Disease Control and Prevention
CRE	carbapenem-resistant Enterobacteriaceae
DASD	Deputy Assistant Secretary of Defense
DHA	Defense Health Agency
DMED	Defense Medical Epidemiology Database
DMTS	Data Management and Technical Support
DMSS	Defense Medical Surveillance System
DoD-GEIS	Department of Defense Global Emerging Infections Surveillance and Response System
DoDI	Department of Defense Instruction
DoDSR	Department of Defense Serum Repository
DoD-VA	United States Department of Veterans Affairs
E&A	Epidemiology and Analysis division
EID	emerging infectious disease
ESKAPE	Enterobacter spp., *Escherichia coli*, vancomycin-resistant Enterococcus, Klebsiella spp., Acinetobacter spp., Pseudomonas spp., and *S. aureus*
ESSENCE	Electronic Surveillance System for the Early Notification of Community-based Epidemics
EVD	Ebola virus disease
EV-D68	enterovirus-D68
FVBI	febrile and vector-borne illness
GEIS	Global Emerging Infections Surveillance and Response System
HA	Health Affairs
HAI	healthcare-associated infection
HIV	human immunodeficiency virus
HPV	human papilloma virus
HSV	herpes simplex virus
HSV-2	herpes simplex virus type 2
H7N9	avian influenza A
IB	Integrated Biosurveillance division
ICD-10-CM	International Classification of Diseases, 10th Revision, Clinical Modification
ICD-9-CM	International Classification of Diseases, 9th Revision, Clinical Modification
IE	Office of Innovation and Evaluation
ILI	influenza-like illness
JDCR	Joint Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, Facilities, and Policy Change Request
LAIV	live attenuated influenza vaccine
LIBR	Liberia Institute of Biomedical Research
MCRD-PI	Marine Corps Recruit Depot, Parris Island
MCRD-SD	Marine Corps Recruit Depot, San Diego
MERS-CoV	Middle East respiratory syndrome coronavirus
MHS	Military Health System
MRSN	Multidrug-resistant Organism Repository and Surveillance Network
MSMR	*Medical Surveillance Monthly Report*
NAMRU-3	Naval Medical Research Unit 3
NAMRU-6	Naval Medical Research Unit 6
NAMRU-A	Naval Medical Research Unit–Asia
NDAA	National Defense Authorization Act
NG	*Neisseria gonorrhoeae*
NHRC	Naval Health Research Center
NMPHC	Navy and Marine Corps Public Health Center
NMRC	Naval Medical Research Center
NMRC- A/ NMRC-Asia	Naval Medical Research Center–Asia
OASD/FHP&R	Office of the Deputy Assistant Secretary of Defense for Force Health Protection and Readiness
OASD/HA	Office of the Assistant Secretary of Defense for Health Affairs
OASD/NBC	Assistant Secretary of Defense for Nuclear, Chemical and Biological Defense Programs
OCONUS	outside the contiguous United States
OUSD(I)	Office of the Undersecretary of Defense for Intelligence
OUSD Policy	Office of the Undersecretary of Defense for Policy
P&I	pneumonia and influenza
PTSD	post traumatic stress disorder
RAP	Request Approval Process
REMR	Reportable Events Monthly Report
RME	reportable medical event
RSV	respiratory syncitial virus
SAGES	Suite for Automated Global Electronic BioSurveillance
SMS	Surveillance Methods and Standards
STI	sexually transmitted infection
TBI	traumatic brain injury
TMDS	Theater Medical Data Store
TMDS-MEDS	Theater Medical Data Store Medications
TRADOC	United States Army Training and Doctrine Command
TTX	tabletop exercise
USAFSAM	U.S. Air Force School of Aerospace Medicine
USAID	U.S. Agency for International Development
USAMRIID	U.S. Army Medical Research Institute of Infectious Diseases
USAMRU-G	Republic of Georgia
USAMRU-K	U.S. Army Medical Research Unit–Kenya
USAPHC	U.S. Army Public Health Command
USU	Uniformed Services University of the Health Sciences
USSTRATCOM	U.S. Strategic Command
VDB	Viral Diseases Branch
VIM	Verona integron-encoded metallo-β-lactamase
VHF	viral hemorrhagic fever
WHO	World Health Organization
WRAIR	Walter Reed Army Institute of Research



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