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LETTER FROM THE CHIEF

DOUGLAS A. BADZIK, MD, MPH, COL, MC, USA
Chief, Armed Forces Health Surveillance Branch

FRIENDS AND COLLEAGUES

The Armed Forces Health Surveillance Branch (AFHSB) is in its fourth year of existence as part of the Defense Health Agency (DHA), and I continue to take pride in our team’s accomplishments in solidifying DHA’s role as a Combat Support Agency (CSA) and providing the military services and the Military Health System (MHS) with sound epidemiologic data to improve the health and readiness of all service members.

Our success is a testament to the hard work of the over 100 staff members at our four sections and three Military Service-aligned satellites. We continue to build upon the successes of the past as we support the military public health transition for the DHA and its Public Health Directorate, refine our role as a CSA, and establish our ability to provide value to the MHS.

HIGHLIGHTS FROM 2018 INCLUDE THE FOLLOWING:

The AFHSB’s Integrated Biosurveillance (IB) section continued to expand on its critical support of the Combatant Commands (CCMDS) with the establishment of a unique Health Surveillance Explorer (HSE) mapping capability, which is able to provide the CCMDS, the Joint Staff, the Military Services, and other MHS public health leadership with near real-time global health surveillance and awareness of outbreaks of operational significance worldwide. This web-based mapping capability has been expanded to provide IB’s customers, particularly the CCMDS, the ability to visualize important details on military-relevant diseases and other medical events/outbreaks. This capability provides CCMDS’s and medical planners with medical threat information “at the tips of their fingers” in a reliable fashion, making possible DHA’s fourth goal to “Deliver Globally Integrated Health Solutions to Combat Forces.” The establishment of the HSE mapping platform addresses an important gap that the CSA Review Team (CSART) 2018 report identified—the clear need for a “one-stop shop” for biosurveillance information that is curated, timely, military-relevant, and presented in a quick and easily understandable format for force health protection (FHP) decision makers.

The IB section has also begun to engage on an “Influenza Forecasting Challenge” initiative in coordination with the Defense Threat Reduction Agency (DTRA), U.S. Centers for Disease Control (CDC), the National Institutes of Health (NIH), and academic centers across the United States (such as Columbia, Carnegie Mellon, University of Virginia, University of Georgia, University of Massachusetts, University of Arizona and Predictive Science, Inc.). In this important collaboration, each group will be provided with seasonal Department of Defense (DoD) location-specific influenza data from 28 military treatment facility (MTFs) in order to generate models and influenza spread for the 2019–2020 influenza season. These models will forecast the onset, peak week, and influenza burden at these CONUS MTFs, and these forecasts will be scored and ranked according to how accurately they predict the targets. As these forecasts continue to improve, they will be used to inform senior leaders during the influenza season as well as during a pandemic.

The AFHSB’s Epidemiology and Analysis (E&A) section continued to provide top-notch, high-quality support to the DoD leadership with production of a broad range of epidemiologic surveillance reports and public health consultation support to MHS officials, completing over 1,400 epidemiologic analytical ad hoc and routine reports in support of the Military Services and the CCMDS. These 2018 reports were highlighted by the publication of the annual burden of disease analyses in the *Medical Surveillance Monthly Report* (MSMR), a publication with over 1,200 subscribers and the DoD’s only MEDLINE-searchable journal, as well as by the analysis of acute respiratory infections as part of the “Warfighter Respiratory Health Report” to Congress detailing the scope and impact of respiratory illnesses on military personnel — particularly on deployed troops – dating from the first Gulf War (1990) through the end of 2018. Of note also, the E&A staff continued to provide analyses and subject matter expertise for AFHSB’s “DoD Seasonal Influenza Surveillance Summary” which contains CCMD-specific weekly analyses of the influenza activity among MHS beneficiaries.

Our Global Emerging Infections Surveillance (GEIS) section continued to expand DoD’s worldwide infectious disease surveillance footprint by providing timely, actionable infectious disease threat information to force readiness in CCMD areas of responsibilities (AORs) by synchronizing projects with other United States Government (USG) interagency partners in coordination meetings in order to reduce duplication of efforts and address gaps in its surveillance efforts. Additionally, GEIS’ continued full engagement with CCMDS in the “Data-to-Decision” initiative to rapidly get infectious disease surveillance data from the field into the hands of decision makers such as CCMDS has resulted in further protection of the health of the force and improvements to its readiness. This large effort consisted of the provision of spot reports and routine monthly updates containing new findings for approximately 170 completed surveillance projects. In addition, it is noteworthy to mention that GEIS continued to expand global infectious disease surveillance by including the North Atlantic Treaty Organization (NATO) partner nations in order to more fully integrate disease surveillance initiatives with partner militaries in support of Joint/Combined Force deployments in the U.S. European Command (EUCOM) and U.S. Africa Command (AFRICOM) AORs.

One notable accomplishment this past year was GEIS program support to the World Health Organization (WHO), CDC, and the U.S. Food and Drug Administration (FDA)’s 2019–20 influenza strain selection. In this role, GEIS provided worldwide geographic and region-specific influenza surveillance and genetic sequencing information on over 700 influenza strains. This massive effort was critical in ensuring that the Northern Hemisphere’s seasonal influenza vaccine composition was as close as possible to the expected prevailing circulating strains for the upcoming influenza season.

As you read AFHSB’s annual report, we hope it will continue to remind you of our recent successes and the future path that we will take to ensure our mission in 2020. We look forward to continuing this tireless effort in support of the Joint Force in order to fulfill the ultimate goal of helping the CCMDS and the Military Services make the best decisions in protecting the health and readiness of DoD’s military and beneficiaries.
VISION
To be the central, integrated, customer-focused epidemiologic and global health surveillance resource for the Department of Defense.

MISSION
To provide timely, relevant, actionable, and comprehensive health surveillance support to the Joint Staff, Combatant Commands (CCMDs) and Military Services in order to promote health and enhance Force Health Protection, Readiness and Lethality.

CRITICAL FUNCTIONS:
• Acquire, analyze/interpret, and disseminate health surveillance 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.
THE ORIGINS OF AFHSB

The AFHSB is the central epidemiologic health surveillance resource for the U.S. military. The branch operates within DHA’s Public Health Directorate under the Assistant Director for Combat Support.

AFHSB was created in February 2008 as the Armed Forces Health Surveillance Center following the merger of the Army Medical Surveillance Activity’s Defense Medical Surveillance System (DMSS) with DoD Serum Repository (DoDSR), the DoD 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.

As the central repository of medical surveillance data for the U.S. Armed Forces, AFHSB manages the DMSS and the DoDSR. The DMSS contains current and historical data on diseases and medical events such as hospitalizations, ambulatory visits, reportable medical events (RMEs), laboratory tests, immunizations, periodic and deployment-related health assessments, and casualty data affecting service members throughout their military careers. The DMSS contains billions of data records on service members and other MHS beneficiaries.

The DoDSR was established in 1989 to store sera collected during the DoD’s testing program for human immunodeficiency virus (HIV) infections. Later, the DoDSR was designated to receive serum specimens collected before and after operational deployments. With more than 66 million serial serum specimens from over 11 million individuals, the DoDSR is the world’s largest serum repository of its kind.

In 1997, the DoD established DoD-GEIS in response to a Presidential Decision Directive to expand its mission to include support of global surveillance, training, research, and response to emerging infectious disease (EID) threats. 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, enteric infections, febrile and vector-borne infections (FVBI), and antimicrobial-resistant organisms. The AFHSB also plays a key role in integrating biosurveillance by collecting data and information in near real-time of the threats from endemic diseases 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, MSMR. AFHSB also provides up-to-date information on diseases that could affect force health readiness and protection.

AFHSB also assumed responsibility of the health surveillance capabilities of the Service Public Health Hubs, which include personnel from the U.S. Army Public Health Center (APHC), 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), E&A, GEIS, and IB.
HISTORY OF AFHSB

AFHSB ORGANIZATIONAL STRUCTURE

CUSTOMERS AND STAKEHOLDERS

CCMDs; CONUS Labs; NAMRU-2; NAMRU-3; NAMRU-6; AFRIMS; USAMRU-K; USAMRU-G; Interagency; Multiple Others

CCMDs; USFK; OASD[HA]; Services; WRAIR; NMRC; NHRC; USU; CONUS Labs; Multiple Others

CCMDs; Services; NCM; JPEO-CBD; OASD(NCB); DHS; CDC/HS; Other USG Interagency

AFHSB Satellites

AFHSB

Other USG

Epidemiology & Analysis (DMSS/DoDSR)

GEIS

Integrated Biosurveillance

Services

JCS (JSS)
AFHSB FINANCES

AFHSB distributed 77.2% of its funds directly to laboratory partners through the GEIS program following an extensive internal and external proposal review process.

Funding recipients included the Army and Navy overseas laboratories such as the US Army Medical Directorate of the Armed Forces Research Institute of Medical Sciences (USAMD-AF-RIMS) U.S. Army Medical Research Directorate-Georgia (USAMRD-G); U.S. Army Medical Research Directorate-Kenya (USAMRD-K), and Naval Medical Research Center Unit No. 2, 3, and 6 (NAMRU-2, NAMRU-3, and NAMRU-6, respectively). Several CONUS-based military and university partners including the Naval Medical Research Center (NMRC), Naval Health Research Center (NHRC); USAFSAM; NMCPC; Walter Reed Army Institute of Research (WRAIR); and Uniformed Services University of the Health Sciences (USU) among others also received funding in support of their robust programs that benefit the DoD and partners. The remaining funds supported various AFHSB sections and headquarters as well as biosurveillance initiatives, comprehensive health surveillance service and support contract staff, contract personnel working with the MSMR and the DoDSR, and other infrastructure costs.

FY18 DISTRIBUTION OF GEIS FUNDING FOR SURVEILLANCE

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THE ELEMENTS OF MILITARY MEDICAL SURVEILLANCE
THE ELEMENTS OF MILITARY MEDICAL SURVEILLANCE

TOOLS OF SURVEILLANCE

The DMSS and DoDSR are longstanding and vital assets to medical surveillance within the U.S. Armed Forces. 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 it in a continuously expanding longitudinal surveillance database for all individuals who have served in the military since 1990. DMSS records are maintained on person, place, and time of reference. Through traditional epidemiologic practices, users can mine the data for efficient and powerful analyses of morbidity among service members. With more than 3 billion data records, including more than 1 billion records on U.S. service members alone, the DMSS remains the DoD’s premier epidemiologic health surveillance resource.

The Defense Medical Epidemiology Database (DMED) is derived from the DMSS, providing select data that are de-identified and remotely accessible to online users. The purpose of DMED is to provide standard epidemiologic methodology used to analyze active duty personnel and medical event data. DMED is available to authorized users—including U.S. military medical providers, epidemiologists, medical researchers, safety officers, and medical operations and 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 access DMED.

The DoDSR specimens are housed in modern freezers with advanced cooling equipment and technology. The DMSS database stores demographic, occupational, and medical information in longitudinal surveillance and records links to the DoDSR specimens. It is a unique and powerful resource to support the conduct of military medical surveillance, clinical care, and seroepidemiologic investigations. During 2018, AFHSB processed and dispensed more than 20,500 aliquots of serum specimens in support of 30 seroepidemiologic studies and analyses.

Of these studies, seven were for clinical needs, eight were operational, and the remaining 15 were in support of research studies, including a study examining alpha-1 acid glycoprotein and its role in the neuropsychiatric side effects of mefloquine, an analysis regarding biomarkers, and biomechanics associated with injury-mediated osteoarthritis, a spectroscopic serum analysis of biomarkers in oropharyngeal squamous cell carcinoma, and an analysis of tick-borne febrile illness in a cohort of U.S. Military Academy cadets.
THE ELEMENTS OF MILITARY MEDICAL SURVEILLANCE

DMSS STRUCTURE AND FUNCTIONAL RELATIONSHIP

**Personnel Data**
- **Active Duty**
  - Since 1990
  - 8.1 million persons
  - 109 million records
- **Reserve Component**
  - Since 1990
  - 3.3 million persons
  - 39.6 million records
- **Active Duty Casualty**
  - Since 1980
  - 57,766 records
- **Military Entrance Processing Stations**
  - Since 1985
  - 15.2 million persons
  - 37.4 million records

**Medical Data**
- **In-patient**
  - Since 1990
  - 21 million records
- **Ambulatory**
  - Since 1996
  - 2.85 billion records
- **Reportable Events**
  - Since 1995
  - 752,544 records
- **Immunizations**
  - Since 1980
  - 146 million records
- **Prescription Data**
  - Since 2014
  - 76.3 million records
- **Periodic Health Assessments**
  - Since 2017
  - 1.6 million records

**Laboratory Data**
- **Serologic Specimens**
  - Since 1985
  - 11.3 million persons
  - 66.5 million specimens
- **Chemistry**
  - Since 2010
  - 363 million records
- **Microbiology**
  - Since 2010
  - 39.9 million records

**Deployment Data**
- **Deployment Rosters**
  - Since 1990
  - 6.8 million records
- **Pre- and Post-Deployment Health Assessments**
  - Since 1994
  - 15,232,314 surveys
- **Theater Medical Data**
  - INPT/Ambulatory (TMDS)
    - Since 2008
    - 7,848,870 records
  - Meds (TMDS-MEDS)
    - Since 2008
    - 11,270,072 records

**DMSS**
- Remote access to DMSS data
  - (non-Privacy Act only)

**DMED**
- Hospitalization Queries
- Ambulatory Queries
- Reportable Events Queries
- Personnel Data Queries

Services of the Armed Forces Health Surveillance Branch

Current as of February 2019
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 DoD policymakers, military commanders, healthcare providers, public health officers, and researchers.

In addition, E&A staff analyze and interpret large data sets, 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 DoD 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 members prepare analyses under two general categories: periodic reports and ad hoc requests. In 2018, the section supported several ad hoc requests for data analyses and distributed hundreds of periodic reports throughout the DoD. These ad hoc requests 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. Ad hoc requests and periodic reports have helped Defense Department policymakers shape their FHP programs and healthcare professionals develop preventive measures against diseases or injuries affecting U.S. service members and their beneficiaries.

For example, E&A staff provided analyses and subject matter expertise for AFHSB’s Seasonal Influenza Surveillance Summary report during the influenza season. This report contains weekly summaries of influenza activity among MHS beneficiaries by CCMD. The influenza report highlights data about outpatient medical encounters for influenza-like illness (ILI), mandatory reports about cases of influenza hospitalizations, and ancillary services data on laboratory test results provided by the NMCPHC to assess weekly influenza activity in the Defense Department.

Another report, the U.S. Central Command (CENTCOM) Deployment Health Report, is produced quarterly for its Surgeon’s Office. “This report provides data on medical encounters that occurred in CENTCOM starting in 2008 through the 15 months before the report is run. These data are grouped by disease and injury categories. Additionally, the report provides extensive data on medical air transports (MATs) out of CENTCOM reported by month starting in October 2001. The MAT data are provided by disease, battle, and non-battle injury categories and by specific areas of interest, such as musculoskeletal issues and mental health disorders and other most common diseases. MAT data are provided on both service members and civilian/contractors who are deployed to CENTCOM. The report was updated in 2018 to incorporate newly mapped disease and injury categories and International Classification of Disease, 10th revision (ICD-10) codes.

During 2018, E&A supported requests for analyses on trends of diseases and injuries that are considered to be of special interest by military leaders at the CCMDs. E&A, for example, produced responses for two ad hoc requests by CENTCOM on influenza-like illness in specific countries in the Command’s area of responsibility, updated and improved the disease non-battle injury mappings that are used for a quarterly CENTCOM report, and supported a request from the U.S. Army Forces Command (FORSCOM) for an investigation of suicidal behaviors among Army Service members.

In 2018, E&A completed four analyses in response to congressional inquiries. The staff provided the data and analysis for a study on the health of tilt-rotor pilots in response to a requirement in the fiscal year (FY) 2017 National Defense Authorization Act (NDAA) (more details below). Additionally, the staff conducted an analysis of eating disorders among active component service members at the request of the Congressional Research Service. E&A supported the Senate Armed Services Committee request for data on heat illnesses between 2013–2017 and provided data on contraceptive use among service members for a Congressional briefing to Senator Jeanne Shaheen.

As part of the inquiry regarding the health of helicopter and tilt-rotor pilots mentioned above, a working group between the military services and E&A was convened to develop the study, interpret the results, and conduct a comprehensive literature review on the topic. The epidemiologic retrospective cohort study evaluated 31 acute and chronic medical conditions including injuries and mental health, metabolic, neurologic, orthopedic, and respiratory conditions among.

E&A also continued to support the DoD’s efforts to address former Vice President Joe Biden’s Cancer Moonshot initiative. This initiative aims to accelerate cancer research and make additional therapies available to patients while also...
THE ELEMENTS OF MILITARY MEDICAL SURVEILLANCE

improving the ability to prevent cancer and detect it at an early stage. E&A provided epidemiologic guidance, DoDSR specimens, and accompanying data from the DMSS to assist the Walter Reed National Military Medical Center’s John P. Murtha Cancer Center in the design and implementation of two additional studies in support of this effort. One study will try to identify genomic and spectroscopic serum biomarkers among diffuse large B-cell lymphoma cases. The other study will be a molecular study of the DoDSR specimens for melanoma cases.

The E&A section also continued to collaborate with other federal partners such as CDC and the FDA in 2018. E&A’s work with CDC included reporting potential malaria cases among service members to be included in CDC’s National Malaria Surveillance System. E&A, in collaboration with the GEIS section, the AFHSB’s Air Force satellite, and the NHRC provided the FDA with evaluation of influenza vaccine effectiveness (VE) analyses. Additionally, in conjunction with GEIS, E&A assisted with the study design and provided data and specimens for two FDA studies evaluating influenza correlates of protection and the effects of multiple annual influenza vaccinations on immune responses.
### FY18 AFHSB Periodic Reports in One Year

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<td>DD2900 Referral Management Report</td>
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<td>MHA Count Report</td>
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<td>Deployment Health Compliance Report</td>
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<td>Deployment Health Report</td>
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<td>Deploy Form Summary Report</td>
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<td>FHPQA TBI</td>
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<td>MSMR Deployment Health Assessment Summary</td>
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<td>Army ILL Trend Report</td>
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<td>IB Flu Forecasting Challenge Report</td>
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<td>Influenza Surveillance Report</td>
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<td>VA Influenza Surveillance Report</td>
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<td>Army Heat and Cold Weather Injury Report</td>
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<td>TRADOC Injuries by Training Cycle</td>
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<td>Army Satellite Injury Report</td>
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<td>Gender Integrated Units Person Time</td>
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<td>Army Injury&amp;Overuse Report</td>
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<td>DoD Eye Injury Annual Report</td>
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<td>DoD Eye Injury Quarterly Report</td>
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<td>DoD Hearing Injury Annual Report</td>
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<td>DoD Hearing Injury Quarterly Report</td>
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<td>USASOC Special Reportable Events (Semi-Annual)</td>
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<td>Separatee Screening Compliance</td>
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<td>Health Affairs (HA) Mental Health Report</td>
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<td>Health Affairs (HA) PTSD Report</td>
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<td>ANAM Report</td>
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<td>PHA Tobacco Use Report</td>
</tr>
<tr>
<td>IB RME Weekly Report</td>
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<tr>
<td>EUCOM RMES Monthly Summary</td>
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<td>Smallpox Cardiac AE Report</td>
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Total Reports 415
THE ELEMENTS OF MILITARY MEDICAL SURVEILLANCE

AFHSB E&A SATELLITES

AFHSB E&A maintains satellite staff at APHC, NMCPHC, and USAFSAM. Satellite staff primarily support Service-specific surveillance at their respective public health centers but also contribute valuable expertise to the enterprise and regularly participate in joint meetings including the bi-weekly Request Approval Process (RAP), quarterly E&A staff meetings, and the quarterly Health Surveillance Steering Group (HSSG).

The HSSG, established in 2017, represents a coordinated effort by AFHSB and the Services to collaborate on common surveillance issues in order to develop reports that advance the mission of DOD public health. Important HSSG accomplishments in 2018 included development of the consolidated influenza report, and development of the DoD Health of the Force report. This report aims to provide summary measures to provide an overall picture of Service member health to leadership.

THE ARMY SATELLITE staff work within the EpiData Center (EDC) which, along with Health Analysis, and Health Promotion and Wellness, is part of the NMCPHC Population Health Directorate. Staff include three epidemiologists and a statistician who serve as subject matter experts in behavioral and operational health, reportable and emerging infections, and data systems and application development. Significant contributions by satellite staff include a report outlining 5-year suicide trends for the Surgeon General Navy Medicine Force Health Report, a 10-year comparative analysis of pneumonia and respiratory encounter rates among Marines at various training sites that had important implications for future training exercises, and ongoing evaluation of data from MHS GENESIS to help ensure that surveillance data continues to be available to the surveillance community as the DoD transitions from legacy systems to the new electronic medical record.

THE ARMY SATELLITE staff, which includes five epidemiologists, support several division within APHC including the Behavioral and Social Health Outcomes Practice (BSHOP), Injury Prevention, Disease Epidemiology, Army Hearing, and Vision Conservation and Readiness. BSHOP completed 44 ad hoc and routine requests on suicidal behavior, alcohol use, and behavioral health outcomes during 2018. Annual reports released during 2018 include the 2017 Surveillance of Suicidal Behavior Publication, the 2016 Behavioral Health Risk Assessment Data Report, and Surveillance of Suicide Cases (National Guard and Reserve) January through December 2016. The cell also contributed significantly to the 2018 Army Health of the Force report.

As part of the Injury Prevention Division, satellite staff contributed to ongoing improvements and expansion of the Weather Related Injury Repository during 2018 which allowed the team to respond to 44 requests for information related to heat and cold-weather illnesses. The team was also instrumental in adding location-specific information related to heat illness to the HSE. Adding the ‘heat layer’ to the HSE improves accessibility of timely surveillance data with the potential to both improve awareness and reduce the incidence of heat illness among Service members worldwide.

The Disease Reporting System, Internet (DRSi) is the official repository for RMEs for the DoD. The Disease Epidemiology Division manages DRSi for the Army. Disease Epidemiology also oversees the Reportable Medical Events Working Group (RM EWG) and publication of the tri-Service Armed Forces Reportable Medical Events Guidelines and Case Definitions. Important accomplishments in 2018 include coordination of ongoing discussions related to adding elevated lead levels to the DoD list of RMEs, development of a communicable disease toolkit to assist and standardize collection of information related to RMEs.

In collaboration with the Vision Center for Excellence, Injury Prevention, and the National Military Audiology and Speech Pathology Center, Army satellite staff instituted several practices to incorporate rigorous epidemiological and statistical analysis in the Army’s tracking and evaluation of vision and hearing among Service members in 2018. Satellite staff are currently working on a project to improve visualization of surveillance data using an online interface. This will allow the vision and hearing community to readily utilize data to improve vision and hearing conservation efforts.

THE AIR FORCE SATELLITE staff, which includes two active duty public health officers and a civilian epidemiologist, work closely with the DoD Global Respiratory Surveillance (DoDGRS) program. This program performs global sentinel site based respiratory surveillance analyzing more than 22,000 specimens from sentinel sites around the world annually. Collection and analysis of specimens allows sequencing and global tracking of influenza strains and data related to vaccine effectiveness; it also assists the Centers for Disease Control and Prevention and World Health Organization with annual vaccine strain selection. The DoDGRS program is active in publication of their surveillance findings including three MSMR articles in 2018. Additional accomplishments include expansion of the number and scope of sentinel sites covered by the DoDGRS program in order to provide an expanded source of data for vaccine strain selection, and improved capabilities related to recognizing the emergence of novel flu strains.
### Air Force Satellite Reports

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### Army Satellite Reports

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SURVEILLANCE METHODS AND STANDARDS

AFHSB’s Surveillance Methods and Standards (SMS) working group develops, documents, and publishes standard surveillance case definitions and methodologies for studies that utilize DMSS data. The working group includes representatives from all services and consults, when needed, with experts from the Defense Department during the case definition development process. These case definitions allow Defense Department 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 as well as consistency and comparability of public health information and data across multiple agencies. The AFHSB case definitions also serve as guidelines for other DoD 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 data sets. The definitions primarily use ICD-9 and ICD-10 codes to identify conditions of interest diagnosed in the MHS.

In 2018, the SMS working group developed and documented 15 new case definitions, updated several others, and continued its efforts to develop ICD-10 code sets for its existing case definitions. The AFHSB prioritizes its case definition documentation process on militarily relevant conditions and on those conditions frequently used in AFHSB reports. To date, there are more than 120 condition-specific case definitions in 18 categories available on AFHSB’s website. The SMS working group developed and documented, among others, new case definitions for male and female infertility, intestinal *Escherichia coli* (*E. coli*), rubella (German measles), varicella (chicken pox), and shigellosis (*Shigella*).

AFHSB also maintains and publishes the “Armed Forces Reportable Medical Events Guidelines and Case Definitions” with the July 17, 2017, version available on AFHSB’s website. The DoD uses these guidelines to help military public health officers, healthcare providers, and laboratories identify and report specific diseases and conditions of public health importance to both military and civilian authorities.
Launched in 1995, the MSMR is the flagship publication for AFHSB. The monthly 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 readership includes professionals throughout the MHS, such as public health officials, clinicians, researchers, academicians, healthcare planners, policymakers, and analysts.

The MSMR is indexed on MEDLINE and has more than 1,200 online subscribers. During 2018, the MSMR received 9,028 total page hits on AFHSB’s website. The average number of page hits per month was 752. Articles published in the MSMR have generated media coverage in diverse publications, including the New York Times, Nature (a British multidisciplinary scientific journal), USA Today, The Standard, The Daily Record, Infection Control Today, Medical Express, the Examiner, The Fayetteville Observer, International Business Times, The Los Angeles Times, The Washington Post, The Times News, Stars and Stripes, and Military Times.

In 2018, the MSMR published a total of 52 articles, including 31 original full reports, 9 updates of previously published data analyses, 5 brief reports, 5 surveillance snapshots, 1 letter to the editor, and 1 editorial. Twenty-one of the articles were submitted by authors not affiliated with the MSMR editorial staff. The most frequent topics of original articles and updates in 2018 were healthcare burden of disease and injury, influenza, vector-borne diseases, heat injuries, and sexually transmitted infections (STIs). The MSMR continues to welcome manuscript submissions for relevant articles on topics in military public health, epidemiology, surveillance, and disease and injury prevention.
RESIDENCY TRAINING

As a key DoD source for health surveillance and epidemiologic training, AFHSB hosts preventive medicine residents from USU for a five-week practicum rotation under the supervision 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 an oral presentation.

Since 2008 AFHSB has trained 58 residents with diverse academic backgrounds from the three Military Services as well as two Doctor of Public Health students. In 2018, there were two Army residents, three Navy residents, and three Air Force residents. Resident and student projects have resulted in published articles such as “Polypharmacy involving opioid, psychotropic, and central nervous system depressant medications, period prevalence and association with suicidal ideation, active component, U.S. Armed Forces, 2016,” “Psychiatric medical evacuations in individuals with diagnosed pre-deployment family problems, active component, U.S. Armed Forces, 2002–2014,” and “Variations in the incidence and burden of illnesses and injuries among non-retiree service members in the earliest, middle, and last 6 months of their careers, active component, U.S. Armed Forces, 2000–2015.” More than one-third of the completed resident projects are published in the MSMR or other peer-reviewed journals or 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.
GEIS VISION
To mitigate the threat of emerging infectious diseases to the U.S. military through a global laboratory network.

GEIS MISSION
Inform force health protection decision making and enhance global health security through a global laboratory network that analyzes and provides timely, actionable infectious disease surveillance information to the Geographic Combatant Commands and partner agencies.

GEIS CORE LABORATORY PARTNERS:
The following are the core GEIS partners who conducted ongoing surveillance projects on behalf of GEIS: NMRC in Silver Spring, Maryland, including NAMRU-2 in Singapore/Cambodia; NAMRU-3 in Cairo, Egypt; NAMRU-3 Ghana Detachment in Accra, Ghana; NAMRU-6 in Lima, Peru, and NHRC in San Diego, California; WRAIR in Silver Spring, Maryland, including AFRIMS in Bangkok, Thailand; USAMRD-G in Tbilisi, Republic of Georgia; and USAMRD-K in Nairobi, Kenya; USAFSAM in Dayton, Ohio; USU in Bethesda, Maryland.

MILITARY TREATMENT FACILITY LABORATORIES: Brian Allgood Army Community Hospital (BAACH), Landstuhl Regional Medical Center (LRMC), and Tripler Army Medical Center(s).

PUBLIC HEALTH COMMANDS: Navy and Marine Corps Public Health Center-EpiData Center (NMCPHC-EDC), Navy Environmental Preventive Medicine Unit 2 and 5 (NEPMU-2 and NEPMU-5 respectively), and Public Health Command Europe (PHC-E).

ADDITIONAL PARTNERS: 18th Aerospace Medicine Squadron (18 AMDS), Theater Preventive Medicine Flight, 65th Medical Brigade, National Aeronautics and Space Administration (NASA), Navy Entomology Center of Excellence (NECE), Office of the Surgeon General-Pharmacovigilance Center (OTSG-PVC), U.S. Army Corps of Engineers (USACE), U.S. Army Medical Research Institute for Infectious Diseases (USAMRIID), and U.S. Military Academy (USMA) at West Point.
GLOBAL EMERGING INFECTIONS SURVEILLANCE

The GEIS section oversees and manages a globally integrated infectious disease surveillance portfolio that operates through a strategically positioned global network of U.S. Army, Navy, and Air Force laboratory partners to provide early, accurate detection of emerging infections to inform FHP decision making and enhance national and global health security. Providing timely communication about operational public health threats is critical to enabling Geographic Combatant Command FHP decision making and mission success. As such, GEIS coordinates directly with the GCC surgeons to capture their infectious disease and theater campaign priorities and uses these priorities to fund the laboratory network’s surveillance efforts in four primary areas of focus: antimicrobial resistant infections, enteric infections, febrile and vector-borne infections, and respiratory infections.

In 2018, GEIS provided $59 million in funding to 27 DoD laboratories and USG agencies to conduct infectious disease surveillance to inform FHP. The service laboratories work with host nations and regional partners to conduct disease surveillance and outbreak response; this collaboration indirectly improves partner nation surveillance and outbreak response capabilities, thereby supporting efforts toward global health security.

Over the course of the past year, GEIS responded to a request from the GCC Surgeons to coordinate infectious disease surveillance activities across multiple DoD and USG agencies in their AOR. The goal of this initiative is to establish a globally integrated infectious disease surveillance enterprise that supports GCC FHP decision making, security cooperation, and operations planning. In order to meet this goal, GEIS funded the Center for Global Health Engagement to develop a regionally focused infectious disease surveillance coordination report for each GCC AOR by holding regional meetings with each GCC and integrating the DoD and other agencies to form the USG infectious disease surveillance enterprise. Outcomes of each meeting included a summary of GCC priority countries by region, infectious disease threats to FHP by region, and the identification of surveillance gaps. These outcomes ultimately informed the solicitation, submission, and selection of projects for GEIS funding in FY19 and will continue to drive GEIS funding in future years.

GEIS continued to implement and refine the Data-to-Decision initiative it launched in late 2017. The goal of this initiative is to provide timely, actionable information from GEIS-funded projects to the GCCs to inform FHP decision making. Over the course of 2018, GEIS...
laboratory partners provided surveillance findings to the GEIS Program Office on a monthly basis, and GEIS subsequently provided reports summarizing the findings and their potential FHP implications to the GCCs. Through this initiative, GEIS also responded to requests from the GCCs for infectious disease surveillance data to inform FHP decision making during specific missions, such as troop deployment to the Southwest border region in late 2018 and into early 2019. The Data-to-Decision initiative will continue into its second full year of implementation in 2019. GEIS is working to improve the collection and analysis of standardized, structured data to enhance information gathering.

In 2017, GEIS established the Next-Generation Sequencing and Bioinformatics Consortium in order to develop a capability for the DoD that uses data from NGS and BI to inform FHP decision making. The Consortium brought DoD partners together to share information on NGS/BI implementation, capabilities, and standard operating procedures to achieve a harmonized approach to sequencing and BI within the network. In 2018, the Consortium completed the Pathogen Discovery Pilot Project to evaluate the ability of DoD laboratories to identify and characterize unknown pathogens and to guide coordinated training efforts. The project was led by three core CONUS sequencing laboratories (WRAIR, NMRC, USAMRIID), with 12 OCONUS and CONUS participating laboratories. A blinded panel of spiked samples, containing human pathogens and negative controls, was constructed to simulate samples that would come from clinical cases and be sent to participating laboratories for testing. Participating laboratories were evaluated on their ability to use NGS to identify and characterize pathogens in the blinded panel. In return, they were provided feedback and detailed recommendations for improving wet lab and BI techniques in their laboratories. Based on the gaps identified with this exercise, the core sequencing laboratories developed a series of NGS and BI training modules and initiated coordinated training activities at strategic sequencing locations. These efforts will lead to confidence in high-quality sequence data to inform FHP decision making and improve diagnostic and vaccine development.

ANTIMICROBIAL RESISTANCE (AMR)

FOCUS: AMR surveillance projects primarily target the identification of multidrug-resistant organisms (MDRO) in populations of interest around the world. The AMR portfolio includes projects that monitor the following six bacterial pathogens: Enterococcus faecium, Staphylococcus aureus, Klebsiella pneumoniae, Acinetobacter baumannii, Pseudomonas aeruginosa, and Enterobacter which are also known as ESKAPE; and observes healthcare-associated infections (HAIs), wound infections, drug-resistant STIs, and emerging resistance patterns in nearly 20 countries. Data provide actionable information to enhance knowledge of resistance patterns among circulating pathogens, inform effective treatment options for Service members in deployed locations, and directly support the DoD Combating Antibiotic-Resistant Bacteria National Action Plan.

WHAT’S NEW IN FY18: The AMR Focus Area supported 21 competed projects and 10 work plan projects at 12 DoD partner laboratories, totaling approximately $10 million. The AMR portfolio expanded to include prospective surveillance efforts
for HAIs and/or STIs in Nepal, Ghana, Djibouti, and the Dominican Republic while continuing surveillance with partner nations Cambodia, Egypt, Honduras, Jordan, Kenya, Peru, the Philippines, Republic of Georgia, Thailand, and Uganda. The AMR portfolio continued to support enhanced surveillance of wound infections associated with blast injuries and added surveillance of AMR patterns in *Mycoplasma genitalium*.

**WHERE WE’RE GOING:** The AMR Focus Area will work to improve coordination and development of standard operating procedures for OCONUS laboratories submitting isolates to the Multidrug-Resistant Organism Repository and Surveillance Network (MRSN) and the DoD Gonococcal Repository & Reference Laboratory. This goal will be met by de-conflicting NGS technologies, optimizing whole genome sequencing and BI capabilities, implementing quality assurance/quality control and proficiency testing, and improving communication within the surveillance network. Additionally, the AMR Focus Area will work across the laboratory network to harmonize collection and testing of AMR isolates from HAIs and wound infections and further explore the use of geospatial visualization tools to identify endemic threats and “hot spots” for emerging resistance.

**DOD SERVICE LABORATORIES AND OTHER ORGANIZATIONS SUPPORTED IN FY18:**
AFRIMS, NAMRU-2, NAMRU-3, NAMRU-6, NMCPHC-EDC, NMRC, OTSG-PVC, Tripler Army Medical Center (TAMC), USAMMD-K, USAMRD-K, USU, and WRAIR

**FY18 ACCOMPLISHMENTS:**
► AFRIMS identified the first dual mobilized colistin resistance (MCR) genes in a human clinical isolate. Further characterization of MDRO isolates collected from hospital patients resulted in the identification of two *E. coli* isolates, each positive for both MCR-1 and MCR-3 genes, which is unusual because bacteria with this dual MCR genotype has previously been confirmed only in agricultural samples. There are multiple indicators that growing resistance to many antibiotics—including colistin, which is widely used in human and veterinary medicine—is more prevalent in countries in the U.S. Indo-Pacific Command (USINDOPACOM) area of responsibility. Monitoring of MCR determinants in colistin-resistant gram-negative bacteria is needed to ensure optimal treatment efficacy for military members and civilians deployed to an endemic area who may become injured and require treatment for bacterial infection.

► The MRSN detected the introduction of pan-drug-resistant (PDR) organisms into the MHS from a deployed tertiary care facility. Over 75% of these isolates were carbapenemase-producers and were resistant to every antibiotic that MRSN tested. PDR and carbapenemase-producing bacteria are extremely rare (<0.01%) in CONUS and OCONUS medical MTFs. It is imperative to inform MHS stakeholders of such organisms to ensure stringent infection control measures are utilized to prevent their proliferation.

► NAMRU-6 identified the first healthcare-associated infections *K. pneumoniae* Carbapenemase (KPC) that produces *P. aeruginosa* as a part of the GEIS AMR surveillance program of HAI multidrug resistant (MDR) ESKAPE pathogens. NAMRU-6 confirmed three *P. aeruginosa* isolates as extensively drug-resistant. Continuing surveillance for MDR pathogens worldwide is critical to determining the risk to DoD personnel in acquiring MDR pathogens and guiding treatment options.

**ENTERIC INFECTIONS (EI)**

**FOCUS:** EI surveillance projects address militarily relevant enteric pathogens that degrade readiness through 1) surveillance for acute gastroenteritis (AGE) in the U.S. military (including recruit, shipboard, and forward-deployed populations) and in foreign military and civilian populations; 2) characterization of travelers’ diarrhea in immune-naïve travelers; 3) advanced characterization and antimicrobial susceptibility testing of enteric pathogens; and 4) detecting emerging pathogens in previously tested “pathogen negative” stool samples.

**WHAT’S NEW IN FY18:** The EI Focus Area supported 9 competed projects and 13 work plan projects at 11 DoD partner laboratories totaling approximately $5.5 million. The multisite Global Travelers’ Diarrhea (GTD) study continued prospective surveillance efforts in Cambodia, Djibouti, Honduras, Kenya, Nepal, Peru, the Republic of Georgia, and Thailand. EI surveillance expanded to two MTFs, TAMC and Brian Allgood Army Community Hospital (South Korea). GEIS supported NAMRU-6’s expansion of enteric surveillance activities during...
military exercises in the SOUTHCOM AOR and USAMRD-K’s initiation of AGE surveillance in Somalia. Additionally, advanced characterization of enteric pathogens was expanded and will enhance the understanding of resistance genes, virulence factors, and dispersion of enteric pathogens geographically.

WHERE WE’RE GOING: The EI Focus Area will continue to expand AMR testing of enteric pathogens to better understand resistance trends and support treatment recommendations. Furthermore, standardization of the GTD study and optimization of its protocol will continue to be addressed to increase data utility as infection rates, case severity, and treatment associations are examined in a harmonized way across sites in five continents. The EI Focus Area will also incorporate the idea that the health of people is connected to the health of animals and the environment through its One Health approach. This will produce more funded projects, with five competed projects for FY19 that include surveillance of animal or environmental food-borne pathogens. Finally, the EI Focus Area will seek to expand utilization of the TaqMan® array platform across multiple sites to improve standardization of diagnostic results and allow rapid testing of AMR bacteria. These efforts will lead to improved actionable information for FHP in the most cost-effective manner across militarily relevant geographic locations within each GCC.

DOD SERVICE LABORATORIES AND OTHER ORGANIZATIONS SUPPORTED IN FY18: 65TH MED BDE/BAACH, AFRIMS, LRMC, NAMRU-2, NAMRU-3, NAMRU-6, NEPMU-5, NHRC, USAMRD-G, USAMRD-K, USU

FY18 ACCOMPLISHMENTS:

► USAMRD-K detected extended-spectrum beta-lactamase targets in 52% of *Shigella* spp. (TEM and OXA-1) and 57% of *Salmonella* spp. (TEM, OXA 1, and CTX group 1). This analysis is unique, particularly since there are no data on MDR determinants from *Shigella* isolates from fecal specimens of patients hospitalized in Kenya. This work can inform FHP antibiotic policies and empirical treatment of bacterial diarrhea.

► FilmArray-based surveillance among U.S. Service members deployed to Beyond the Horizon 18 - El Salvador revealed that a majority of pathogens tested positive for multiple types of pathogenic *E. coli* as well as *Salmonella* and *Campylobacter*. These findings informed GCC medical planners’ logistic and treatment decisions, enhancing FHP. NHRC provided laboratory support to a large outbreak at the Marine Recruit Training Depot, San Diego. NHRC’s work helped direct preventive medicine efforts to remediate the outbreak. NHRC also supported AGE surveillance among recruits and trainees, collecting and testing 185 specimens over the course of the year. Routine surveillance characterizes the epidemiology of AGE in U.S. military recruits and trainees, and these data can be used to inform preventive measures, update prophylaxis or empiric treatment regimens, and guide future vaccine research.

► LRMC collected and tested 865 samples from 15 clinics in the EUCOM AOR, with enteropathogenic *E. coli* and *Campylobacter* spp. being the most commonly identified. These data have assisted GCC and public health officials by providing knowledge of pathogens most commonly detected at operationally important sites in the EUCOM AOR.

► The 65th MED BDE collected stool samples from patients with diarrhea and/or gastrointestinal symptoms, providing the first data on circulating enteric pathogens for U.S. military and dependent populations in the operationally important Republic of Korea. Pathogenic *E. coli* was isolated most frequently, and this baseline of data can aid in monitoring trends of important enteric pathogens, including potential spikes in pathogen circulation that warrant additional preventative or response measures.

FEBRILE AND VECTOR-BORNE INFECTIONS (FVBIs)

FOCUS: FVBI surveillance projects address vector-borne and zoonotic pathogens that threaten the health of U.S. Service members, with the goal of better characterizing risk to U.S. personnel, guiding FHP decision making, and informing countermeasure development. To accomplish these objectives, FVBI surveillance projects fall into three general areas: identifying causes of acute febrile illness, including drug-resistant malaria; documenting the presence of vectors, reservoirs, and associated pathogens; and understanding environmental drivers of exposure and infection.

WHAT’S NEW IN FY18: The FVBI Focus Area supported 24 competed projects and 38 work plan projects at 18 DoD partner laboratories, totaling approximately $20.8 million. FY18 efforts enhanced the GEIS network’s surveillance capabilities for vector-borne and zoonotic pathogens, including increased vector surveillance activities on and around Soto Cano Air Base, Honduras, through a partnership with NAMRU-6; establishment of the framework for a malaria parasite repository at WRAIR; focused insecticide resistance testing in Southeast Asia; and increased utilization of NGS to examine dengue viruses in U.S. Africa Command (AFRICOM). The GEIS network began projects that extended FVBI surveillance activities into Azerbaijan, Cameroon, and Somalia.

WHERE WE’RE GOING: The FVBI Focus Area will continue to increase coordination and collaboration on vector-borne diseases across the GEIS network,
GLOBAL EMERGING INFECTIONS SURVEILLANCE NETWORK

particularly as related to improving acute febrile illness surveillance, coordinating antimalarial drug resistance testing, and detecting malaria rapid test failure. FVBI activities will capitalize on the NGS/BI Consortium for validating pathogen detection, identification, and characterization activities. These activities will enhance the capability to identify known and/or emerging FVBI vectors and pathogens for expanded FHP decision-making capabilities globally.

DOD SERVICE LABORATORIES AND OTHER ORGANIZATIONS SUPPORTED IN FY18: 18 AMDS, 65th MED BDE, AFRIMS, NAMRU-2, NAMRU-3, NAMRU-6, NASA, NECE, NEPMU-2, NHRC, NMRC, USACE, USAMRD-G, USAMRD-K, USAMRIID, USMA, USU, and WRAIR

FY18 ACCOMPLISHMENTS:

► AFRIMS and NAMRU-6 expanded understanding of Zika virus (ZIKV) geographic distribution and documented its ongoing circulation in Thailand, Bolivia, and northeastern Peru. Even though circulation (and media attention) have decreased, Zika Virus (ZIKV) still presents a threat to U.S. Forces and other DoD beneficiaries.

► Partners at the Australian Defense Forces documented Plasmodium falciparum strains associated with malaria rapid diagnostic test failure (pfhrp2- and pfhrp3-deletion mutants) in countries in AFRICOM, INDOPACOM, and SOUTHCOM. The malaria RDT approved for use in the U.S. military relies on the detection of the pfhrp2 gene product for diagnosis of malaria caused by P. falciparum. Continued surveillance for the prevalence of these mutants is important to determine the future sensitivity of RDTs and treatment options for malaria among U.S. Service members.

► AFRIMS detected Leptospira in water, rodent, and domestic animal samples and also documented the active circulation of rickettsial pathogens in vectors and rodent hosts at Cobra Gold training sites. Findings alerted Commanders to the risk of these endemic pathogens and supported exercise planning and implementation of FHP measures.

► AFRIMS also documented novel viruses and bacteria that expanded the geographic range of known pathogens. Examples include Spondweni virus in Haiti, the first identification of this flavivirus in the Western Hemisphere (NEPMU-2); expanded range of West Nile virus in northeastern Turkey (WRAIR); outbreaks of chikungunya and dengue viruses in Kenya (USAMRD-K);
characterization of Lassa virus in Liberia (NAMRU-3); and evidence for endemic Japanese encephalitis virus circulation in Guam (18 AMDS). This up-to-date information is critical to examining the risks to U.S. Service members deployed to outbreak regions and can guide investments into medical countermeasures.

**RESPIRATORY INFECTIONS (RI)**

**FOCUS:** RI surveillance projects address rapid pathogen detection and response, especially for those respiratory infections with pandemic potential, through surveillance of U.S. military members (including recruit, shipboard, and deployed populations), other MHS beneficiaries, and foreign military and civilian populations as well as at the human–animal interface. Advanced characterization is also conducted to monitor concerns such as influenza antigenic drift and shift and to evaluate VE and response.

**WHAT’S NEW IN FY18:** The RI Focus Area increased surveillance at the human–animal interface with the start of RI surveillance among swine in Peru and expansion among poultry in Southeast Asia. The first shipboard FilmArray® polymerase chain reaction system for respiratory and gastrointestinal disease detection was deployed, enabling faster response to disease clusters. Partners in the Republic of Korea (ROK) initiated a comparison of the burden of RIs between U.S. and ROK Forces. A comparison of VE between the three influenza vaccine production technologies also commenced.

**WHERE WE’RE GOING:** The RI Focus Area will support the DoD Global Respiratory Pathogen Surveillance Program (DoDGRS) to provide broad surveillance of RIs; a sentinel site evaluation will optimize surveillance across the MHS. Surveillance at the human–animal interface will continue, especially where spillover is possible. The Focus Area aims to standardize laboratory workflows across the network while better characterizing samples and reducing the number of samples that fail to detect a pathogen. Another area of emphasis will include improving awareness of partner findings and resources to enhance network collaboration.

**DOD SERVICE LABORATORIES AND OTHER ORGANIZATIONS SUPPORTED IN FY18:**

- 65th MED BDE/BAACH, AFRIMS, LRMC/PHC-E, NAMRU-2, NAMRU-3, NAMRU-6, NEPMU-5, NHRC, NMRC, USAFSAM, USAMRD-G, USAMRD-K, USU, and WRAIR

**FY18 ACCOMPLISHMENTS:**

- NHRC and FDA analysis of data from an influenza A (H3N2) outbreak at Marine Corps Recruit Depot – Parris Island showed that unvaccinated recruits with preexisting antibodies had lower odds of having an infection, which could improve future risk assessments and outbreak response. A pseudovirus neutralization assay was found to be a better marker of influenza immunity than classical hemagglutination inhibition assays, which could lead to a more accurate method for evaluating vaccination response.

- NMRC found nine cases of previously unidentified Middle East Respiratory Syndrome Coronavirus (MERS-CoV) infection, suggesting a potential false negative rate of 17% (9/52) for the assay in use by the Kingdom of Saudi Arabia. Therefore, MERS-CoV risk predictions for U.S. Forces in Saudi Arabia and the region are likely underestimates.

- WRAIR found that overall adenovirus serotype distribution in the MHS was similar to the U.S. general population and was caused primarily by serotypes not covered by the vaccine. However, in persons 16–25 years old, serotypes covered by the vaccine were most common, indicating a benefit of vaccination in this age range. Statistically significant differences in age and associated serotype could offer insight into
duration and cross-protection of adenovirus immunity.

► NHRC serotyped samples from an adenovirus outbreak in U.S. personnel in the ROK and found 47% (31/66) were typed as human adenovirus type 55 (HAdV-B55) and human adenovirus 11a (HAdV-11a) — the first detection of this serotype in the MHS. HAdV B55 is an emerging pathogen in the region and is not covered by the vaccine. Detection is not surprising, but further surveillance is needed to describe HAdV B55 epidemiology and effective preventive measures.

► USAFSAM continued to manage the DoDGRS in FY18, finalizing results on 11,977 specimens from 98 locations and conducting phylogenetic analysis on a portion of influenza samples to determine geographic distribution and predominance of clades. Data were provided to CDC and FDA to inform selection of the seasonal influenza vaccine strains.
BIOSURVEILLANCE IN THE DoD
INTEGRATED BIOSURVEILLANCE (IB)

The National Strategy for Biosurveillance offers a complex definition for biosurveillance. It is defined as “the process of gathering, integrating, interpreting, and communicating essential information related to all-hazards threats or disease activity affecting human, animal, or plant health to achieve early detection and warning, contribute to overall situational awareness of the health aspects of an incident, and to enable better decisionmaking at all levels.” The DoD uses global biosurveillance networks to identify and track these public health threats to national security that are unbounded by state, regional, and international borders. DoD partners are from multidisciplinary agencies, including the Office of the Assistant Secretary of Defense for Nuclear, Chemical, and Biological Defense Programs, DHA, and military service research agencies.

The DoD’s biosurveillance enterprise has two primary strategic goals:

► SITUATIONAL AWARENESS of biological warfare programs, threat agents and technologies, and intent and use.

► ENHANCED DoD PUBLIC HEALTH by providing situational awareness of naturally occurring microbial pathogens and infectious disease incidence, prevalence, and emerging countermeasures.

Effective biosurveillance requires an interdisciplinary and integrated approach that coordinates efforts across federal and non-federal agencies. Accurate capture of threat information, thorough risk assessment, and rapid risk communication are critical for countermeasure development and other planning and response activities.

With the recent designation as a CSA, the DHA must design and deliver solutions to CCMDs that meet the demands of the 21st century battlespace. This battlespace will feature a Joint Force aligned to execute globally integrated operations characterized by global agility, flexibility, and small, low-signature capabilities, increased partnership, and cross-domain synergy to maintain the initiative in every domain. This creates a challenge for the MHS in providing comprehensive health surveillance to deployed forces in a highly distributed operating environment and minimal, if any, pre-established health service infrastructure to detect, respond to, and/or prevent disease threats from reducing health security and threatening the health of the force.

The AFHSB established the IB section to execute global horizon scanning of public health threats to forces operating in all six GCCs. The vision of IB is to provide enhanced FHP and national security through comprehensive public health surveillance support to the GCCs and military services. To achieve this vision, IB’s mission is to inform FHP decision making and enhance global health security by detecting and rapidly communicating public health threats in support of GCCs and USG national security priorities.

IB staff members have a wide variety of skills and experiences in the fields of infectious disease epidemiology, preventive medicine, family medicine, veterinary epidemiology, statistical analysis, and occupational and environmental health. The staff lends its expertise by collaborating with other offices in the Defense Department as well as external USG agencies. Those agencies include the National Security Council and Office of Science and Technology Policy, the U.S. Department of Homeland Security’s Science and Technology Directorate and DHA’s Office of Health Affairs, along with DoD’s Office of Undersecretary of Defense for Policy and the Office of the Joint Staff.

IB continues to engage with its DoD and interagency partners to be the focal point for biosurveillance information. This comprehensive health surveillance strategy will:

► Scan the horizon for global event-based, open-source raw or aggregated data to gather, analyze, and rapidly disseminate information on current and emerging health events of military interest

► Provide indicator-based surveillance and analysis of raw unstructured data and relevant information technology platforms to identify potential healthcare and non-healthcare information that can provide early detection of disease outbreaks

► Synchronize biosurveillance efforts across the DoD programs

► Provide near real-time surveillance, DoD public health threat assessment, and situational awareness for its customers

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

ARO monitors biosurveillance data sources and communicates routinely with the DoD as well as USG interagency, non-USG, and international partners to detect and report all-hazard events (e.g., emerging and re-emerging infectious diseases and environmental incidents) relevant to the health of all military personnel, including beneficiaries and veterans. ARO develops timely and relevant products based on these data and information, provides expertise on issues relevant to the health of DoD populations, and coordinates information
BIOSURVEILLANCE IN THE DEFENSE DEPARTMENT

gathering and resource leveraging, as available. ARO also disseminates information through various communication channels depending on the level of urgency.

ARO FY18 ACCOMPLISHMENTS INCLUDE:

► Creating and releasing the HSE capability as a Geographic Information Systems (GIS) map interface providing CCMD and Military Service decision makers timely, actionable, and integrated biosurveillance alert and response capabilities in a DoD Common Access Card (CAC) enabled platform. The HSE is designed to be the central “one-stop shop” for DoD health surveillance responsive to CCMD needs by providing 1) timely, relevant, FHP threat-prioritized, health surveillance events customized by CCMD needs; 2) easily accessed CCMD-specific FHP information; and 3) country-specific FHP-relevant information available at one site.

► Increasing customer interest in ARO products by increasing the number of individuals receiving our products by 24% during FY18. Reached over 960 visits to the HSE in FY18 during the first three months of its existence.

► Integrating surveillance across domains by adding the capability to monitor classified networks to improve comprehensive health surveillance and allow GCC desk officers within the section to better communicate with the global CCMDs.

► Producing and distributing 50 AFHSB Health Surveillance Updates (AHSU) reporting on more than 125 public health events of interest to the Global CCMDs.

► Producing and distributing 11 disease-specific surveillance summaries on topics including MERS-CoV and the Ebola outbreaks in the northeastern and northwestern Democratic Republic of the Congo.

► Developing fully unclassified 508-compliant versions of surveillance summaries on the AFHSB website and sharing with non-governmental organizations and foreign nations.

► Producing and distributing six executive summaries and four spot reports for relaying quick information on topics, including norovirus in U.S. troops in Kuwait, WHO Emergency Committee meetings, novel and variant influenza viruses, Ebola outbreaks in northeastern and northwestern Democratic Republic of Congo, and other events.

► Writing and presenting weekly reports on current health events being tracked, RMEs, and global health items of interest.

► Improving DoD comprehensive health surveillance information products to focus closely on events currently or potentially affecting FHP by better integrating DoD reportable medical event reporting, laboratory and medical encounter data, and syndromic surveillance monitoring.

► Participating in 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 USG sources.

► Participating in EUCOM’s Pandemic Influenza and Infectious Disease exercise to enhance regional and global health surveillance through multilateral military participation in the event of a biological event within the AOR.

► Developing health scenarios for the Office of the Secretary of Defense (Policy) Insidious Outbreak Table Top Exercises, which assessed DoD policies, authorities, and governance framework that could facilitate a unified, effective national response to an overseas and CONUS infectious disease outbreak.

► 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.

► Presenting on ARO activities, including “The Avian Influenza Epidemic,” which was a featured presentation at the 2018 Esri Federal GIS Conference, and the HSE, which was showcased to the White House Medical Unit Staff, all CCMD Surgeon Sections, various DoD public health students through courses, and multiple senior leaders across the DoD.
HSE featured on the National Geospatial Agency portal as an innovative use of GIS for health surveillance.

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 of AFHSB’s other divisions. The Epidemiology Investigations team also collaborates with interagency partners such as the CDC, WHO, U.S. Department of Homeland Security, U.S. Department of Agriculture, other DoD and non-government U.S. organizations.

IE’S FY18 ACCOMPLISHMENTS INCLUDE:

► Conducting an analysis of influenza laboratory data and their correlation with ILI medical encounter data for incorporation into a fused syndromic detector algorithm in Electronic Surveillance System for the Early Notification of Community-based Epidemics (ESSENCE), presented at the International Society for Disease Surveillance Conference.

► Producing a weekly influenza map for the HSE, incorporating DMSS medical encounter, laboratory, vaccination, and civilian ILINet data to provide an interactive web-based map of the DoD influenza burden.

► Establishing predictive modeling knowledge and capacity through internal analysis of medical encounter data and external collaboration with leading forecasting modelers through participation in the Pandemic Prediction and Forecasting Science and Technology Working Group meetings, establishing data sharing agreements to develop operational influenza forecasts, and contributing to the “Wisdom of Crowds” forecast in CDC’s influenza forecasting challenge.

► Providing end-user public health recommendations to the developers of the Biosurveillance Ecosystem through monthly meetings and an evaluation report.

► Collaborating with the services to improve the functionality of ESSENCE, which brings advanced visualization capability on par with the civilian sector. Upgrading to same code as civilian ESSENCE provides an opportunity to share future system enhancements and allow for easier data sharing across agencies.

► Organizing the National Syndromic Surveillance Program data sharing pilot project between DoD, CDC, and Virginia Department of Health. This project piloted viewing DoD data from Virginia installations in the same syndromic surveillance system as civilian public health data from Virginia.

► Assisting in the development of new data streams allowing for laboratory results data to be visualized for inclusion as a new function of ESSENCE v5.
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 2018, 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 disease transmission, severity, prevention. AFHSB reports and publications are located on its website. 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 the DoD and other government agencies, AFHSB staff is encouraged to consider submission of selected reports to the Defense Technical Information Center, which serves the DoD community as a central resource for scientific and technical information.
SPREADING THE NEWS ON MEDICAL SURVEILLANCE

2018 PARTNER PUBLICATIONS


76. Smith JL, Pugh CL, Cisney ED, et al. Human antibody responses to emerging Mayaro virus and cocirculating alphavirus infections examined by using structural proteins from nine new and old world lineages. *mSphere.* 2018;3(2).


ACRONYMS

AD-CS Assistant Director for Combat Support
AFHSB Armed Forces Health Surveillance Branch
AFMR Air Force Mortality Registry
AFRICOM U.S. Africa Command
AFRIMS U.S. Armed Forces Research Institute of Medical Sciences
AGE acute gastroenteritis
AMD Aerospace Medicine Squadron
AMR antimicrobial resistance
APHC U.S. Army Public Health Center
AOR Areas of Responsibility
ARO Office of Alert and Response Operations
BAACH Brian Allgood Army Community Hospital
BIWAC Biosurveillance Indications and Warnings Analytic Community
BSHOP Behavioral and Social Health Outcomes Practice
CAC Common Access Card
CARB Combating Antibiotic Resistant Bacteria
CSART CSA Review Team
CCMD Combatant Command
CDC Centers for Disease Control and Prevention
CENTCOM U.S. Central Command
CONUS contiguous United States
CSA Combat Support Agency
DHA Defense Health Agency
DMED Defense Medical Epidemiology Database
DMSS Defense Medical Surveillance System
DMTS Data Management and Technical Support
DoD Department of Defense
DoD-GEIS DoD Global Emerging Infections Surveillance and Response System
DoDGRS DoD Global Respiratory Pathogen Surveillance Program
DoDSR Department of Defense Serum Repository
DRSi Disease Reporting System internet
E&A Epidemiology and Analysis
EDC EpiData Center
EI enteric infection
EID emerging infectious disease
EPEC enteropathogenic E. coli
ESSENCE Electronic Surveillance System for the Early Notification of Community-based Epidemics
EUCOM U.S. European Command
FDA U.S. Food and Drug Administration
FHP force health protection
FY fiscal year
FORSCOM United States Army Forces Command
FVBI febrile and vector-borne infection
GAO Government Accountability Office
GCC Geographic Combatant Command
GEIS Global Emerging Infections Surveillance
GHE Global Health Engagement
GHSA Global Health Security Agenda
GIS Geographic Information Systems
GTD Global Travelers’ Diarrhea
H7N9 avian influenza A (subtype H7N9)
HAI healthcare-associated infection
HAV human adenovirus type 55
HAV-11a human adenovirus 11a
HIV human immunodeficiency virus
HPV human papilloma virus
HSSG Health Surveillance Steering Group
IB Integrated Biosurveillance
ICD-10-CM International Classification of Diseases, 10th Revision, Clinical Modification
ICD-9-CM International Classification of Diseases, Ninth Revision, Clinical Modification
ID identification
IE Office of Innovation and Evaluation
IHR International Health Regulations
ILI influenza-like illness
IPL Institut Pasteur du Laos
LOE line of effort
LRMC Landstuhl Regional Medical Center
MAT medical air transports
MDR-TB multidrug-resistant tuberculosis
MDO Multidrug resistant
MDRO multidrug-resistant organisms
MERS-CoV Middle East Respiratory Syndrome Coronavirus
MHS Military Health System
MRSN Multidrug-Resistant Organism Repository and Surveillance Network
MSMR Medical Surveillance Monthly Report
MTF military treatment facility
NAMRU-2 Naval Medical Research Unit No. 2
NAMRU-3 Naval Medical Research Unit No. 3
NAMRU-6 Naval Medical Research Unit No. 6
NATO North Atlantic Treaty Organization
NDM-1 New Delhi metallo-beta-lactamase-1
NECE Navy Entomology Center of Excellence
NEPMU-2 Navy Environmental Preventive Medicine Unit 2
NHRC Naval Health Research Center
NIH National Institutes of Health
NMCPHC Navy and Marine Corps Public Health Center
NMCPHC-EDC Navy and Marine Corps Public Health Center-EpiData Center
NMRC Naval Medical Research Center
OCONUS outside the contiguous United States
OTSG-PVC Office of the Surgeon General Pharmacovigilance Center
PCR polymerase chain reaction
PHC-E Public Health Command Europe
RAP Request Approval Process
RI Respiratory infections
RME reportable medical event
RMEWG Reportable Medical Events Working Group
SMS Surveillance Methods and Standards
SOUTHCOM U.S. Southern Command
SSBP Surveillance of Suicidal Behavior Publication
STI sexually transmitted infections
TAMC Tripler Army Medical Center
TBI traumatic brain injury
USG United States Government
USAFSAM U.S. Air Force School of Aerospace Medicine
USAEC U.S. Army Corps of Engineers
USAMC U.S. Army Medical Command
USAMRD-G U.S. Army Medical Research Directorate–Georgia
USAMRD-K U.S. Army Medical Research Directorate–Kenya
USAMRIID U.S. Army Medical Research Institute for Infectious Diseases
USINDOPACOM U.S. Indo-Pacific Command
USU Uniformed Services University of the Health Sciences
VE vaccine effectiveness
WHO World Health Organization
WRAIR Walter Reed Army Institute of Research
WRIR Weather-Related Injury Repository