2024
ANNUAL REPORT

DHA
Defense Health Agency ®
PUBLIC HEALTH

ARMED FORCES HEALTH SURVEILLANCE DIVISION

FRIENDS AND COLLEAGUES

The Armed Forces Health Surveillance Division (AFHSD) continues to evolve and grow as the Department of Defense's (DOD) central entity for global health surveillance. We are a division aligned with the Defense Centers for Public Health—Falls Church, within the Public Health Directorate under Healthcare Administration (HCA) in the Defense Health Agency (DHA). AFHSD operates three main branches: Epidemiology and Analysis (E&A), Global Emerging Infections Surveillance (GEIS), and Integrated Biosurveillance (IB).

In support of DHA's role as a Combat Support Agency, AFHSD provides early warning, health threat assessments, and force readiness information to both operational forces and DOD leaders. We are embracing technology and adding new skillsets to incorporate the tools and practices of modern data science, which will facilitate a more rapid data response and information dissemination.

We are codifying our relationships across the DOD, seeking to leverage internal strengths, and working with global allies to increase our footprint. AFHSD supports the nation's strategic, operational, and tactical objectives. Transformation is critical to our continued success. Our team works tirelessly in support of leadership enabling the improvement of the Military Health System and Defense Public Health.

As you read AFHSD's annual report, we hope our continued success both inspires and shapes the future to ensure mission accomplishment in 2025. We look forward to continuing this effort while striving to increase our agility, relevance, and timeliness in support of the Joint Force. As always, our goal is to help the Combatant Commands and the military services make the best decisions in protecting the health and readiness of the DOD's military and beneficiaries.

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Captain, Medical Corps, U.S. Navy
Chief, Armed Forces Health Surveillance Division

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HISTORY OF SURVEILLANCE

The Armed Forces Health Surveillance Division (AFHSD) is the central public health entity of global health surveillance for the U.S. military. AFHSD is a component of the Defense Health Agency (DHA) within the Public Health Directorate. The division is organized into three branches: Epidemiology and Analysis (E&A), Global Emerging Infections Surveillance (GEIS), and Integrated Biosurveillance (IB).

AFHSD 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 the Department of Defense (DoD) Serum Repository (DODSR), 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, AFHSD fulfills its mission through its technical infrastructure, expertise in database management for the DMSS and related applications, and operations and management of the DODSR. The DMSS houses both current and historical data on diseases and medical events, including 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. It contains billions of data records on service members and other Military Health System (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 75 million serial serum specimens from over 12.2 million individuals, the DODSR stands as 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 for global surveillance, training, research, and response to emerging infectious disease (EID) threats. GEIS coordinates AFHSD's global EID surveillance and response initiatives among a network of partner organizations. It executes a militarily relevant surveillance program focused on respiratory, enteric, febrile and vector-borne infections (FVBI), and antimicrobial-resistant organisms.

AFHSD plays a key role in integrating biosurveillance efforts by collecting data and information in near real-time of the threats from endemic diseases and EIDs relevant to the military worldwide. AFHSD 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)*. Additionally, AFHSD provides up-to-date information on diseases that could impact force health readiness and protection.

Maintaining a presence at three service public health hubs [Defense Centers for Public Health–Aberdeen (DCPH-A), Defense Centers for Public Health–Dayton (DCPH-D), and Defense Centers for Public Health–Portsmouth (DCPH-P)], AFHSD's health information analysis supports worldwide disease surveillance and public health activities, enhancing the U.S. military's Force Health Protection mission.

THE ELEMENTS OF MILITARY MEDICAL SURVEILLANCE

TOOLS OF SURVEILLANCE

The DMSS and the DODSR are longstanding and vital components of medical surveillance within the U.S. Armed Forces. Originally established for routine screening and surveillance for HIV, the DMSS and DODSR expanded their functions in the early 1990s to encompass all diseases and injuries relevant to protecting U.S. forces and deployment health.

The DMSS receives data from multiple sources and integrates it in a continuously expanding longitudinal surveillance database covering all individuals who have served in the military since 1990. DMSS records contain information on three fundamental elements of epidemiological surveillance – person, place, and time – providing a wealth of data for efficient and robust analyses of morbidity among Service members.

WITH MORE THAN 6.5 BILLION DATA RECORDS, INCLUDING MORE THAN 1.6 BILLION RECORDS ON U.S. SERVICE MEMBERS ALONE, THE DMSS REMAINS THE DEPARTMENT OF DEFENSE'S PREMIER EPIDEMIOLOGIC HEALTH SURVEILLANCE RESOURCE.

The Defense Medical Epidemiology Database (DMED), derived from the DMSS, offers select de-identified, remotely accessible data to authorized users. These users include U.S. military medical providers, epidemiologists, medical researchers, safety officers, and medical operations and clinical support staff tasked with assessing and analyzing medical event data in the U.S. military using standard epidemiologic methods and sharing their findings with commanders to enhance the health of active duty personnel. Civilian collaborators may also access DMED with appropriate documentation.

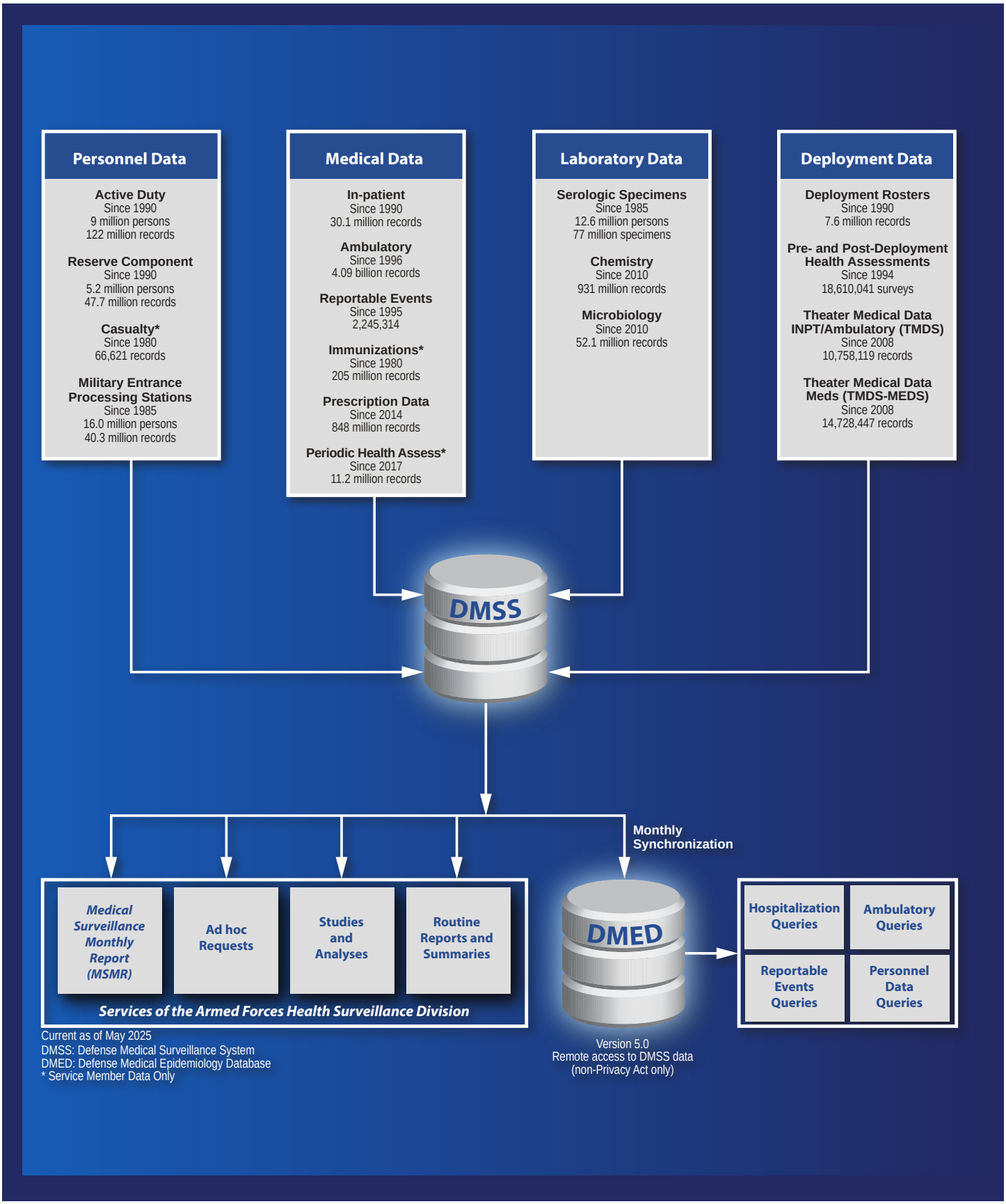
The DODSR was established in 1989 to store serum specimens collected from the DoD's testing program for HIV infections. Later, it was designated to store sera collected before and after operational deployments.

WITH MORE THAN 77 MILLION SERIAL SERUM SPECIMENS FROM OVER 12.6 MILLION INDIVIDUALS, THE DODSR IS THE WORLD'S LARGEST SERUM REPOSITORY OF ITS KIND.

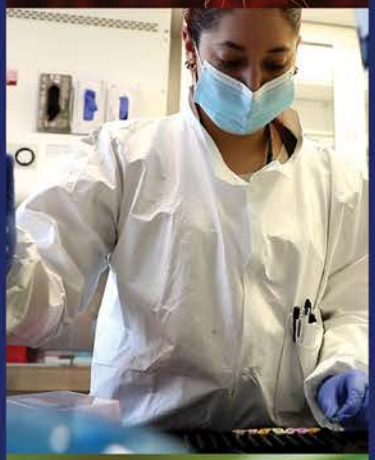
The DODSR keeps specimens in state-of-the-art freezers with advanced cooling technology. The DMSS database records demographic, occupational, and medical records longitudinally with links to the stored specimens. It is a unique and powerful resource that plays a pivotal role in supporting military medical surveillance, clinical care, and seroepidemiologic investigations.

In 2024, AFHSD processed and dispensed serum specimens in support of 19 seroepidemiologic studies and inquiries to meet clinical needs, operational investigations such as Identification of biomarker signatures of jet fuel exposure (a sub-study of Millenium Cohort Study), environmental determinants of breast cancer among military women, and monoclonal gammopathy in burn pit exposed service members as well as research endeavors, including a study examining the association between genetic and environmental risk factors for Multiple Sclerosis.

DMSS STRUCTURE AND FUNCTIONAL RELATIONSHIP



Current as of May 2025
DMSS: Defense Medical Surveillance System
DMED: Defense Medical Epidemiology Database
* Service Member Data Only



PURPOSE:

To protect the total force through actionable health surveillance information and support.

GOALS:

- Flexible, responsive, and predicative to our customers
- Early warning capability of global health threats
- Inform risk management decisions across the health surveillance enterprise

Armed Forces Health Surveillance Division

Retrospective

EPIDEMIOLOGY AND ANALYSIS

The E&A Branch integrates the expertise of epidemiologists, preventive medicine physicians, and data analysts to provide timely analyses and reports of actionable health information. The branch uses AFHSD health surveillance tools—the DMSS and the DODSR—and provides surveillance products to DOD policymakers, military leaders, 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 surveillance case definitions, and train preventive medicine residents. The branch 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 branch 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.

IN 2024, E&A STAFF MEMBERS 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. The resulting reports have helped DoD policy makers shape their Force Health Protection (FHP) programs, as well as healthcare professionals develop preventive measures against diseases or injuries affecting U.S. Service members and their beneficiaries.

Of note, in 2024 E&A completed a retrospective cohort study to examine incidence of noise-induced hearing injury, behavioral health disorders, acute and cumulative musculoskeletal injuries, and dog bites among active component military working dog handlers. This study was conducted as requested in the DoD Working Dog Enterprise Management Doctrine, Organization, Training, materiel, Leadership and Education, Personnel, Facilities, and Policy Change Recommendation, Action 22.

IN 2024, E&A COMPLETED THREE ANALYSES IN RESPONSE TO CONGRESSIONAL INQUIRIES RELATED TO MILITARY EXPOSURES. E&A PROVIDED DATA ON COVID-19 VACCINE ADVERSE EVENTS, DEPLOYMENT HEALTH ASSESSMENT COMPLIANCE, AND COMPLETED PHASE 1B OF THE MILITARY AVIATOR CANCER STUDY.

Examples of Select AFHSD Periodic Reports in 2024

1. Heat and Cold Weather Injury Report
2. COVID-19 Case Tracking Report
3. DOD Eye Injury Report
4. Health Affairs (HA) Mental Health Report
5. HA TBI Report
6. Walk-in Contraceptive Services Outcomes Report
7. Public Health Assessment (PHA) Suicidal and Homicidal Ideation Report
8. PHA Tobacco Use Report
9. Congressionally Directed Medical Research Program (CDMRP) Incidence & Burden Reports
10. Medical Affairs HIV PrEP Report
11. DOD Musculoskeletal Injury Report
12. TRICARE Coverage in Reserve Component Report

E&A also continued to support important DOD research studies, including the Project for Military Exposures and Toxin History Evaluation in U.S. Service Members (PROMETHEUS). This project was created as part of the White House Cancer Moonshot initiative to better understand the causes and effective treatments for cancer in service members. Other examples of research study support in 2024 included data provided for assessing long-term immunogenicity of Japanese encephalitis vaccine, serological survey to evaluate pertussis carriage, and characterizing presence and treatment of risk factors among young Service members with myocardial infarctions.

In 2024, E&A hosted a journal club to support staff analysts and epidemiologists in staying up to date with the latest epidemiologic methods and current developments in military-relevant research and surveillance activities. The club facilitates discussions on emerging developments in the field, as well as fosters skills in critical evaluation and the development of publication-quality manuscripts. E&A also updated and maintained SAS® code libraries to standardize programming code used for surveillance case definitions.

E&A SATELLITES

AFHSD E&A maintains satellite staff at at DCPH-A, DCPH-P, and DCPH-D – Aberdeen, Portsmouth, and Dayton. Satellite staff primarily support surveillance at their respective public health centers but also contribute valuable expertise to the enterprise and regularly participate in joint meetings including the weekly Request Assessment Process and monthly E&A staff meetings.

THE ABERDEEN SATELLITE staff supports several divisions and branches within the Clinical Public Health and Epidemiology Directorate at DCPH-A, including Behavioral and Social Health Outcomes Practice, Injury Prevention, and Army Hearing Conservation and Readiness. Reports produced during 2024 include the annual *Joint Health of the Force* report and the Army Behavioral Health Monitoring Report. Other products include publications such as "Incidence of Self-Reported Bothersome Tinnitus Versus Tinnitus Diagnosis Among U.S. Army Soldiers," published in the *American Journal of Audiology*. Additionally, the *DOD Suicide Event Report (DODSER)* was presented at the 2024 Army Suicide Prevention Program Managers (SPPM) Course, and comprehensive updates to Cost of Injury analyses were presented at quarterly Defense Safety Oversight Council (DSOC) Military Injury Working Group (MIWG) meetings.

THE PORTSMOUTH SATELLITE staff work within the Epi Data Center (EDC), which, along with Health Analysis, is part of the DCPH-P. Satellite staff serve as subject matter experts in behavioral and operational health, reportable and emerging infections, exposure and injury analysis, and data systems and application development.

THE DAYTON SATELLITE staff work closely with the DoD Global Respiratory Pathogen Surveillance Program, which collects and analyzes more than 12,000 specimens from sentinel sites around the world annually. Additionally, staff at Dayton Satellite supported GEIS effort in the DoD Influenza surveillance and Mid-Season Vaccine Effectiveness through a presentation to the Vaccines and Related Biological Products Advisory Committee (VRBPAC) for 2024. Others work included providing routine surveillance report to various stakeholders throughout the year and supporting year-round epidemiology consults from combatant commands (CCMDs).

MEDICAL SURVEILLANCE MONTHLY REPORT

MSMR is the premiere medical peer-reviewed journal published by AFHSD and DHA. The monthly journal, launched in 1995, provides evidence-based estimates of the incidence, distribution, impact, and trends of illness and injuries among U.S. military Service members and associated populations. Continuously evaluating manuscript submissions for scientific accuracy, *MSMR* publishes pertinent articles on military public health, epidemiology, surveillance, and disease and injury prevention.

MSMR reports present data, public health information, and original research with direct relevance to the operational fitness of military members or MHS beneficiaries' health, safety, and well-being. In addition, *MSMR* dedicates one issue annually to reporting on comprehensive morbidity burdens among service members and MHS beneficiaries.

MSMR articles published in 2024 on health.mil in were viewed over 25,000 times, more than doubling recorded readership on health.mil from the previous year. The five most read articles published in 2024 reported on weight loss medication prescription prevalence in the active component, Army mortality surveillance, ivermectin prescription fill rates during the coronavirus pandemic, and the annual heat illness and exertional rhabdomyolysis updates.

IN 2024, MSMR PUBLISHED 12 SURVEILLANCE SNAPSHOTS AND 36 ARTICLES, INCLUDING 17 ORIGINAL FULL REPORTS, 2 BRIEF REPORTS, 16 PERIODIC UPDATES, AND 1 HISTORICAL PERSPECTIVE. THESE REPORTS AND PERIODIC UPDATES INCLUDE MSMR'S ANNUAL REPORTING ON THE HEALTH CARE BURDEN OF DISEASE AND INJURY, UPDATES ON HEAT AND COLD INJURIES, MENTAL HEALTH DISORDERS, AS WELL AS MALARIA AND HIV INFECTIONS.

MSMR is indexed in PubMed, MEDLINE, and Scopus, which regularly review indexed journals for adherence to peer-reviewed standards. In 2024, *MSMR's* LinkOut hits on PubMed to published articles on health.mil continued to increase, totaling 5,184, a nearly 25 percent increase from 2023. *MSMR's* average number of page hits per month on PubMed in 2024 was 432.

2024 marked the first year that *MSMR* began full text archiving on PubMed Central (PMC), the permanent repository of record for biomedical and life sciences journal literature hosted by the U.S. National Institutes of Health's National Library of Medicine (NIH/NLM). All *MSMR* articles from January 2024 onward will be fully available to readers on the PMC site, which will greatly expand the journal's readership and impacts.

More than 1,400 individuals, comprising a diverse readership of public health practitioners, clinicians, and military health leadership, in addition to scientists, researchers, educators, and analysts from the public, private, as well as academic sectors, are direct subscribers to the *MSMR* journal.

GRADUATE MEDICAL EDUCATION

As a key DoD source for health surveillance and epidemiologic training, AFHSD hosts preventive medicine residents from the Uniformed Services University of the Health Sciences (USUHS) for a 5-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 are also exposed to AFHSD daily operations and initiatives. Central to their rotation, residents conduct an epidemiologic study using the DMSS. Residents engage in all stages of epidemiologic investigation starting with the formation of a hypothesis and development of an appropriate study design, then analyze the data, interpret findings, and generate a publishable manuscript. Finally, they culminate their project by giving an oral presentation to peers and senior staff.

SINCE 2008, AFHSD HAS TRAINED 97 RESIDENTS WITH DIVERSE ACADEMIC BACKGROUNDS FROM THE 3 MILITARY SERVICES, AS WELL AS 2 DOCTOR OF PUBLIC HEALTH STUDENTS. IN 2024, AFHSD TRAINED A TOTAL OF 8 RESIDENTS, INCLUDING 6 FROM THE NAVY AND 2 FROM THE AIR FORCE.

Resident and student projects in 2024 resulted in published articles such as:

- "Weight loss medication prescription prevalence in the active component, 2018-2023,"
- "Trends of ischemic heart disease and cerebrovascular disease in active component female service members, 2014-2023,"
- "Incidence and risk factors for hip fractures among U.S. Armed Forces active component women compared to men, 2018-2022," and
- "Vitamin D deficiency trends, risk factors, and occupational risk in active component service members of the U.S. Armed Forces, 2018-2022."

Completed resident projects are published in the *MSMR* or other peer-reviewed journals and presented at the American College of Preventive Medicine meeting. Additionally, the E&A Branch offers rotation and practicum opportunities for occupational and environmental medicine residents and candidates pursuing Master of Public Health and Master of Science in Public Health degrees at USUHS.

E&A PUBLICATIONS LIST 2024

1. Mabila SL, Murray JH, Stahlman SL, Sheriff EA, McQuistan AA. Surveillance snapshot: incidence of dog bites among military working dog handlers, 2012-2023. *MSMR*. 2024;31(11):21-22. Published 2024 Nov 20.
2. Eick-Cost AA, Mabila SL, Ying S. HIV pre-exposure prophylaxis (PrEP) prescriptions within the active component of the U.S. military, 2023. *MSMR*. 2024;31(3):17. Published 2024 Mar 20.
3. McQuistan AA, Wilkerson T 3rd, Mabila SL. Incidence of alopecia and hair loss among female active component service members, 2010-2022. *MSMR*. 2024;31(9):12-15. Published 2024 Sep 20.
4. Mancuso JD, Mabila SL. A comparison of the rate of HIV incidence in the active component U.S. military with the U.S. population in 2021. *MSMR*. 2024;31(3):18-19. Published 2024 Mar 20.
5. Stidham RA, Cole R, Mabila SL. The four most frequently diagnosed vector-borne diseases among service member and non-service member beneficiaries in the geographic combatant commands, 2010-2022. *MSMR*. 2024;31(1):14-16. Published 2024 Jan 20.
6. Hiban K, Mabila SL, Murray JH, McQuistan AA, Wells NY. Post-acute sequelae of SARS-CoV-2 and kidney events in U.S. active component service members, March 1, 2020-September 30, 2022. *MSMR*. 2024;31(12):17-22. Published 2024 Dec 20.
7. Nieh C, Mabila SL. Incidence and health care burden of uterine fibroids among female service members in the active component of the U.S. Armed Forces, 2011-2022. *MSMR*. 2024;31(2):9-15. Published 2024 Feb 20.
8. Lorei NC, Stahlman SL, Oh GT, Wells NY. Weight loss medication prescription prevalence in the active component, 2018-2023. *MSMR*. 2024;31(1):9-13. Published 2024 Jan 20.
9. Stahlman SL, Wilkerson TG. Demographics of the Space Force active component, U.S. Armed Forces, November 2023. *MSMR*. 2024;31(2):16. Published 2024 Feb 20.
10. Kotas KS, Stahlman SL, Ying S, Yun DH, McCannon CE, Ambrose JF. Syphilis cases among pregnant women and newborns in the Military Health System, 2012-2022. *MSMR*. 2024;31(12):12-16. Published 2024 Dec 20.
11. Donici V, Stahlman SL, Fan MT, Langton RS. Trends of ischemic heart disease and cerebrovascular disease in active component female service members, 2014-2023. *MSMR*. 2024;31(11):14-19. Published 2024 Nov 20.
12. Clausen SS, Murray JH, Stahlman SL. Ivermectin prescription fill rates among U.S. Military members during the coronavirus disease 2019 (COVID-19) pandemic. *MSMR*. 2024;31(1):2-8. Published 2024 Jan 20.
13. Vu PA, Stahlman SL, Fan MT, Wells NY. Incidence and risk factors for hip fractures among U.S. Armed Forces active component women compared to men, 2018-2022. *MSMR*. 2024;31(8):8-13. Published 2024 Aug 20.
14. Townsend LC, Stahlman SL, Escobar JD, et al. Positivity and Follow-Up Testing of Chlamydia trachomatis and Neisseria gonorrhoeae Infections in Universally Screened Female Basic Military Trainees. *Sex Transm Dis*. 2025;52(3):176-180. doi:10.1097/OLQ.0000000000002099
15. Kelly DC, Fan M, Langton RS, Stahlman SL. Vitamin D deficiency trends, risk factors, and occupational risk in active component service members of the U.S. Armed Forces, 2018-2022. *MSMR*. 2024;31(8):2-7. Published 2024 Aug 20.
16. Rossi KR, Pursley RN. A content review of articles published in the Medical Surveillance Monthly Report, 2019-2023. *MSMR*. 2024;31(1):17-20. Published 2024 Jan 20.
17. Rossi KR, Sheriff EA, Russell S. Trends in pharmacy prescriptions by therapeutic class among active component members of the U.S. Armed Forces, 2014-2023. *MSMR*. 2024;31(7):23. Published 2024 Jul 20.
18. Mancuso JD, Ahmed AE, Rossi KR. Tobacco and nicotine use among active component U.S. military service members: a comparison of 2018 estimates from the Health Related Behaviors Survey and the Periodic Health Assessment. *MSMR*. 2024;31(3):2-12. Published 2024 Mar 20.
19. Eick-Cost AA, Thervil JW, Hu Z, DeMarcus LS. Mid-season influenza vaccine effectiveness estimates among DOD populations: a composite of data presented at VRBPAC-the Vaccines and Related Biological Products Advisory Committee-2024 meeting on influenza vaccine strain selection for the 2024-2025 influenza season. *MSMR*. 2024;31(3):20-23. Published 2024 Mar 20.
20. Kwaah B, Gruner WE, DeMarcus LS, et al. Surveillance outcomes of respiratory pathogen infections during the 2021-2022 season among U.S. Military Health System beneficiaries, October 3, 2021-October 1, 2022. *MSMR*. 2024;31(5):16-23. Published 2024 May 20.
21. Sherlock LP, Gibson KJ, Talian DS, Lake DC. Incidence of Self-Reported Bothersome Tinnitus Versus Tinnitus Diagnosis Among U.S. Army Soldiers. *Am J Audiol*. 2024;33(4):1212-1220. doi:10.1044/2024_AJA-24-00053

These *MSMR* covers capture the articles produced in 2024. The report publishes articles on trends of illness or injury for force health protection since 1995

Prospective

GLOBAL EMERGING INFECTIONS SURVEILLANCE

The purpose of the GEIS Branch is to increase battlespace awareness and improve Total Force Readiness in support of the unified CCMDs via a global laboratory network focused on mitigating the threat of emerging infectious diseases to U.S. Service members.

The GEIS Branch achieves its purpose through three strategic goals:

1. Relevant, timely, and impactful surveillance products are curated through robust PROGRAM MANAGEMENT that incorporates strategic and technical guidance, and sound fiscal practices;

2. A global capability to conduct SURVEILLANCE for known and emerging infections that threaten the health of the Force and/or military operations is maintained within the DoD;

3. Surveillance information PRODUCTS provide early warning of known and emerging threats and/or situational awareness of infectious diseases globally to decision-makers, enabling signal to action.

GEIS-funded DoD partner laboratories conduct laboratory-based infectious disease surveillance and provide timely information on circulating threats for FHP and public health decision-making. The GEIS Branch coordinates a portfolio of surveillance activities within four Focus Areas: Antimicrobial Resistant Infections (AMRI), FVBI, Respiratory Infections (RI), and Wastewater-Based Biosurveillance (WBB). Each Focus Area's portfolio may be further divided into "surveillance categories," a collection of similar surveillance activities centered on common themes such as pathogen/disease targets, populations, or surveillance techniques.

IN 2024, GEIS DISTRIBUTED $39.966M IN FUNDING TO 20 DOD LABORATORIES TO CONDUCT INFECTIOUS DISEASE SURVEILLANCE TO INFORM FHP. AN ADDITIONAL $12M IN BIODEFENSE POSTURE REVIEW FUNDING WAS DEDICATED TO MAINTAINING NEXT-GENERATION SEQUENCING CAPABILITIES AND BIG DATA TRANSFER EFFORTS.

In November 2024, a supplement entitled 'Reports from the U.S. Department of Defense Global Emerging Infections Surveillance Branch' was published (Vol 30, No. 14 Supplement) in the *Emerging Infectious Diseases* journal, highlighting the work of both the GEIS Branch and the partner network.

GEIS PARTNERS

FIGURE 1. Map of GEIS Partner Locations

U.S. NAVY PARTNERS:

- Naval Medical Research Command (NMRC)
- Naval Medical Research Unit (NAMRU) INDO PACIFIC
- NAMRU Navy Regional Europe, African, Central (EURAFCENT)
- NAMRU SOUTH
- Naval Health Research Center (NHRC)
- Navy Entomology Center of Excellence (NECE)

U.S. AIR FORCE PARTNERS:

- U.S. Air Force Aerospace School of Medicine (USAFSAM)
- 18th Operational Medical Readiness Squadron (18 OMRS)

U.S. ARMY PARTNERS:

- Public Health Command–Pacific (PHC-P)

DEFENSE HEALTH AGENCY (DHA) PARTNERS:

- Walter Reed Army Institute of Research (WRAIR)
- WRAIR Africa (WRAIR-A)
- WRAIR Armed Forces Research Institute of Medical Sciences (WRAIR-AFRIMS)
- WRAIR Europe–Middle East (WRAIR-EME)
- U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID)
- Defense Centers for Public Health (DCPH)–Aberdeen (DCPH-A)
- DCPH–Dayton (DCPH-D)

MILITARY TREATMENT FACILITY PARTNERS:

- Landstuhl Regional Medical Center (LRMC)
- Tripler Army Medical Center (TAMC)
- Brian D. Allgood Army Community Hospital (BDAACH)

ADDITIONAL PARTNERS:

- Uniformed Services University of the Health Sciences (USUHS)

GEIS INITIATIVES

The GEIS Branch enhances the execution of surveillance activities and information sharing through several key initiatives, including Data-to-Decision (D2D), Data Modernization, and Next-Generation Sequencing and Bioinformatics (NGS-BI).

DATA-TO-DECISION

The D2D initiative aims to communicate infectious disease surveillance findings with primary GEIS stakeholders (e.g., Geographic Combatant Commands (GCC); CCMDs) to inform FHP decision-making in a timely manner. In 2024, GEIS partner laboratories continued to provide monthly surveillance findings to the GEIS Branch. This data was used to develop and disseminate 11 Monthly Surveillance Reports and 9 SPOT reports throughout the year. SPOT reports are concise, rapid reports of essential information about diseases or pathogens that pose a moderate or high threat to FHP and are urgently communicated to GEIS audience members with a need-to-know and U.S. service members. In alignment with DoD guidance (DOPSR 24-P-0363), the GEIS Branch is now routinely sharing reports with allied militaries to further impact risk mitigation. Notable findings shared this year include the first identified cases of Zika virus and Mpox in Kenya and two human cases of *Plasmodium knowlesi* in Thailand.

Over the past year, several goals were accomplished as part of the D2D initiative. First, the GEIS Branch continued to curate its CarePoint site, making several modifications to streamline information sharing between partner laboratories and the Program Office. Second, the GEIS flagship product, the Monthly Surveillance Update report, was improved to more easily permit audience members to navigate partner findings and relate them to activities on the ground. In addition, the report now features a highlighted scientific publication along with a listing of recent publications to better illustrate the breadth of GEIS-funded surveillance activities and contributions to the scientific literature. As part of this effort, the GEIS Branch continues to encourage its partners to contribute to the GEIS Partner Publication Database. The database allows the program to track publications as part of evaluating project progress and outcomes resulting from GEIS-funded efforts. From 2016 to 2024, the GEIS program logged **435** publications in **144** unique journals. In 2024 alone, the GEIS-funded partners published **46** manuscripts.

DATA MODERNIZATION

The implementation of data modernization strategies will improve data quality, enable advanced analytics, increase agility and scalability of systems, and enhance data accessibility and usability for the GEIS audience. By moving to modern platforms for ingesting and sharing data, the GEIS Branch will be able to further leverage the available digital landscape to timely communicate FHP impacts. The GEIS Branch's data modernization plan encompasses both programmatic and surveillance data streams to better ingest and translate findings, improving the ability to move from signal to action.

The modernization plan for programmatic data will be implemented through the Smartsheet Gov web-based tool (https://www.smartsheet.com/solutions/federal-government) that will streamline operations, enable powerful program management insights and task automation to enhance the oversight of surveillance activities and facilitate the alignment of GEIS Branch operations with modern standards found in comparable industries.

The surveillance data modernization plan will be enabled by data standardization within each Focus Area and will decrease laboratory reporting burden and combat access restrictions with current platforms. Initial data modernization will be largely executed through provision and implementation of a computerized health information system across the GEIS-funded laboratories, DHIS2, for wastewater surveillance. This fully customizable and accessible tool is utilized in more than 80 countries as an integrated health information platform to facilitate data management across multiple programs to provide critical information to decision makers at all levels, demonstrating its flexibility.

GEIS Branch and Defense Centers for Public Health–Aberdeen staff members visited laboratory network partners at the Naval Medical Research Command – Biological Defense Research Directorate in December 2024. (AFHSD/GEIS)

NEXT GENERATION SEQUENCING AND BIOINFORMATICS CONSORTIUM

The GEIS Next-Generation Sequencing (NGS) and Bioinformatics (BI) Consortium (NGSBC), established in 2017 as part of the NGS-BI cross-cutting initiative, continues to coordinate NGS and BI activities within the GEIS portfolio. The NGSBC is comprised of DoD subject matter experts in NGS and BI, and laboratory partners with varying NGS and BI skillsets for genomic surveillance.

The NGSBC uses a three-tiered framework to enable NGS-BI capabilities to be leveraged throughout the network and provide many forms of support, including two iterations of a proficiency testing exercise. The first iteration, the Pathogen Discovery Project, was executed in 2017-2018. The second iteration, the Pathogen Detection Project (PDP), was executed in late 2023. The GEIS NGSBC executed PDP 1.0 in 2017-2018 and began the PDP 2.0 exercise in late 2023. The second iteration is a smaller, blinded panel of simulated clinical specimens sent to 11 participating laboratories to assesses current methods in NGS and BI analysis for unknown pathogens. This exercise provides detailed information for continued development of sequencing capabilities, particularly pathogen agnostic sequencing capabilities.

In addition to proficiency testing, subject matter experts in the NGSBC provide reach back support where members of the network can access specialized expertise, resources, or tools to assist with troubleshooting, incident response, or ongoing operations. For the NGSBC, this includes site visits, remote consultation, and secondary data validation to direct limited resources for training and equipment. This multi-pronged approach ensures that NGS and BI capabilities are continuously developed throughout the GEIS network, ultimately strengthening infectious disease surveillance through collaboration and mentorship.

For the past two fiscal years, the GEIS Branch has executed funding from the Biodefense Posture Review (BDPR) to support two major lines of effort: genomic sequencing and bioinformatics and big data transfer for GEIS-supported surveillance activities. This funding enables the DoD to:

- Ensure microbial genomes are paired with clinical and epidemiologic data to guide FHP and public health context for emerging pathogens.
- Identify novel and emerging human pathogens via agnostic surveillance.
- Provide pathogen characterization to assess current countermeasure effectiveness and inform future countermeasure development.
- Support wastewater surveillance to supplement existing surveillance systems and to potentially identify earlier signals of potential outbreaks.
- Upgrade DHA cloud-based genomic data storage, sharing, and analytics.
- Invest in modernizing sequencing equipment and computational infrastructure.

In addition to bolstering NGS, BI, and big data transfer activities, the GEIS Branch sought to increase the contribution of pathogen agnostic sequencing (PAS) activities to its portfolio. PAS can identify novel, emerging, or re-emerging pathogens present in a sample, including bacteria, viruses, fungi, and parasites, without prior knowledge of what might be there. These data can also help guide evaluation of existing interventions, as well as the development of new countermeasures by permitting the tracking of genomic changes in a pathogen population. Therefore, in late 2024, the GEIS program released a targeted, mid-year RFP to solicit proposals specific to pathogen agnostic sequencing activities. Ultimately, effective utilization of PAS data requires accompanying clinical and epidemiologic data of sufficient quality to inform FHP and broader public health guidance around emerging pathogens.

STAYING ON THE LEADING EDGE

The GEIS Branch is committed to maintaining cutting-edge biosurveillance laboratory capabilities and technologies through several key initiatives. A key component of these efforts is the development and implementation of the Military Health System (MHS) Digital Biobank, a secure cloud environment within the MHS Information Platform designed to securely store, analyze, and share omics data between laboratories. By providing a centralized platform, the Digital Biobank enhances the GEIS network's capacity to collectively and independently detect, characterize, and respond to emerging infectious diseases threats. In 2024, the Digital Biobank team onboarded 190 members, processed the approval of 1,181 bioinformatics packages, and stored over 600 files totaling more than 115GB.

The MinION User Group established in 2019 was renamed the NGS User Group in late 2024 to reflect the group's expanded scope beyond Oxford Nanopore Technology sequencing to include platforms such as Illumina and PacBio. This expanded focus promoted broader genomic sequencing information exchange, collaboration, and innovation as sequencing technologies continue to evolve, and will enhance the group's ability to address applications of sequencing technology. The NGS User Group continues to highlight and discuss advancements that enable rapid, agnostic pathogen identification and early warning capabilities, ultimately bolstering national and global biosurveillance and FHP efforts. Currently, the NGS User Group includes approximately 250 participants from 45 entities across the DoD, interagency, and academia. In 2024, the group facilitated five presentations that were shared widely among GEIS network and interagency collaborators. Looking ahead, a key goal is to expand engagement and participation from interagency, academic,

Dr. Stephanie Cinkovich supports collaborative efforts to enhance force health protection in East Africa. Members from AFHSD-GEIS, CJTF-HOA, 406 AEW, EMF, AFRICOM Surgeon Cell, and SOCAF at Camp Lemonnier, Djibouti, assessing and documenting FHP assets across all component commands. (AFHSD/GEIS)

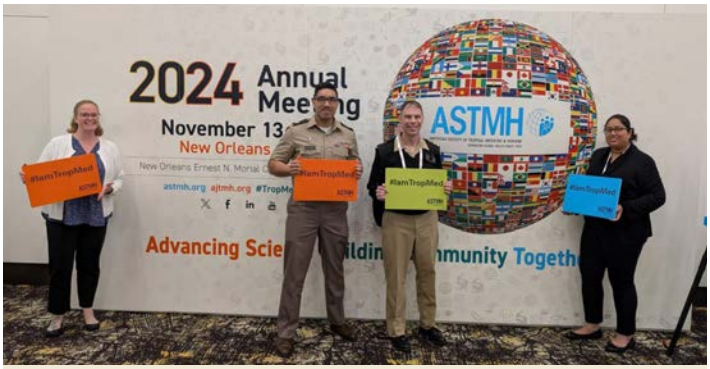
and private sector partners. This initiative will serve to increase awareness, grow membership, and foster participation from a broader spectrum of sequencing experts and partner organizations. The group remains committed to providing a forum for the exchange of best practices, lessons learned, and emerging technologies within the biosurveillance community.

Looking ahead to 2025, the GEIS Branch is increasing direct engagements with the CCMDs to better support infectious disease surveillance in operational environments, including before and during military exercises. The goal of these efforts is to collect and disseminate findings that inform preventive medicine actions needed to maintain medical readiness. In 2024, the GEIS Branch laid the groundwork for this initiative through increased participation in broad planning events and symposiums with the CCMDs. This expansion also included the first engagement at a critical enduring location, Camp Lemonnier, demonstrating the GEIS Branch's ability to provide biosurveillance support in key operational areas. Collaboration with all FHP assets and stakeholders allowed for preparation of the inaugural East Africa FHP Group Meeting in 2025, including comprehensive mapping of available resources, strengthening relationships between laboratories, and fostering connections with component commands to broaden access to biosurveillance capabilities. The large-scale Balikatan exercise in the Philippines continues to validate field biosurveillance capabilities and remains a pivotal effort for piloting new biosurveillance activities.

KEY ENGAGEMENTS

In 2024, the GEIS Branch conducted site visits with NAMRU INDO PACIFIC in Malaysia, WRAIR-AFRIMS in Thailand, WRAIR-A in Kenya and Uganda, TAMC in Hawaii, and USAFSAM/DCPH-D in Ohio to assess capabilities, identify gaps, and plan for future surveillance activities. Members of the team also traveled to Mombasa, Kenya to participate in a strategic scientific planning meeting for the upcoming year. These visits allowed the staff to meet with leadership and investigators at the laboratories, evaluate the readiness of potential surveillance site locations and the success of existing active sites, and assess on-site capabilities for high-impact activities such as NGS. Team members from the Branch also participated in two tabletop exercises: Pandemics and Infectious Diseases Coordination Conference/Viral Supremacy 2024 in Pennsylvania and the inaugural U.S. 5th Army biological incident tabletop exercise in Texas. Members of the GEIS team also traveled to Atlanta, Georgia to participate in a wastewater summit sponsored by the Water Environment Federation (WEF) and meet with key staff from the U.S. Centers for Disease Control and Prevention (CDC) regarding wastewater surveillance. Finally, members of the GEIS Branch attended the annual American Society of Tropical Medicine and Hygiene (ASTMH) conference in Louisiana where many GEIS network partners were in attendance, presented their work, and networked with the GEIS Branch team and other collaborators.

The GEIS Branch hosted a combination in-person and virtual Vector Surveillance Summit in September 2024 to bring together personnel from GEIS-funded laboratories, collaborating DoD organizations, the U.S. Department of Agriculture, and the U.S. Department of Health and Human Services (the Office of the Assistant Secretary for Health, the National Institutes of Health, and the CDC). The goals of the Summit were to increase connections between laboratories and the vector-borne disease surveillance and response entities throughout the U.S. interagency, share updates on current capabilities and activities in vector-borne disease surveillance within the GEIS network, and discuss potential program adjustments to meet anticipated vector-borne threats. The Summit provided the GEIS Branch and partners an opportunity to inform and plan the execution of DoD-wide vector and vector-borne disease surveillance relevant to FHP.



GEIS Branch staff members attended the annual American Society for Tropical Medicine and Hygiene in New Orleans, Louisiana in November 2024. From left: Dr. Jessica Radzio-Basu, CPT Mark Gutierrez, CDR Matthew Kasper, and Ms. Nazia Rahman (AFHSD/GEIS)

BRANCH FOCUS AREA OVERVIEWS

ANTIMICROBIAL RESISTANT INFECTIONS FOCUS AREA

The AMRI Focus Area executes coordinated surveillance of AMR pathogens to inform FHP decision-making, DoD policy, and public health authorities in preventing, detecting, and responding to military-relevant infectious disease and AMR threats. The Focus Area portfolio addresses the surveillance of antimicrobial-resistant organisms across three pathogen domains: ESKAPE+ infections, sexually transmitted infections (STIs), and enteric infections. The ESKAPE+ domain encompasses surveillance of clinically relevant pathogens with a high propensity for developing AMR and causing healthcare associated infections: *Enterococcus faecium, Staphylococcus aureus, Klebsiella pneumoniae, Acinetobacter baumannii, Pseudomonas aeruginosa*, *Enterobacter* spp., *Escherichia coli*, *Candida auris*, and emerging antimicrobial-resistant threats. In line with the concerns of the DoD, the STI domain includes multidrug-resistant *Neisseria gonorrhoeae* and *Mycoplasma genitalium* surveillance activities in priority populations around the world. The enteric infections domain includes surveillance to define AMR patterns among bacterial enteric pathogens, as well as the etiology of diarrheal diseases. The discrete surveillance categories and sub-categories within the AMRI Focus Area include clinically relevant ESKAPE+ pathogen surveillance, limited antibiotic-resistant STI surveillance, symptomatic enteric infection surveillance, environmental surveillance, surveillance for ESKAPE+ and enteric infections during military exercises and engagements, and One Health as it relates to AMR.

CURRENT PORTFOLIO

To address the specific needs of the DoD, the AMRI Focus Area continues to conduct surveillance of ESKAPE+ pathogens in 19 countries detecting and characterizing critical AMR threats through partnerships with NAMRU SOUTH, WRAIR-EME, WRAIR-A, NAMRU EURAFCENT, NAMRU INDO PACIFIC, and WRAIR-AFRIMS. Additionally, the AMRI Focus Area increased its support for the WRAIR Multidrug-Resistant Organism Repository and Surveillance Network (MRSN) for detection of outbreaks of multidrug-resistant organism in the MHS, monitored global distribution of priority AMR genes through whole genome sequencing, and further expanded their repository of ESKAPE+ isolates. These surveillance collaborations revealed a high prevalence of extensively drug-resistant (XDR) *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, and other ESKAPE+ pathogens in clinical settings. Within the Enteric Infections pathogen domain, the GEIS Branch continued its support for the flagship Global Travelers' Diarrhea Study (GTD), capturing key information about the causes and impacts of diarrhea in adults traveling to Djibouti, Egypt, Honduras, Kenya, Nepal, Peru, and Georgia. This was complemented by surveillance of enteric infections among Service members at military exercises in the USINDOPACOM and USEUCOM areas of responsibility, and among recruits at U.S. military training facilities and along the U.S.-Mexico border. In the STI pathogen domain, the AMRI Focus Area supported surveillance of AMR among *Neisseria gonorrhoeae* and *Mycoplasma genitalium* with a geographic focus on USINDOPACOM. The Uniformed Services University (USU) Gonococcal (GC) Repository & Reference Laboratory provided reach back support to laboratories outside of the continental U.S. (OCONUS) collecting *N. gonorrhoeae* by providing confirmatory testing, coordinating whole genome sequencing (WGS) through MRSN, and maintaining a repository of internationally sourced GC isolates.

WHERE WE ARE GOING

The AMRI Focus Area will continue to emphasize integrated and harmonized surveillance of multidrug-resistant organisms with FHP relevance and prioritize laboratory-based ESKAPE+ surveillance in foreign military, Tricare- and Department of State-approved hospitals OCONUS. This requires submission of drug-resistant isolates collected from clinical laboratories to WRAIR-MRSN for additional analysis to understand large-scale trends and further define circulating resistant strains. The AMRI Focus Area will continue to connect OCONUS laboratories with the USU GC Repository to grow and reinforce its STI network and aims to improve the culturing of priority STI pathogens at key locations. In addition, to further understand regional risk, it will support progress toward an expanding Pacific network of STI surveillance. The AMRI Focus Area will also prioritize knowledge of the epidemiology, etiology, and AMR patterns of enteric pathogens. A standardized data collection process has previously been implemented for the GTD Study and may be used as a framework for other enteric surveillance activities in future. The AMRI Focus Area is taking steps to establish a reach back laboratory and repository for enteric isolates collected across the GEIS network at the DCPH-A and NMRC-Biological Defense Research Directorate (BDRD). These facilities will conduct centralized WGS and bioinformatic analysis of bacterial isolates to complement regional surveillance capabilities and facilitate global surveillance analyses.

RECENT FINDINGS AND ACCOMPLISHMENTS

The AMRI Focus Area identified several important accomplishments from its funded portfolio efforts in 2024.

- In Kenya, WRAIR-A identified novel variants of AMR genes conferring resistance to colistin, an important

last-resort antibiotic, in *K. pneumoniae*, *Enterobacter cloacae*, and *P. aeruginosa* isolates. Additionally, NAMRU SOUTH detected AMR genes in *E. coli* isolates that had not been reported in SOUTHCOM previously. These genes can confer resistance to carbapenem and aminoglycoside classes of antibiotics, which are important clinically relevant treatment modalities. The detection of these genes far from large urban areas demonstrates the potential for emergence of AMR threats in austere environments in the SOUTHCOM area of responsibility.

- NHRC established enteric pathogen surveillance along the U.S.-Mexico border. Complemented by collaboration with other U.S. government agencies as well as state and local health departments, this surveillance provides a comprehensive picture of the epidemiology and etiology of enteric infections and their antimicrobial resistance patterns in the region.
- Findings from GEIS-funded surveillance have informed actions to slow the spread of AMR and preserve the effectiveness of critical antibiotics. For example, NAMRU EURAFCENT collaborated with the Jordanian Ministry of Health to update hospital antibiograms and create policies requiring preauthorization of carbapenem and colistin use at hospitals with potential to treat U.S. Service members based their surveillance data showing an increase in multidrug-resistant *Klebsiella* spp. infections. Limiting the use of these medications prevents the emergence of resistance to these critical last-resort antibiotics to ensure they will be effective when needed.
- The GEIS AMRI Focus Area collaborated with OCONUS laboratories to develop and publish five manuscripts in the journal *Emerging Infectious Diseases* in the GEIS feature supplement issue. These papers examined the epidemiology of travelers' diarrhea, multidrug-resistant ESKAPE+ organisms, and *Neisseria gonorrhoeae*. Three of the papers reflected global, multi-country collaborations to compare surveillance findings across the GEIS network.

FEBRILE AND VECTOR-BORNE INFECTIONS FOCUS AREA

The FVBI Focus Area portfolio emphasizes actionable surveillance of vector-borne and zoonotic febrile infections that pose risks to the health of U.S. Service members. The FVBI Focus Area surveillance projects are organized into three surveillance categories: characterizing acute febrile illnesses (AFI) by linking syndromes to causative pathogens; documenting the geographic and temporal distributions of vectors, reservoirs, and associated pathogens; and assessing the effectiveness of FHP countermeasures to malaria infections. The FVBI Focus Area funds activities to generate FHP-relevant information across the geographic CCMDs, improve awareness and understanding of emerging diseases and countermeasure effectiveness, enhance detection and diagnosis of febrile and vector-borne pathogens, and ultimately protect the health and readiness of the Joint Force.

CURRENT PORTFOLIO

In 2024, the FVBI Focus Area prioritized funding for vector surveillance across OCONUS partner labs to bolster existing efforts. Examples included initiating mosquito surveillance and screening from host nation military sites in Tanzania through WRAIR-A and continued acaricide resistance monitoring for tick and mosquito vectors in Thailand with WRAIR-AFRIMS. DCPH-A stood up the local capability to test USSOUTHCOM ticks for *Borrelia (Borreliella)* during a technical site visit to NAMRU SOUTH. WRAIR-EME continued their field surveillance of various vectors, providing the GEIS network consistent awareness of vector threats in high-priority USEUCOM countries. AFI surveillance was sustained in partner nations and included modest expansions and trainings to help bolster support for deployed battalions through NAMRU INDO PACIFIC. The FVBI Focus Area continued to prioritize factors responsible for rapid diagnostic test (RDT) failure in malaria screening, such as the distribution of *pfhrp2* gene-deleted *Plasmodium falciparum* parasites. NAMRU EURAFCENT was able to expand their surveillance footprint with the onboarding of sites in Yemen for malaria screening. Surveillance data from the Australian Defence Forces Malaria Infectious Disease Institute, in partnership with WRAIR-AFRIMS, NAMRU EURAFCENT, NAMRU INDO PACIFIC, and WRAIR-A continued to reveal that RDT failure rates can be highly variable within countries. Collectively, their findings also illustrate that the GEIS network has maintained the capability to provide such nuanced FHP countermeasure risk analysis for the DoD. Finally, PHC-P, DCPH-A, and the One Health Vector Diagnostic Laboratory (formerly Walter Reed Bioinformatics Unit) further developed their field-testing capability and taxonomic analysis proficiency, into standardized methods for creation of infectious disease risk assessments, particularly at sites that host military exercises and exchanges.

WHERE WE ARE GOING

To better serve DoD customers, the FVBI Focus Area is concentrating its surveillance efforts to meet unique DoD needs and harnessing efficiencies made possible by new or improved tools, techniques, and standardization efforts. The FVBI Focus Area intends to fund activities that generate actionable, FHP-relevant surveillance information. This includes expanding surveillance support for military exercises and operations, as well as continued monitoring of FHP countermeasure effectiveness (e.g., malaria RDTs). The FVBI Focus Area will move forward with coordinating surveillance procedure

Members of the GEIS Branch were joined by Rear Admiral Brandon Taylor on a site visit to its partner laboratories in Southeast Asia, including the Naval Medical Research Unit INDO PACIFIC and the Walter Reed Army Institute of Research – Armed Forces Research Institute of Medical Sciences. (AFHSD/GEIS)

harmonization and data integration across the GEIS network. The initial emphasis will be on dissemination of protocols and identification of standardized tools and equipment that can deliver the appropriate level of surveillance information faster and at lower cost. The FVBI Focus Area will also provide stronger coordination between laboratories pursuing similar surveillance objectives. This coordination will increase the return of investments on network-wide capabilities and speed up the sharing of surveillance material, including samples and data. As an example, DCPH-A will continue to increase tick surveillance capabilities at select OCONUS laboratories over the coming fiscal years. The FVBI Focus Area seeks to maximize surveillance impact by exploiting established methods and equipment, directing resources to fill gaps identified by operational customers, and increasing synergies across GEIS partner laboratory surveillance activities and collaborations.

RECENT ACCOMPLISHMENTS:

The FVBI Focus Area identified several important accomplishments from its funded portfolio efforts in 2024.

- The GEIS Branch hosted the 2024 AFHSD-GEIS Vector Surveillance Summit. During the 3-day event, participants received updates on the current state of FVBI surveillance through over 40 oral presentations from both CONUS and OCONUS partners. The GEIS Branch and its partners and stakeholders evaluated the landscape of vector and vector-borne disease surveillance across its global network and set strategic goals for the next 3 years.
- USAMRIID-Diagnostic Systems Division's second Global Emerging Assay Response System (GEARS) exercise successfully developed and tested room-temperature PCR assays for distribution to overseas laboratories. This will significantly reduce financial and logistical barriers for GEIS partner laboratories, enabling rapid deployment of situation-specific assays during time-sensitive infectious disease outbreaks. WRAIR-A announced the first known detection of Zika virus in Kenya from samples collected from two patients at a local hospital. Existing countermeasures for FHP were reevaluated considering evidence of low seroprevalence and infrequent transmission from *Aedes aegypti*. Confirmed local permethrin resistance was detected, indicating the need for other countermeasures when traveling around regions in Kenya where the samples originated.
- WRAIR-EME, in collaboration with WRAIR-Viral Diseases Program, used NGS to detect tick-borne encephalitis virus (TBEV) ticks collected from a military training area in Poland. While TBEV has been found in the northeast region of Poland, this was the first identification of the virus in the Bemowo Piskie Training Area. This discovery highlights the importance of adherence to tick bite prevention measures.
- NAMRU SOUTH screened *Aedes aegypti* mosquitoes in Iquitos, Peru (a dengue hotspot) and found high levels of pyrethroid resistance linked to knock-down resistance (kdr) alleles. This suggests that standard permethrin-based countermeasures may be ineffective, necessitating alternative insecticides or mosquito netting.

RESPIRATORY INFECTIONS FOCUS AREA

The RI Focus Area supports routine surveillance of respiratory pathogens (viral and bacterial), advanced characterization including NGS, and activities designed to examine the burden and distribution of respiratory pathogens that may have pandemic potential, increased risk of severity, or increased transmission rates. Surveillance is conducted through routine genomic and molecular surveillance among U.S. military members (including recruits, cadets, and pre- and post-deployment populations), MHS beneficiaries, foreign military, and civilian populations. Additionally, animal-focused genomic and molecular surveillance (i.e., influenza, novel coronavirus) is executed in animals and humans in geographically relevant locations of FHP interest where there is a high risk of spillover events (e.g., markets, backyard farms, border regions).

CURRENT PORTFOLIO

In 2024, the RI Focus Area prioritized enhancing respiratory genomic sequencing, with an emphasis on scientifically and operationally relevant pathogens, and retaining surge capacity for pandemic preparedness and emerging threats. This

CDR Shayne Gallaway and CDR Matthew Kasper (GEIS) tour one of the laboratories during a site visit to Walter Reed Army Institute of Research - Africa in February 2024. (AFHSD/GEIS)

focus aimed to provide genomic and advanced characterization data for known and unknown respiratory pathogens, with a particular emphasis on influenza and SARS-CoV-2. Routine surveillance data is aggregated and operationalized in products to inform geographic CCMDs and other key partners of up-to-date, actionable information about important and relevant pathogens circulating in the region. This year, the most frequently detected pathogens included influenza (A/B/non-subtyped), SARS-CoV-2, adenovirus, and rhinovirus.

WHERE WE ARE GOING

The RI Focus Area will maintain its existing priorities for routine viral and bacterial surveillance and will continue to support the DoD Global Respiratory Pathogen Surveillance Program (DODGRPSP), which provides broad surveillance of respiratory infections across the Department. The annual review and strategic selection of sentinel military installation sites optimizes surveillance across the MHS by ensuring sites with greater potential for participation continue to be included as part of the network while inactive sites are removed or further evaluated to understand barriers to participation. Surveillance at the human-animal interface will continue to be prioritized, emphasizing advanced characterization over basic testing to provide more useful and actionable data as it relates to pandemic preparedness and spillover events. The RI Focus Area will concentrate on improving awareness of partner findings and resources to enhance network collaboration and data sharing, particularly with NGS and BI initiatives and reach back laboratories. The Focus Area plans to coordinate with external organizations to improve surveillance synchronization and decrease duplicate surveillance efforts in comparable geographic regions. As NGS technologies and methods become more cost effective and practical in far-forward settings, the RI Focus Area may look to expand pathogen agnostic and semi-agnostic sequencing for a subset of influenza-like illness and severe acute respiratory infection specimens that have tested negative by conventional detection methods. Finally, the RI Focus Area is working to fill surveillance gaps where possible to improve the likelihood of the GEIS network detecting novel or emerging respiratory pathogens of public health importance.

RECENT ACCOMPLISHMENTS

The RI Focus Area identified several important accomplishments from its funded portfolio efforts in 2024.

- DCPH-D/USAFSAM generated more than 1,300 influenza sequences (and identified strains) from samples or data contributed by 9 GEIS-funded laboratories for the 2024–2025 respiratory season that was discussed with interagency partners to inform the composition of the 2025–2026 Northern Hemisphere influenza vaccine.
- WRAIR-AFRIMS, in collaboration with the Armed Forces Philippines (AFP), detected and reported a surge of SARS-CoV-2 among students at the AFP Health Service Education and Training Center, which resulted in updated Command guidance for re-emphasis of adherence to minimum public health safety protocol and COVID-19 case reporting.
- NHRC, in support of Navy Environmental and Preventive Medicine Unit - 5, performed WGS during an adenovirus surge at Marine Corps Recruit Depot - San Diego to confirm cases were not the result of breakthrough infections; subsequently leading to local policy changes to timing of immunization among new recruits.
- WRAIR-AFRIMS identified the presence of influenza A/H1N1(pdm09) immune response in serum from pigs, poultry, and farmers through active surveillance in backyard multi-species farms across Thailand, highlighting high-risk areas with the potential for spillover to humans in regions that border Myanmar and Cambodia.
- NHRC and NMRC-BDRD collaborated to conduct agnostic and semi-agnostic pathogen detection and viral culturing on over 150 samples collected from persons with acute respiratory symptoms near the U.S.-Mexico border who tested otherwise negative for respiratory viruses to identify other possible circulating pathogens/viruses of infection.

WASTEWATER-BASED BIOSURVEILLANCE FOCUS AREA

In August 2024, the GEIS Branch established WBB as an independent Focus Area in accordance with priorities outlined in the BDPR and the National Defense Authorization Act for FY25. Although wastewater surveillance (WWS) had been

incorporated into multiple GEIS-funded projects in years past, overwhelming interest in the utilization of wastewater-based biosurveillance for FHP prompted GEIS to unify and codify this line of effort into a distinct focus area. WWS offers cost-effective, near real-time monitoring of pathogen circulation at the population-level and can function as an early-warning indicator for emerging threats.

The WBB Focus Area currently prioritizes using a non-invasive, population-level infectious disease surveillance approach that fill gaps in existing infectious disease surveillance efforts to better inform FHP decision-making in CONUS and OCONUS settings. The priority pathogens for the WBB portfolio include SARS-CoV-2, influenza A/B, dengue virus (DENV), mpox virus (MPXV), respiratory syncytial virus (RSV), norovirus (NoV), as well as genes or select biomarkers associated with AMR.

Current Portfolio

In 2024, the WBB Focus Area drafted new strategic guidance for pilot WBB projects by leveraging technical expertise from current laboratory performers with ongoing WWS activities. Two key documents include the first edition of the WBB Focus Area Roadmap and the GEIS Wastewater Surveillance Handbook, which outline technical best practices for wastewater sample collection and analysis geared toward FHP. Building on the current body of work, the WBB Focus Area anticipates strategic expansion due to increased interest in WWS, demonstrated proof of capability, and utility of WWS for FHP. These strategic guidance documents will be paramount to the future success of this developing portfolio and the alignment of WBB proposals to the priorities of geographic CCMD FHP decision-makers and other GEIS program stakeholders.

Where We Are Going

The WBB Focus Area continues to expand in accordance with the overarching mission of supporting FHP decision-making and providing value to DoD customers. The current WBB portfolio focuses on implementation, validation, and providing proof of capability at strategically selected sites. Current activities focus on targeted molecular analysis of wastewater for a standard list of known viral targets (SARS-CoV-2, DENV, MPXV, RSV, influenza, NoV). Laboratories with demonstrated expertise in WWS methods will be recommended to expand their capabilities based on salient surveillance needs (e.g., influenza sub-typing) using methods like NGS, to include pathogen agnostic sequencing. While NGS has been performed throughout the GEIS network for over a decade, WWS specimens present technical challenges absent from many other specimen types, such as high sample complexity and relatively low concentrations of target nucleic acids. Accordingly, established WWS projects are encouraged to leverage both on-site NGS capabilities and reach back support from USAFSAM and DCPH-A.

Moving forward, the WBB Focus Area will continue to engage with DoD and interagency partners to align priorities and surveillance coverage, compare and discuss best practices, and promote collaboration and data harmonization. In the near-term, WBB reach back laboratory teams (DCPH-A and USAFSAM) will conduct on-site capabilities assessments and provide training. To align WBB priorities with the dynamic needs of FHP stakeholders, the Focus Area will continue to refine GEIS-level strategic guidance and facilitate consultations with new and existing partners. Ultimately, the GEIS WBB Focus Area aims to enhance global surveillance through early forecasting of military-relevant pathogens and integration of complementary WWS with existing public health monitoring activities.

Recent Accomplishments

The WBB Focus Area identified several important accomplishments from its funded portfolio efforts in 2024.

- In 2024, WRAIR-A initiated wastewater surveillance in Kenya to detect infectious pathogens, monitor countermeasure effectiveness, and increase potential disease awareness for U.S. Service members and Kenya Defense Forces. With bioinformatics support from NMRC-BDRD, WRAIR-A monitored for a comprehensive panel of high-threat pathogens and antimicrobial resistance genes to support and promote Warfighter health. Sampling locations later expanded to include allied military partners at Camp Simba, Manda Bay Naval Base, and Mtongwe Naval Base.

- In collaboration with USU – Infectious Disease Clinical Research Program, USAFSAM implemented WWS at the U.S. Naval Academy (USNA). This project exemplifies feasible utilization of WWS for real-time/near-real-time detection pathogens of concern in a controlled population. In 2024, this project assessed year-long baseline trends in SARS-CoV-2, influenza A/B, adenovirus, and mpox in wastewater at the USNA. These data, overlaid with medically-attended acute respiratory infection case counts, demonstrate the value of WWS as a potential early forecasting system.

- The WBB Focus Area established expert points of contact for reach back laboratory support at DCPH-A and USAFSAM. The reach back team works in close coordination with highly functional regional partners who have been conducting wastewater analysis since 2020. In 2024, the WBB reach back team successfully executed a pilot 3-day training at DCPH-A for WRAIR-AFRIMS personnel where they discussed surveillance methods and laboratory techniques for successful implementation of WWS systems.

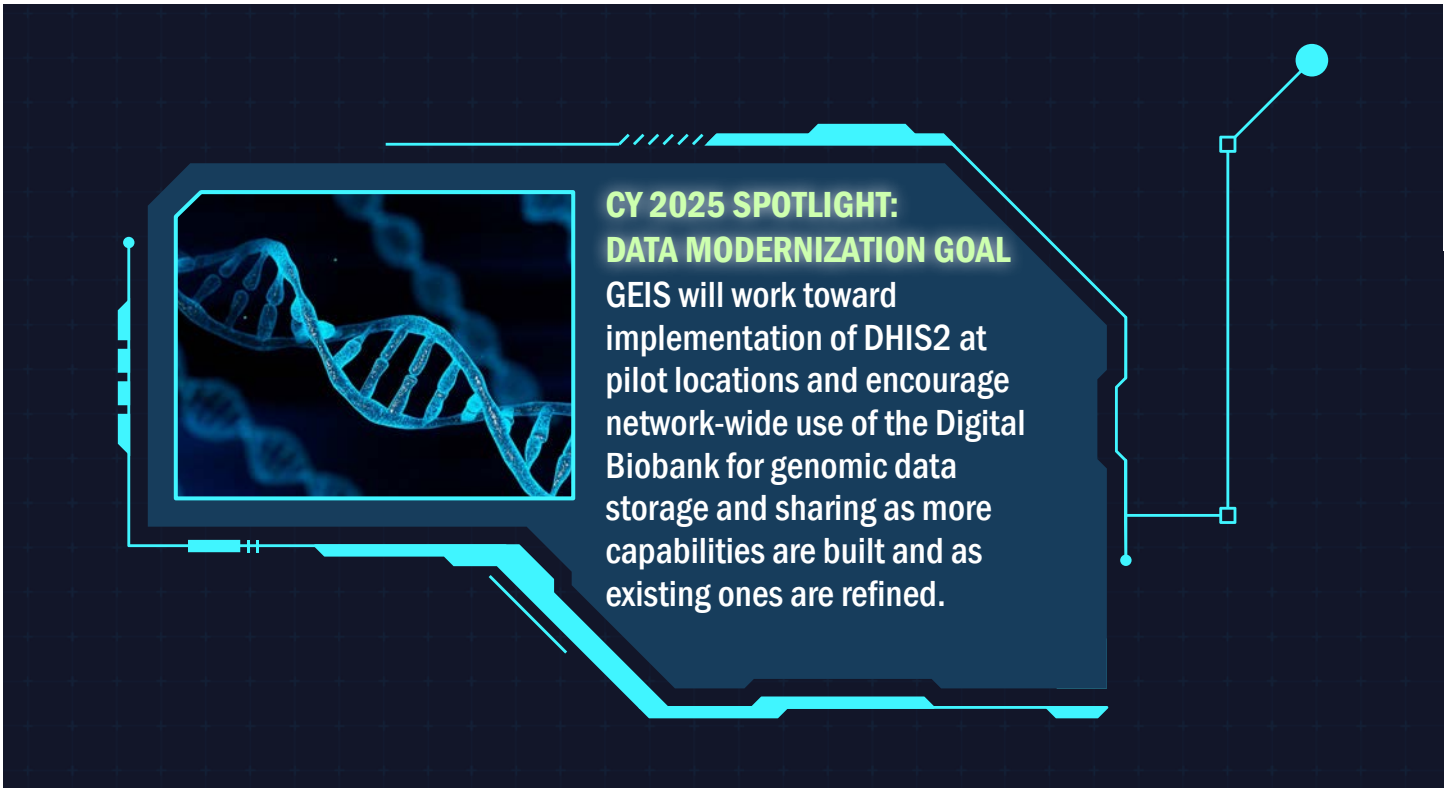
- Throughout 2024, The WBB Focus Area met with partners and key FHP stakeholders onsite at USAFSAM, U.S. CDC, TAMC, Medical Readiness Command – Pacific (Hawaii), U.S. Navy Pacific Fleet (COMPACFLT, Hawaii), WRAIR, and NMRC-BDRD. The WBB Focus Area engaged with partners at conferences including the WEF/CDC Wastewater Disease Surveillance Summit in Georgia, the MHS Research Symposium in Florida, the WRAIR One Health Symposium in Maryland, and the ASTMH Annual Meeting in Louisiana.

GEIS BRANCH PRIORITIES FOR CY 2025

In 2025, the GEIS Branch will continue to strategically align its portfolio with priorities from the geographic CCMDs and the DoD Biosurveillance Program (BSV-P). This will include close review and refinement of long-standing surveillance activities and emphasizing high-priority surveillance topics or regions as part of its annual Request for Proposals. This will include funding for surveillance at the U.S.-Mexico border, testing and evaluating specific capabilities around advanced or novel NGS and BI methods, standing up wastewater surveillance at strategic locations within USEUCOM and USCENTCOM, supporting pilot biosurveillance efforts within USINDOPACOM to enhance early warning for biothreats, and further integrating biosurveillance activities within military engagements around the world.

In early 2025 the GEIS Branch plans to execute a Strategic Offsite session and begin planning for a program evaluation to further internal and external quality assurance and improvement for the Program Office and the network activities. The GEIS Branch will work toward implementation of DHIS2 at pilot locations and will also encourage network-wide use of Digital Biobank for genomic data storage and sharing as more capabilities are built out and as existing ones are refined.

These data platforms and the resulting flow of information will continue to be important inputs for the development of the Biosurveillance Information Platform led by the BSV-P. In late 2025, the GEIS Branch will host a third iteration of its annual Summit at AFHSD in Silver Spring, Maryland. The topic of this summit will be NGS-BI, but with an emphasis on pathogen agnostic sequencing methods and genomic data interpretation and application.



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Current

INTEGRATED BIOSURVEILLANCE

Global health surveillance is critical for the DoD because infectious diseases, regardless of origin, pose significant threats to national security and military readiness. Pandemics can rapidly spread globally, impacting deployed forces, disrupting operations, and destabilizing regions critical to U.S. interests. By monitoring emerging health threats worldwide, the DoD can protect service members, inform strategic planning, and collaborate with partner nations to build resilient health systems. This proactive approach strengthens alliances, prevents widespread outbreaks, and mitigates the potentially devastating human and economic consequences of global health crises, ensuring a healthy and ready force capable of executing its mission.

AFHSD's IB Branch plays a crucial role in protecting military readiness by providing comprehensive health surveillance information. The IB Branch is instrumental in coordinating the DoD's biosurveillance efforts, acting as a central hub for health information. Tools like the Health Surveillance Explorer (HSE), a web-based mapping application that provides near real-time data on global health threats and disease outbreaks, allow for improved situational awareness and decision making, enabling military planners access to vital information for force health protection and operational planning. This allows for improved situational awareness and decision-making, enabling military planners to access vital information for force health protection and operational planning. Information about the HSE, including how to register for an account, is available at www.health.mil/hse.

The IB Branch's work supports the DoD's strategic missions of force health protection, biological weapons defense, and global health security, aiming to get "left of boom" – preparing for and averting health crises before they escalate. The IB Branch plays a crucial role in the global health surveillance network by providing timely, relevant, and actionable health intelligence. It integrates diverse data streams to achieve early detection and warning of health threats, including emerging infectious diseases such as Ebola. In 2024, the IB Branch continued to enhance situational awareness for military decision-makers and contributes to global health security through information sharing, collaborative partnerships with international agencies such as the the Defense Intelligence Agency National Center for Medical Intelligence (NCMI), the Department of Homeland Security/National Biosurveillance Integration Center (NBIC), the Defense Threat Reduction Agency (DTRA), the French Armed Forces Centre for Epidemiology and Public Health (CESPA), DHS, and the German Federal Armed Forces (Bundeswehr).

The IB Branch is composed of three sections: Alert and Response Operations (ARO), Geographic Information System (GIS), and Innovation and Evaluation (I&E). IB generates a variety of recurring and ad hoc health surveillance reports, including the weekly AFHSD Health Surveillance Update, Mpox Placemat, Executive Summaries (EXSUMs), SPOT Reports, Disease-Specific Surveillance Summaries, Military Exercise Surveillance Reports, Respiratory Forecasting Reports, and Reportable Medical Event (RME) Summaries. IB also strives to identify in near real-time potential health threats and disease outbreaks of military interest via horizon scanning of open-source surveillance data and to disseminate these events through various formal communication channels. Additionally, IB conducts syndromic and indicator-based surveillance and analysis of MHS beneficiary data using the Disease Reporting System internet (DRSi) and the DoD Electronic Surveillance Systems for the Early Notification of Community-based Epidemics (ESSENCE).

Since its creation in 2012, IB has consistently demonstrated a forward-looking and responsive approach, expanding biosurveillance capabilities to incorporate forecasting techniques to anticipate future threats and inform planning and decision-making to enhance military readiness.

What we do in the field of global biosurveillance for the DoD enterprise?

- Early warning and risk awareness of health threats to the DoD
- Open source event-based surveillance
- Increase understanding of biological threats
- In-depth surveillance analysis for GCC military exercises and missions (e.g., Balikatan)
- Integration of military and civilian surveillance data and information
- Strengthen biodefense collaboration with allies and partners (e.g., CESPA, Bundeswehr)
- Engage interagency to support national biodefense enterprise (e.g., NBIC, DTRA)
- Outbreak surveillance and reporting (e.g., DoD mpox)
- Forecasting analysis of respiratory and vector-borne diseases (e.g., COVID-19, Lyme disease)
- Syndromic and indicator-based surveillance (e.g., ESSENCE, DRSi)
- Management of the NIPR and SIPR HSE for near real-time surveillance

ALERT AND RESPONSE OPERATIONS
SIGNIFICANT ACCOMPLISHMENTS

The ARO Section plays a pivotal role in the DoD's global biosurveillance mission. During 2024, ARO consistently delivered timely and actionable information on health threats of military interest, significantly enhancing the breadth and reach of its comprehensive biosurveillance products. Key outputs included daily early warning emails, the weekly AFHSD-IB Health Surveillance Update (AHSU), and EXSUMs.

Beyond routine reporting, ARO provided critical support to five major military exercises, demonstrating its capacity for operational integration and real-time health threat assessment. The section also adeptly responded to numerous ad hoc requests for information, rapidly developing tailored products to monitor dynamic health events. ARO actively fostered crucial interagency and interdepartmental collaboration through participation in foreign and domestic meetings, strengthening partnerships vital for comprehensive global health surveillance.

Furthermore, ARO maintained close coordination with the intelligence community, producing classified products for senior leadership, notably the Global Biosurveillance Slide and contributing to newsroom events for the Secret Internet Protocol Router Network (SIPRNet) HSE. This ensured high-level decision-makers had access to sensitive, in-depth analyses.

Finally, ARO continued its vigilant monitoring of infectious diseases worldwide, including persistent threats like COVID-19, emerging pathogens such as Marburg virus disease and novel avian influenza, and other undiagnosed infectious illnesses. A prime example of ARO's comprehensive surveillance efforts was its detailed mpox case tracking within MHS beneficiaries, which culminated in a full report published in the September 2024 issue of the *MSMR*, providing valuable epidemiological insights.

Below are the significant accomplishments for ARO in 2024.

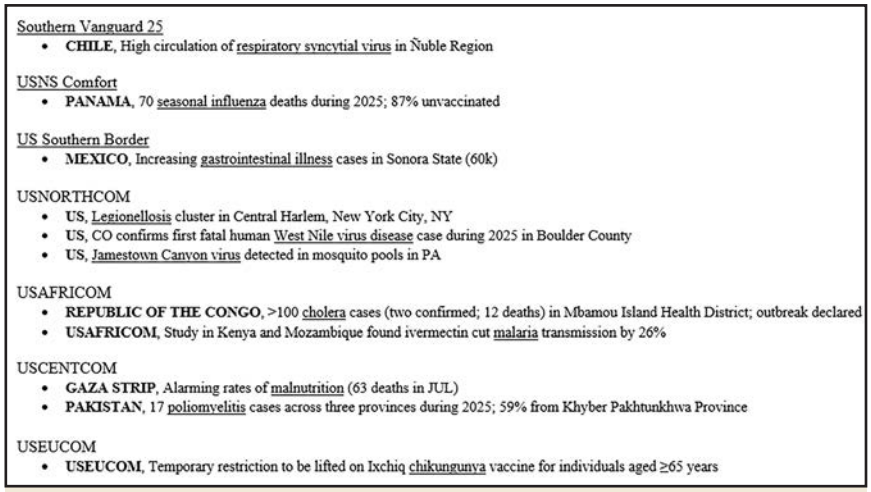
PRODUCED DAILY EARLY WARNING EMAILS

In order to provide timely alerts regarding global biological threats, ARO initiated the production of a daily early warning email report in May 2024. The early warning email is a collection of the top emerging health threats that could impact military operations in every GCC. ARO conducted daily surveillance of open-source information from a variety of sources, including academic journals, blogs, media reports, public health agency reports, Really Simple Syndication (RSS) feeds, and the NBIC Biofeeds web scraper. This comprehensive approach enabled surveillance of thousands of open-source media and academic journals, which was shared in near-real time, allowing rapid responses to protect MHS beneficiaries. During 2024, the early warning email has been expanded to provide in-depth ongoing surveillance support on a range of ad hoc requested topics, including USAFRICOM mpox and the conflicts in the Gaza Strip and Ukraine.

GENERATED WEEKLY HEALTH SURVEILLANCE UPDATES

In 2024, ARO produced 51 AHSU reports, providing weekly assessments and analyses of military-relevant public health threats to the GCCs. Threats were identified through a robust dual-surveillance approach: event-based surveillance tracked disease trends, novel pathogens, host and vector relationships, transmission routes, new types of antimicrobial resistance, and environmental factors that might influence disease spread. Concurrently, indicator-based surveillance leveraged analysis of MHS data, including laboratory results, medical encounters, and RMEs.

The AHSU contributes to DoD biosurveillance by providing military public health officials with comprehensive health information. In addition to the sources used for the early warning report, the AHSU employed a combination of open-source and controlled unclassified information, including from DRSi, internal AFHSD reports from the GEIS and E&A sections, IB-I&E, ESSENCE syndromic surveillance data, and public health agency and interagency sites and reports (CDC, country ministries of health (MOHs), DIA-NCMI, World Health Organization (WHO), etc.). The ARO Section has received numerous kudos from various stakeholders within and outside the DoD regarding the quality and timeliness of the reporting.



Southern Vanguard 25
- **CHILE**, High circulation of respiratory syncytial virus in Ñuble Region

USNS Comfort
- **PANAMA**, 70 seasonal influenza deaths during 2025; 87% unvaccinated

US Southern Border
- **MEXICO**, Increasing gastrointestinal illness cases in Sonora State (60k)

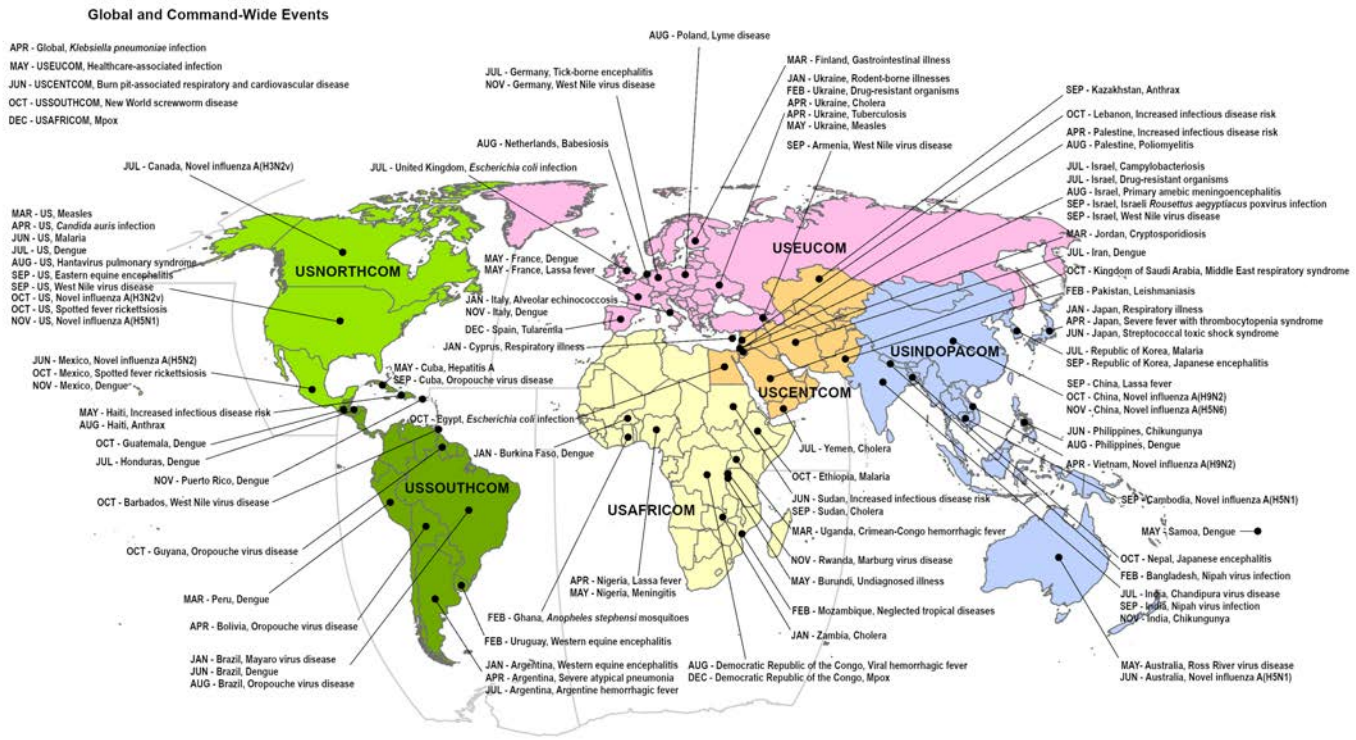
USNORTHCOM
- **US**, Legionellosis cluster in Central Harlem, New York City, NY
- **US**, CO confirms first fatal human West Nile virus disease case during 2025 in Boulder County
- **US**, Jamestown Canyon virus detected in mosquito pools in PA

USAFRICOM
- **REPUBLIC OF THE CONGO**, >100 cholera cases (two confirmed; 12 deaths) in Mbamou Island Health District; outbreak declared
- **USAFRICOM**, Study in Kenya and Mozambique found ivermectin cut malaria transmission by 26%

USCENTCOM
- **GAZA STRIP**, Alarming rates of malnutrition (63 deaths in JUL)
- **PAKISTAN**, 17 poliomyelitis cases across three provinces during 2025; 59% from Khyber Pakhtunkhwa Province

USEUCOM
- **USEUCOM**, Temporary restriction to be lifted on Ixchiq chikungunya vaccine for individuals aged ≥65 years

Early warning email report screenshot.



Top Events Reported in the AHSU, 2024.

GENERATED EXSUMS OF MAJOR HEALTH THREATS

In 2024, ARO significantly enhanced biosurveillance by integrating military and civilian biosurveillance data and information to produce and disseminate five EXSUMs. These one-page reports of high-importance events include executive issues, background, discussion, and recommendations. The 2024 EXSUM reports covered the first human cases of novel influenza A(H1N2v), A(H3N2v), and A(H5N1) in the United States during 2024, mpox being declared a Public Health Emergency of International Concern (PHEIC) by WHO, and the first mpox clade I case in the United States. Each EXSUM was distributed on the day of confirmation by either CDC or WHO, ensuring prompt and accurate communication regarding these emerging threats.

- **NOVEL INFLUENZA A(H5N1) –** In April, ARO reported on the first human A(H5N1) case associated with dairy cows presumed to be infected with avian influenza. The case came following avian influenza detected in dairy herds in other states, and was the first of at least 70 cases, which ARO tracked with weekly updates in the AHSU.
- **MPOX** – ARO produced two EXSUMs on mpox in August and November 2024, on the disease being declared a PHEIC by WHO due to the spread of novel mpox clade Ib outside of the Democratic Republic of the Congo and the first mpox clade I case in the United States, respectively. ARO continued tracking mpox in the USAFRICOM area of responsibility (AOR; 53 African nations), globally, and in the MHS population in the AHSU as well as the mpox placemat. Additionally, ARO conducted enhanced surveillance for mpox, which was included in the early warning email and USAFRICOM dashboard on the HSE.

"Thank you for the long hours planning and supporting the exercise."

– USINDOPACOM Command Surgeon (September 2024)

SURVEILLANCE SUPPORT FOR MILITARY EXERCISES

ARO provided support for five military exercises during 2024, including Able Resolve 2024, African Lion 2024, Balikatan 2024, Cobra Gold 2024, and Steadfast Defender 24.

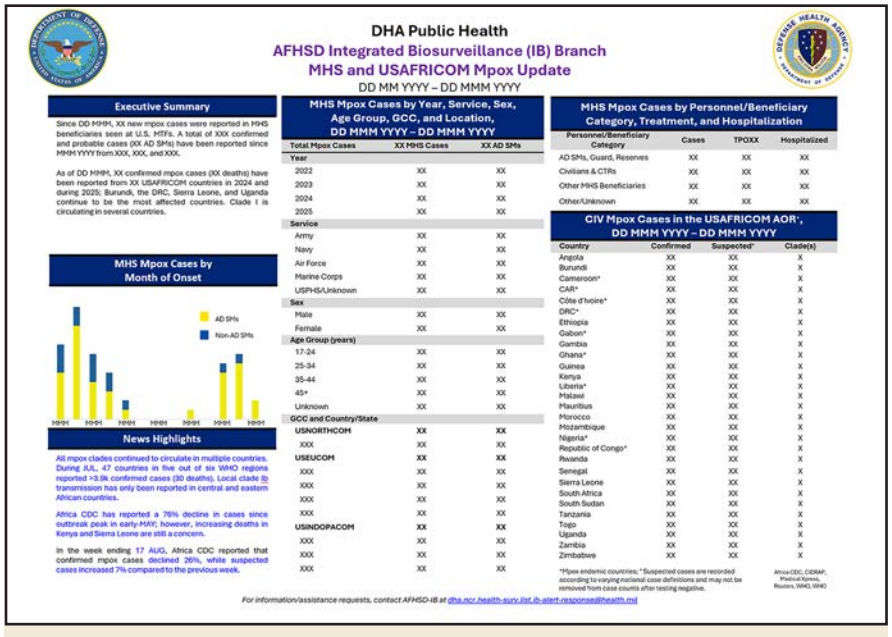
ABLE RESOLVE 2024 – USINDOPACOM. From 03 to 13 September, the Able Resolve 24 international bio-threat tabletop

exercise was held in USINDOPACOM. The ARO Section collaborated closely with USINDOPACOM FHP, the University of New South Wales, and exercise participants in Hawaii and Australia. ARO's role included distributing twice-daily injects for timely exercise information and participating in daily planning calls with exercise planners. This collaboration aimed to evaluate the communication channels and methods among DoD partners in the event of a global emerging biothreat. The ARO team was praised for its timely communication and coordination during the exercise, despite the time zone difference. Most importantly, the ARO Section successfully demonstrated its capability to overcome time differences to interact with allies and partners during a crisis.

- **AFRICAN LION 2024 – USAFRICOM.** Held from 19 April to 31 May, African Lion 24 was an annual exercise led by the U.S. Army Southern European Task Force, Africa, with >8k participants from 27 countries and NATO contingents. The exercise provided readiness training in austere environments across multiple geographic and functional CCMDs (USAFRICOM, USCENTCOM, and USEUCOM). Over 6 weeks, ARO provided USAFRICOM with 13 health surveillance reports on health threats and disease outbreaks in Ghana, Morocco, Senegal, and Tunisia. In total, 25 events were reported, covering 15 different diseases and health threats. Notable findings included Crimean-Congo hemorrhagic fever cases, hepatitis A in strawberries, *Plasmodium vivax* circulation in Senegal, and cutaneous leishmaniasis in Tunisia. The ARO Section primarily relied on data from open-source media reports.
- **BALIKATAN 2024 – THE PHILIPPINES.** Balikatan 24, held from 22 April to 10 May throughout the Philippines, was a large annual training event. It involved ~16k American, Filipino, Australian, and French service members, alongside representatives from over 14 countries participating in the International Observer Program. ARO supported the Balikatan 24 military exercise by providing the U.S. Army 18 MEDCOM, U.S. Marine Corps, III Marine Expeditionary Force, U.S. Pacific Air Forces, 11th Marine Expeditionary Unit, U.S. Army 44th Medical Brigade, and USINDOPACOM with 13 health surveillance reports over 3 weeks on health threats and disease outbreaks in the Philippines. These reports detailed a total of 30 events, covering 15 distinct diseases and health conditions. Notable threats included dangerous heat indexes, surging dengue, malaria, and typhoid cases, and a measles outbreak alert.
- **COBRA GOLD 2024 – THAILAND.** From 27 February to 10 March, the Cobra Gold 24 military exercise took place in several areas of Thailand and included cyber warfare training, field training exercises, humanitarian assistance and disaster response training, and space domain awareness and operations. ARO significantly contributed by providing 3 weekly pre-exercise and 10 daily mid-exercise surveillance reports. These reports detailed health threats and disease outbreaks in Thailand and the participating countries (Australia, China, Indonesia, Japan, Malaysia, the Republic of Korea, and Singapore) that could potentially impact U.S. service members. Over the surveillance period, ARO identified 52 events, covering 30 different diseases and health threats, including surging dengue cases in Indonesia, Malaysia, Singapore, and Thailand, a novel influenza A(H9N2) case from Hong Kong, and cryptosporidiosis in Australia.
- **STEADFAST DEFENDER 24 – USEUCOM**. Held from January to May 2024, Steadfast Defender 24 was NATO's largest military exercise since the Cold War, involving ~90k troops from all 32 NATO allies. The exercise's initial phase focused on securing the Atlantic and Arctic regions, and then transitioning to the movement of forces across far northern, central, and eastern Europe. ARO contributed to operational health readiness by producing six detailed background medical health surveillance reports for Finland, Hungary, Norway, Poland, Romania, and Slovakia. These reports covered foodborne and gastrointestinal illness, respiratory disease (COVID-19), tick- (Lyme disease and tick-borne encephalitis) and vector-borne diseases, and zoonotic diseases (hemorrhagic fever with renal syndrome and novel avian influenza).

SUPPORT FOR ONGOING SURVEILLANCE OF BIOLOGICAL THREATS

In response to recurring requests for information to monitor ongoing biological threats, ARO developed several new products. These included specialized reporting for dengue and malaria outbreaks in the USSOUTHCOM AOR, consolidated RME summaries for GCC, the MHS mpox


DHA Public Health
AFHSD Integrated Biosurveillance (IB) Branch
MHS and USAFRICOM Mpox Update
DD MM YYYY – DD MMM YYYY

Executive Summary

MHS Mpox Cases by Year, Service, Sex, Age Group, GCC, and Location, DD MMM YYYY – DD MMM YYYY

MHS Mpox Cases by Personnel/Beneficiary Category, Treatment, and Hospitalization

MHS Mpox Cases by Month of Onset

CIV Mpox Cases in the USAFRICOM AOR*, DD MMM YYYY – DD MMM YYYY

News Highlights

MHS mpox placemat.

placemat, and enhanced USCENTCOM surveillance capabilities. Additionally, ARO used DRSi for daily tracking and reporting of anomalous and emerging diseases in military populations, specifically addressing mpox and vector-borne diseases that are expanding in geographic range and incidence, such as dengue, malaria, and West Nile virus. Throughout 2024, ARO diligently tracked and maintained line lists of MHS cases of 17 high-priority diseases.

- **DENGUE AND MALARIA DISEASE OUTBREAKS IN THE US-SOUTHCOM –** In 2024, USSOUTHCOM experienced its largest dengue outbreak in history. In support of regional operations in the AOR, ARO produced 12 monthly dengue and malaria disease outbreak reports, tracking the disease progress in countries throughout the GCC. These reports, crucial for situational awareness, were further enhanced by an interactive dashboard, facilitating data manipulation and trend chart production, as needed. The ARO Section primarily relied on data from open-source media reports, academic journals, PAHO, and DRSi.
- **GCC REPORTABLE MEDICAL EVENTS REPORT –** During 2024, ARO produced 12 monthly GCC RME reports for USCENTCOM, USEUCOM, and USINDOPACOM. Each report summarizes DoD-reportable medical events in the GCC and displays case trends of the RME for the previous 13 months. Additionally, the USCENTCOM report includes Theater Medical Data Store (TMDS) data from ESSENCE, which tracks encounters of 20 medical events.
- **MHS MPOX PLACEMAT –** In July, after months of tracking mpox, the ARO Section, in collaboration with the GIS Section, developed a weekly mpox placemat. The placemat tracks mpox cases in the MHS population and the USAFRICOM civilian population, and also includes recent mpox news highlights. The ARO Section primarily relied on data from open-source media reports, academic journals, Africa CDC, WHO, and DRSi. Since its release, the placemat has received numerous kudos on its quality, accuracy, and clear presentation, even by the Office of the Assistant Secretary of Defense For Health Affairs.
- **USCENTCOM SURVEILLANCE –** ARO provided enhanced surveillance for USCENTCOM in support of operations surrounding the conflict in the Gaza Strip. Distributed daily, this surveillance included hundreds of health threats from key countries in the region.

INTERAGENCY/INTERDEPARTMENTAL COLLABORATION

In November, the ARO Section participated in an interagency Biosurveillance Indications and Warning Analytic Community – Analyst to Analyst Knowledge Exchange. The meeting brought together over 50 analysts from various across federal agencies (e.g., CDC, Food and Drug Administration, State Department, Department of Homeland Security) to discuss our respective missions, resources, achievements, and challenges. The 1-day event allowed ARO epidemiologists to network with colleagues in other government departments doing similar work, and to set the groundwork for continued future collaboration. Additionally, the ARO attained voting member representation in the new DHA RME Working Group (WG), an expert forum authorized to revise and adjust the Armed Forces RMEs Guidelines and Case Definitions, as well as DRSi elements. This WG serves as an advisory body to the DoD Public Health Integration Council and other MHS Governance groups. The new WG voted to ratify its charter in DEC 2024 and convenes as needed.

> *"From a product standpoint, you all by far have given us relevant data that is providing a better picture of "how we look" vs. "how we think we look." Thanks again for the team's hard work on this!"*
>
> *– USCENTCOM Office of Command Surgeon (January 2024)*

- **COLLABORATION WITH FOREIGN PARTNERS –** In September 2024, the ARO hosted a delegation from the French Armed Forces Centre for Epidemiology and Public Health (CESPA) for a workshop on collaborative work between the United States and France in the fields of military health surveillance, medical information, and public health risk assessment. During the workshop, the following areas of potential collaboration between CESPA and AFSHD-IB were identified: 1) share the Unclassified AFHSD-IB Health Surveillance Update with CESPA, 2) provide unclassified health surveillance information to CESPA dashboards and NEXUS platform, its health surveillance ecosystem that is currently under development, 3) share the monthly CESPA health surveillance report with AFHSD, 4) share the Communicable Disease Toolkit for Armed Forces RMEs with CESPA, 5) share information from the AFHSD and CESPA Early Warning Processes (e.g. threat alerts), and 6) training of CESPA epidemiologists by AFHSD IB SMEs in ARO procedures.
- **EXPANDING STAKEHOLDER REACH ACROSS THE INTELLIGENCE COMMUNITY (IC) –** Throughout 2024, the ARO Section has worked to establish its footing in the IC for the purposes of sharing information. This involved weekly engagement with partners at NCMI, including attendance at production meetings and interagency discussions; monthly engagement with NCMI and interagency analysts on current health threats; and quarterly engagement with interagency partners to discuss global health and biosecurity threats. Additionally, efforts on posting ARO Section products in the classified space were also initiated to aid in the knowledge exchange across the IC. These sustained engagements and collaborations continue to position the IB Branch as a key resource within the DoD and interagency, providing reliable, timely, and comprehensive surveillance information on global health threats.

FIGURE 2. Sign and Symptom Frequency Among MHS Beneficiary Mpox Cases, May 2022-April 2024

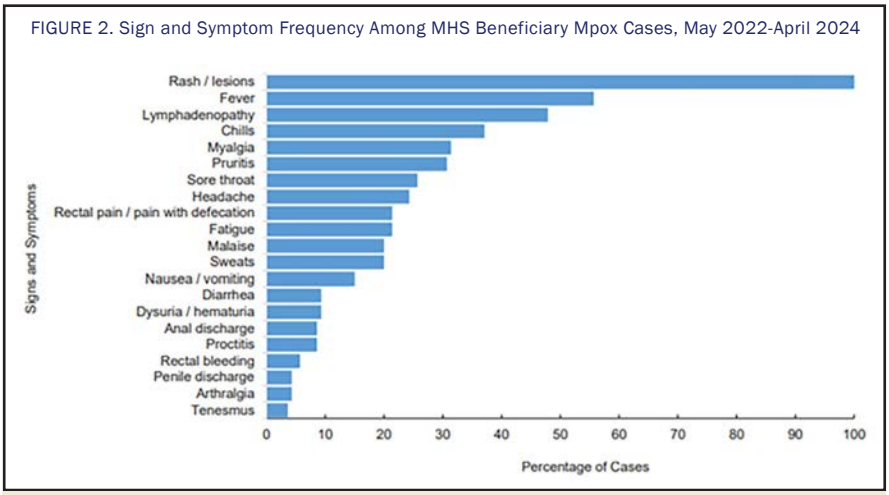


Figure from IB mpox publication in SEP 2024 *MSMR*

- **DEVELOPED CLASSIFIED BIOSURVEILLANCE PRODUCTS –** In 2024, the ARO Section developed the SIPR Global Biosurveillance slide to provide SECRET-level biosurveillance of public health threats of military importance. The team presented the slide during the DHA J-3 Operations Update Brief on a bi-weekly basis, after which it was distributed to a larger audience. Numerous kudos have been received from the DHA J-3 Operations team, as well as DHA Public Health on the excellent overviews provided during the briefs. Additionally, ARO conducts horizon scanning and provides newsroom events for the SIPR HSE, similar to the NIPR HSE.

OTHER ACCOMPLISHMENTS OF THE ARO SECTION

In addition to the routine health surveillance products, the ARO section has also performed the following:

- Responded to requests for information on topics including respiratory illnesses in Guam and the top health threats in Haiti.
- Developed topical content for high-level DHA meetings, including a fact sheet on Eastern Equine encephalitis.
- Published a full report in the September 2024 *MSMR*: "Characteristics of mpox cases diagnosed in Military Health System beneficiaries, May 2022 – April 2024" describing the demographic and epidemiologic features and clinical presentation of the 146 confirmed and probable cases identified by the IB Branch contemporaneously during the surveillance period.
- Performed enhanced surveillance of several countries in USCENTCOM in support of the Special Operations Command Central.
- Continued engagement with GCC Force Health Protection teams by attending and delivering briefings during calls.
- Developed posters to highlight IB products and features of the HSE for display at Exercise Viral Supremacy 2024 and throughout DHA Headquarters.

GEOGRAPHIC INFORMATION SYSTEMS

SIGNIFICANT ACCOMPLISHMENTS

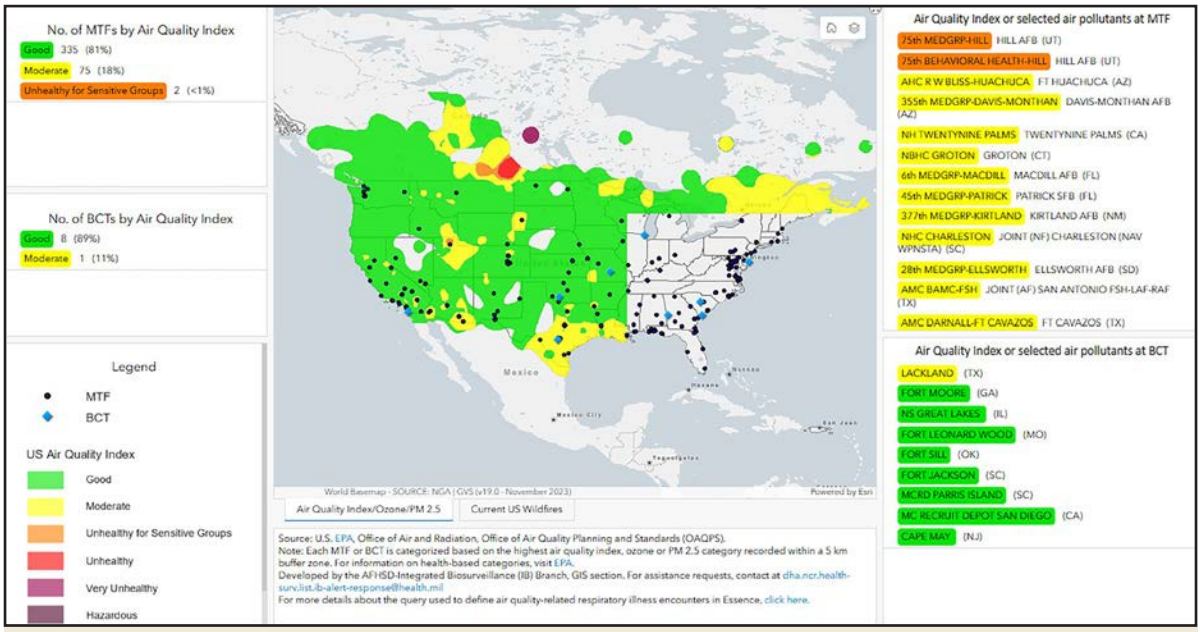
Created in 2018 by the GIS Section, the DHA HSE serves as a critical enterprise-wide mapping platform for near real-time health surveillance across the DoD. Also, the HSE exemplifies the critical role of GIS in modern health surveillance. Leveraging the power of geospatial information, the HSE provides highly effective visual displays of biosurveillance data through interactive web-based dashboards, significantly enhancing decision-making capabilities at all echelons of the DoD. This centralized one-shop synthesizes up-to-date information on infectious diseases of military interest from a diverse array of sources, surveillance platforms, and databases, offering stakeholders a comprehensive and actionable operational picture. Hosted by the National Geospatial-Intelligence Agency, the HSE is accessible via health.mil/hse (Common Access Card required).

Below are the significant accomplishments for the GIS Section in 2024.

ENHANCED EXISTING PRODUCTS TO UPHOLD OUR REPUTATION FOR EXCELLENCE

In 2024, the DHA HSE saw a significant surge in use, reaching over 17,500 views, an impressive 14% increase from the preceding year, showcasing its growing influence and reach.

- **AIR QUALITY DASHBOARD.** In 2024, the GIS Section significantly improved its air quality surveillance capabilities by integrating new features into the air quality dashboard. This enhancement included current U.S. wildfires around CONUS military installations and basic combat training sites. Wildfire data are obtained from the National Interagency Fire



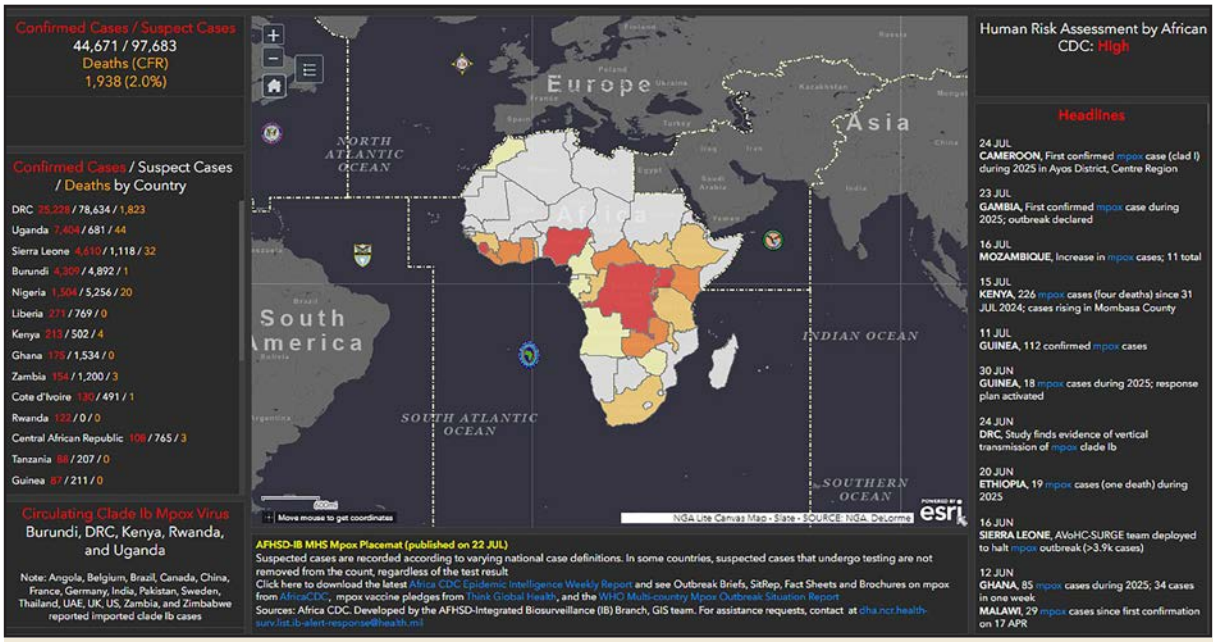
The Air Quality Index Dashboard displays air quality, wildfire, and respiratory encounter data at and around CONUS medical treatment facilities and basic combat training sites.

Center (NIFC) and Integrated Reporting of Wildland-Fire Information (IRWIN). Each installation in the dashboard now includes MHS respiratory encounter data from ESSENCE, providing additional data critical to the health of Service members and MHS beneficiaries. Additionally, the GIS Section produces and distributes a daily report summarizing the air quality conditions in relation to CONUS military installations and basic combat training sites. These enhancements along with the daily report are paramount for ensuring operation readiness, safeguarding the health of all MHS beneficiaries, and ultimately, protecting force health.

DEVELOPED NEW DHA HSE LAYERS FOR MISSION SUPPORT

During 2024, the GIS Section developed several new geographic data layers in the DHA HSE in support of military exercises and the DHA mission.

- **BALIKATAN 24 – PHILIPPINES.** From 11 April to 10 May, the GIS, Section also provided support for the Balikatan 24 exercise in the Philippines by creating a layer in the DHA HSE that integrated event- and indicator-based surveillance from the ARO Section and GEIS Branch, respectively. The layer included pre-exercise and exercise health events, base camp assessments of occupational and environmental health, and vector-borne disease risk analyses.
- **AFRICAN LION 24 – GHANA, MOROCCO, SENEGAL, TUNISIA.** From 19 April to 31 May, the GIS Section supported the African Lion 24 exercise in Ghana, Morocco, Senegal, and Tunisia by creating a layer in the DHA HSE that displayed event-based surveillance and health information from the ARO Section. The new layer included pre-exercise and exercise health events, DoD vaccine recommendations for the USAFRICOM AOR, major disease and health risks, and infectious disease risk assessments for Morocco.
- **COBRA GOLD 24 – THAILAND.** From 07 February to 10 March, the GIS Section provided support for the Cobra Gold 24 exercise in Thailand, creating a layer in the DHA HSE that displayed pre-exercise and exercise event-based surveillance from the ARO Section.
- **WORLD ANIMAL HEALTH INFORMATION SYSTEM.** At the request of USAREUR-AF, the GIS Section developed two new layers in the DHA HSE to display animal disease events from the World Animal Health Information System (WAHIS), the authoritative global animal health reference database maintained by the World Organisation for Animal Health (WOAH). The first layer displays "Immediate Notification" events from WAHIS, focusing on critical or unexpected events, such as initial disease outbreaks, the re-emergence of eradicated diseases, or sudden increases in incidence of within specific regions. The second layer presents the past 2 weeks of "Follow-up Reports," which provide weekly updates on disease events until the situation stabilizes or is eradicated. These integrated features, when overlaid with human health events reported by the ARO Section, significantly enhance the situational awareness by providing a more holistic view of disease circulation in any given location.



The USAFRICOM Mpox Dashboard displays mpox case and death data by country, a map of confirmed mpox cases in the USAFRICOM AOR, and daily event-based surveillance headlines.

DEVELOPED NEW USAFRICOM MPOX DASHBOARD

The GIS Section created a new surveillance dashboard specifically tailored to monitor the evolving mpox situation within the USAFRICOM AOR. Given the WHO declaration of mpox in Africa as a PHEIC, this dashboard plays a critical role in ensuring operation readiness and protecting force health. It provides comprehensive insights, including mpox case and death data by country, a detailed map of confirmed mpox cases across the USAFRICOM AOR, and daily event-based surveillance headlines. The USAFRICOM mpox dashboard, in conjunction with the existing MHS mpox dashboard from IB, provides a more complete and nuanced surveillance picture. Since its creation, the new dashboard has received numerous kudos from DHA senior leaders, recognizing it as a valuable surveillance product for the DoD enterprise.

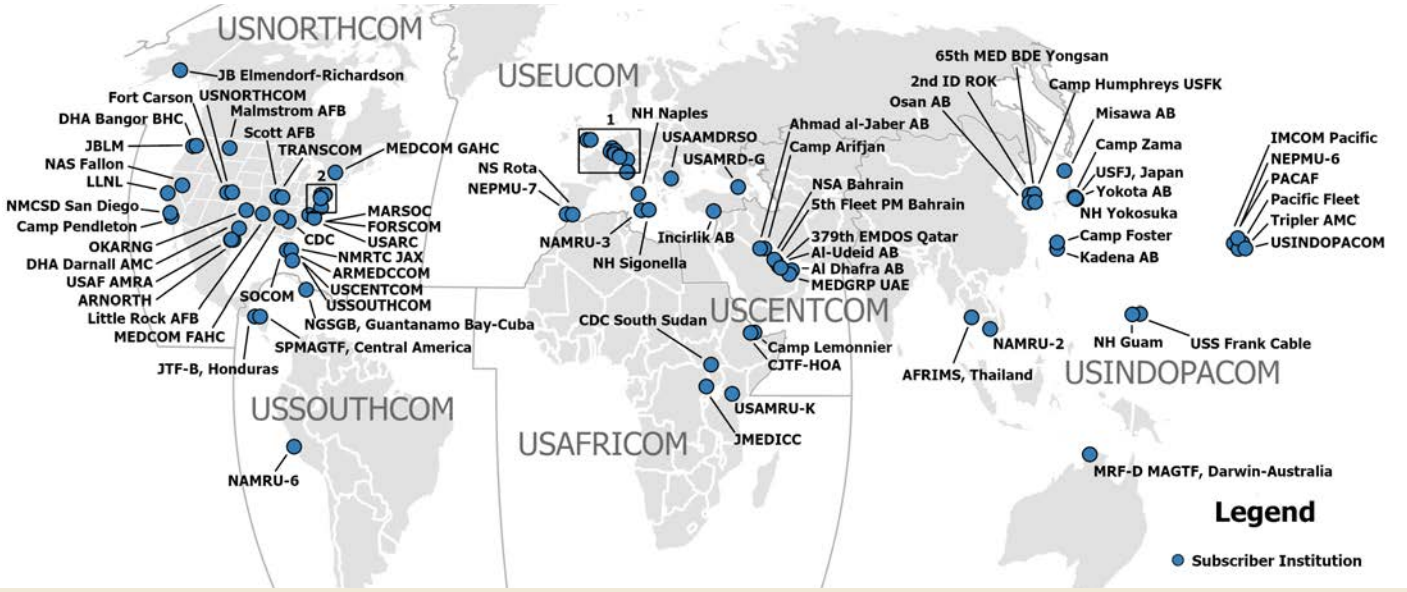
DEVELOPED AD HOC MAPS FOR OPERATIONAL SUPPORT

At the request of DHA J-3 Operations, the GIS Section developed two maps to aid operational readiness and promote the work of IB.

- **QUARTERLY DISEASE SURVEILLANCE SUMMARY MAP.** In July 2024, the GIS Section produced a map of the top events (over 35) reported in the weekly AHSU from April to June 2024. The events included in the map represent public health threats that are of military relevance to the GCCs. The map provided decision-makers with a tool for analyzing disease outbreak trends and their potential implications for the MHS population.
- **IB NETWORK SUBSCRIBER MAP.** The GIS Section developed a map displaying locations of institutions subscribed to the IB products distribution list, through which EXSUMs, weekly reports, and daily early warning news surveillance are distributed. The map demonstrated the global reach of IB products.

Additionally, throughout 2024, the GIS Section has greatly supported ARO and I&E section products by creating a variety of maps.

- **AHSU REPORT MAPS.** The GIS Section significantly contributed to situational awareness and force health protection by providing critical supplemental maps for the AHSU reports during three distinct disease outbreaks. In July, the team generated four weekly showing medical treatment facility (MTF) locations and civilian travel associated dengue cases by U.S. county. In August, two maps were developed displaying MTF locations and civilian West Nile virus human and non-human activity by U.S. county. Finally, in DEC, a detailed map of the Democratic Republic of the Congo was created to show the location of an undiagnosed illness outbreak, as well as past Ebola and Marburg virus disease outbreak locations. These maps provided clear, actionable visualizations, greatly enhancing the understanding of outbreak dynamics, and supporting force health protection.
- **MPOX PLACEMAT MAPS AND GRAPHS.** Starting in July, the GIS Section contributed weekly maps to the Mpox



The Global IB Network Subscriber Map, 2024

Placemat, a key product tracking the mpox outbreak in the USAFRICOM AOR. The maps initially focused on global civilian mpox cases, but shifted to confirmed civilian mpox cases in the USAFRICOM AOR. These maps were a valuable visual tool used to track new cases and the spread of mpox within the AOR. The GIS Section also produced charts of MHS mpox cases by month for the placemat, broken down into active-duty service members (AD SMs) and non-AD SMs.

- **TICK-BORNE DISEASE MAPS.** The GIS Section created a comprehensive series of maps for Germany, Japan, the Republic of Korea, and the United States, visualizing tick-borne disease surveillance data within and surrounding AFHSD surveillance regions. Each country map showed civilian Lyme disease encounter rates by county or prefecture, as well as MHS Lyme disease encounter rates by AFHSD region. These fundamental maps were instrumental for the I&E Section, serving as core components of their weekly Tick-borne Disease Regions to Watch product. Additionally, larger-scale maps were produced for each region to allow specific markets to be highlighted each week.

COLLABORATION WITH NATO PARTNERS

In September 2024, the GIS Section hosted a delegation of representatives from CESPA, showcasing the biosurveillance products produced and maintained by the GIS Section. Participants strategized and discussed methods by which IB and French partners could share data and collaborate to improve GIS and biosurveillance capabilities. In a concerted effort to fortify global biosurveillance capabilities, the GIS Section continues to use the Protected Internet eXchange (PiX) for data dissemination, aiming to bridge gaps in knowledge and understanding across NATO partnerships. Through PiX, the GIS Section exchanges unclassified health surveillance data daily with the Bundeswehr, enhancing our collective ability to monitor and respond to health threats, and also emphasizing our commitment to advancing public health security on an international scale. Information from IB are incorporated into the NEXUS platform, a new application created by the Bundeswehr to provide a centralized hub for surveillance data from a variety of NATO member states. The GIS Section is also actively working with CESPA to establish additional data sharing through PiX. Through these strategic partnerships, the IB Branch seeks to ensure a more informed and responsive global health community.

COLLABORATION WITH MEDCOP TEAM

The GIS Section has continued to forge a strategic partnership with Accenture Federal Services (AFS), working closely to harmonize the DHA HSE and MedCOP HSE. This concerted effort ensures that both platforms align seamlessly and provide comprehensive and accessible health data critical to the well-being of armed forces and their families. By pooling expertise and resources, the partnership has created a cohesive information ecosystem where data integrity and user experience are paramount. The GIS Section worked with AFS to enhance the user interface and incorporate additional reports and resources into the MedCOP HSE (a basic version). This collaboration underscores a commitment to leveraging cutting-edge technology to deliver exceptional access to health information, facilitating informed decisions, and fostering a supportive environment in service of those who serve.

INNOVATION AND EVALUATION
SIGNIFICANT ACCOMPLISHMENTS

The I&E Section plays a vital role in the IB Branch, focusing on proactive analysis and monitoring of significant health threats. Its main responsibility is to provide forecasting analysis for various respiratory diseases, including COVID-19, RSV, and seasonal influenza. To effectively track the impact of these seasonal respiratory illnesses on the MHS population, I&E produces a valuable weekly report called "Respiratory Regions to Watch." This product is designed to offer near real-time insights into the health status of the DoD. It achieves this by integrating both civilian and military data sources to highlight emerging trends in respiratory illness activity. Data are presented within the framework of AFHSD-IB Surveillance Regions, which are geographically defined areas encompassing neighboring military installations, clinics, and hospitals, along with civilian counties located within a 30-mile radius.

Recognizing the evolving landscape of health threats, the I&E Section expanded its product line in 2024 to include the "Vector-borne Disease Regions to Watch." This new addition provides similar trend analysis, but specifically for tick-borne and mosquito-borne diseases across the DoD. Both "Regions to Watch" products serve as indispensable planning tools for senior leaders, empowering them to make expeditious and informed decisions. By providing early warning and comprehensive information, these products enable military leadership to effectively anticipate and mitigate potential threats to both military health and overall readiness.

Below are the significant accomplishments for I&E in 2024.

PRODUCED AND EXPANDED "RESPIRATORY REGIONS TO WATCH" PRODUCTS AND DASHBOARD

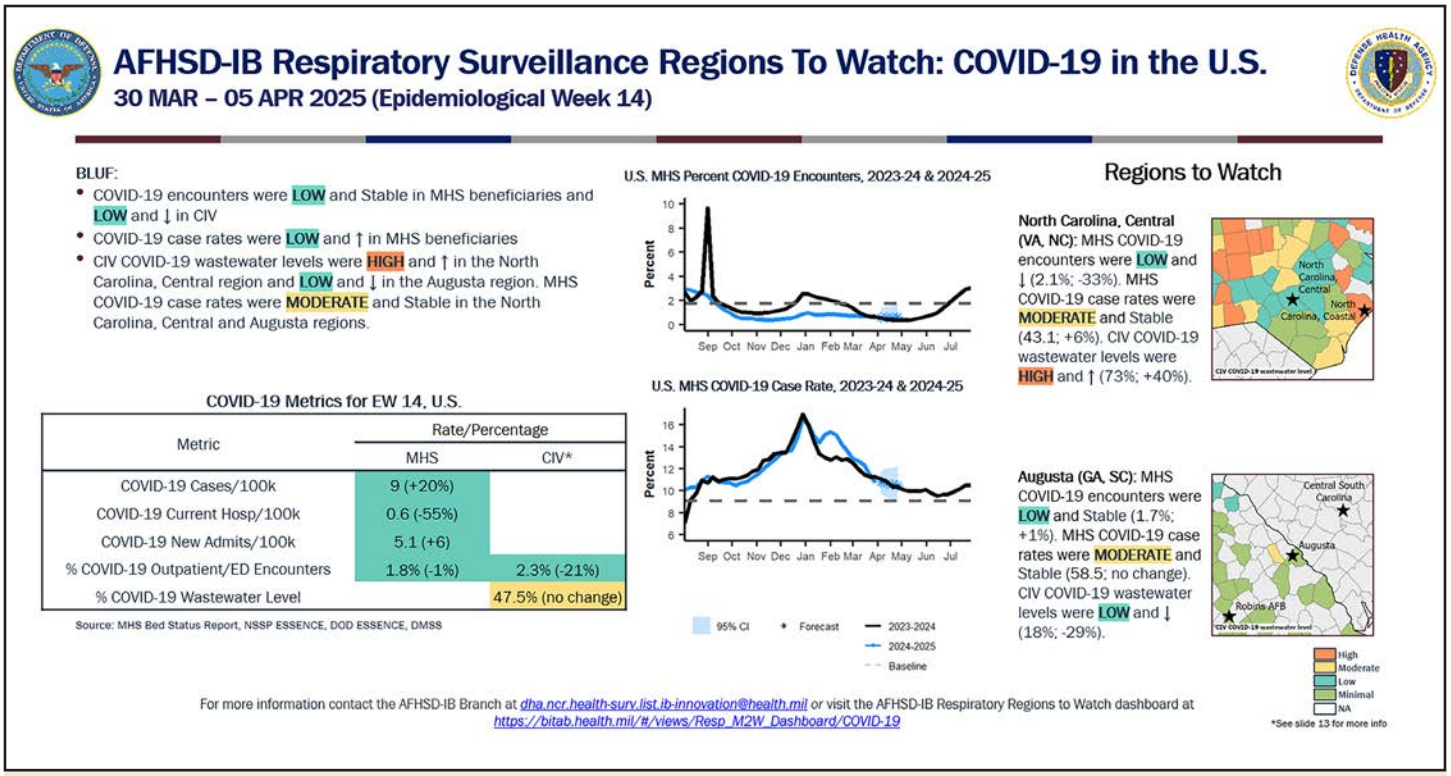
In 2024, the I&E Section developed and disseminated around 50 weekly COVID-19 and respiratory "Regions to Watch" reports, spotlighting disease activity and trends within and surrounding AFHSD surveillance regions and Defense Health Networks (DHNs). These reports enabled real-time monitoring and offered a comprehensive overview of the health status of MHS beneficiaries regarding COVID-19, influenza, and RSV cases, health encounters, and hospitalizations from both MHS and civilian sources.

Additionally, since the conclusion of the COVID-19 Public Health Emergency in May 2023, reliable data sources of COVID-19 and other respiratory illness data have undergone significant change. To address these changes, I&E expanded the "Respiratory Regions to Watch" product in OCT and NOV 2024 to capture new data streams, including civilian COVID-19 wastewater levels, MHS RSV cases and hospitalizations, and overseas (OCONUS) data from Germany and Japan, along with U.S. data from Alaska and Hawaii. This enhancement ensures the product's continued relevance amidst evolving disease reporting and data availability.

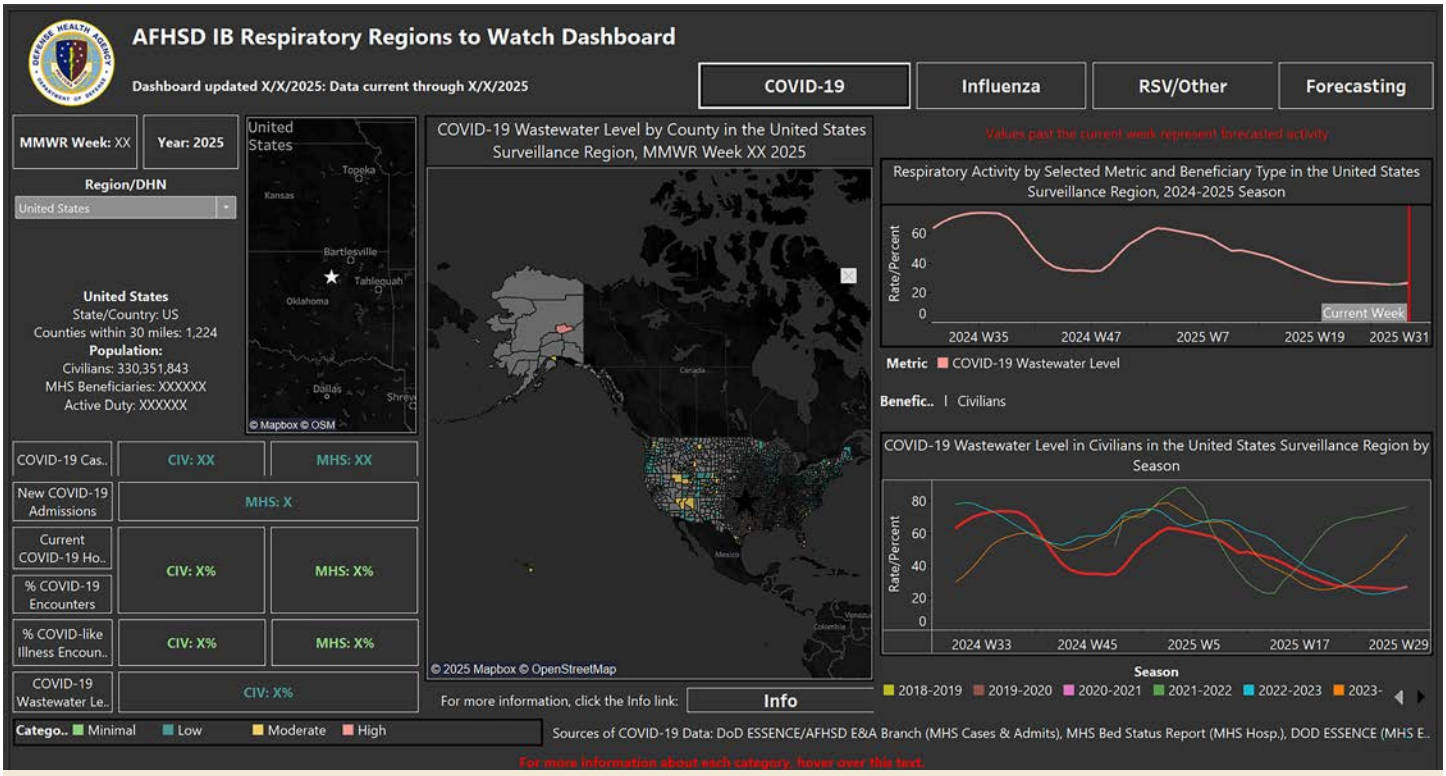
The updated "Respiratory Regions to Watch" product integrates various data sources within the DoD (AFHSD-E&A COVID-19 Master Case List, MHS Bed Status Report, and DoD ESSENCE, DMSS, DCPH-Portsmouth) and civilian space (CDC, Robert Koch Institute, Japan National Institute of Infectious Diseases, New Integrated Japanese Sewage Investigation for COVID-19, and NSSP ESSENCE). Technically, this involved new R code to import data through Application Programming Interfaces (APIs), aggregate data into AFHSD-defined regions, and generate the necessary data files for product development. The results of this expanded product are accessible via the IB dashboards at https://bitab.health.mil/#/projects/1493 (CAC required).

DEVELOPED NEW "RESPIRATORY TRENDS ANALYSIS" PRODUCT

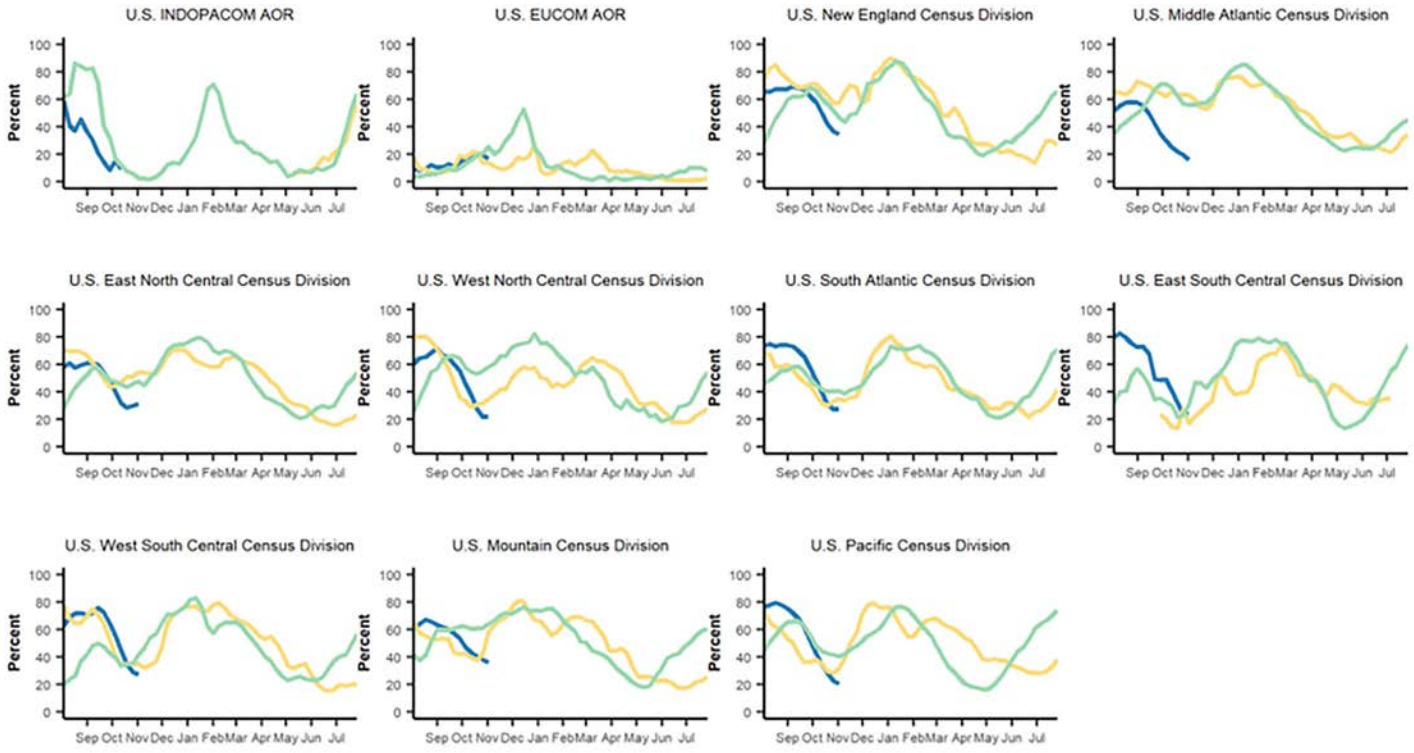
In October 2024, the I&E Section launched a weekly "Respiratory Trends Analyses" product for the 2024–2025 influenza season, complementing the existing "Respiratory Regions to Watch" product and dashboard. This new product utilized R Markdown to present trends and forecasts for COVID-19, influenza, and RSV outpatient encounters, cases, and hospitalizations. It analyzes data across DoD and civilian populations by DHN, U.S. Census Division, and GCC AOR, and provides senior leaders with additional context and regional breakdowns. The product is distributed weekly along with the "Respiratory Regions to Watch" product.



The U.S. COVID-19 Surveillance Slide from the Respiratory Regions to Watch product.



The Respiratory Regions to Watch Dashboard found on the AFHSD-IB Tableau Page.



COVID-19 Wastewater Levels by census division and AOR from the new Respiratory Trends Analysis product.

DEVELOPED A NEW "TICK-BORNE DISEASE REGIONS TO WATCH" PRODUCT AND DASHBOARD

In April 2024, I&E expanded the "Regions to Watch" product line by introducing a new tickborne disease product. The "Tickborne Disease Regions to Watch" product offered region-level surveillance of tick and tick-borne disease activity as well as utilized time-series and machine learning models to forecast disease trends 1 to 3 months in advance for the United States, Germany, Japan, and the Republic of Korea during 2024. A key component, the "Tick-borne Disease" dashboard, incorporated additional data elements and updated forecasting data for 36 CONUS and OCONUS AFHSD surveillance regions. In addition to forecasting, the "Tick-borne Disease" dashboard provided routine surveillance of tick bites and tick-borne disease affecting both MHS and civilian populations, allowing for region-specific breakdowns of cases, health encounters, and tick collections. Upon its release, both the product and dashboard received numerous kudos for being an excellent and timely set of products, including from Public Health Command – Europe. To access the IB dashboards, visit: https://bitab.health.mil/#/projects/1493 (CAC required).

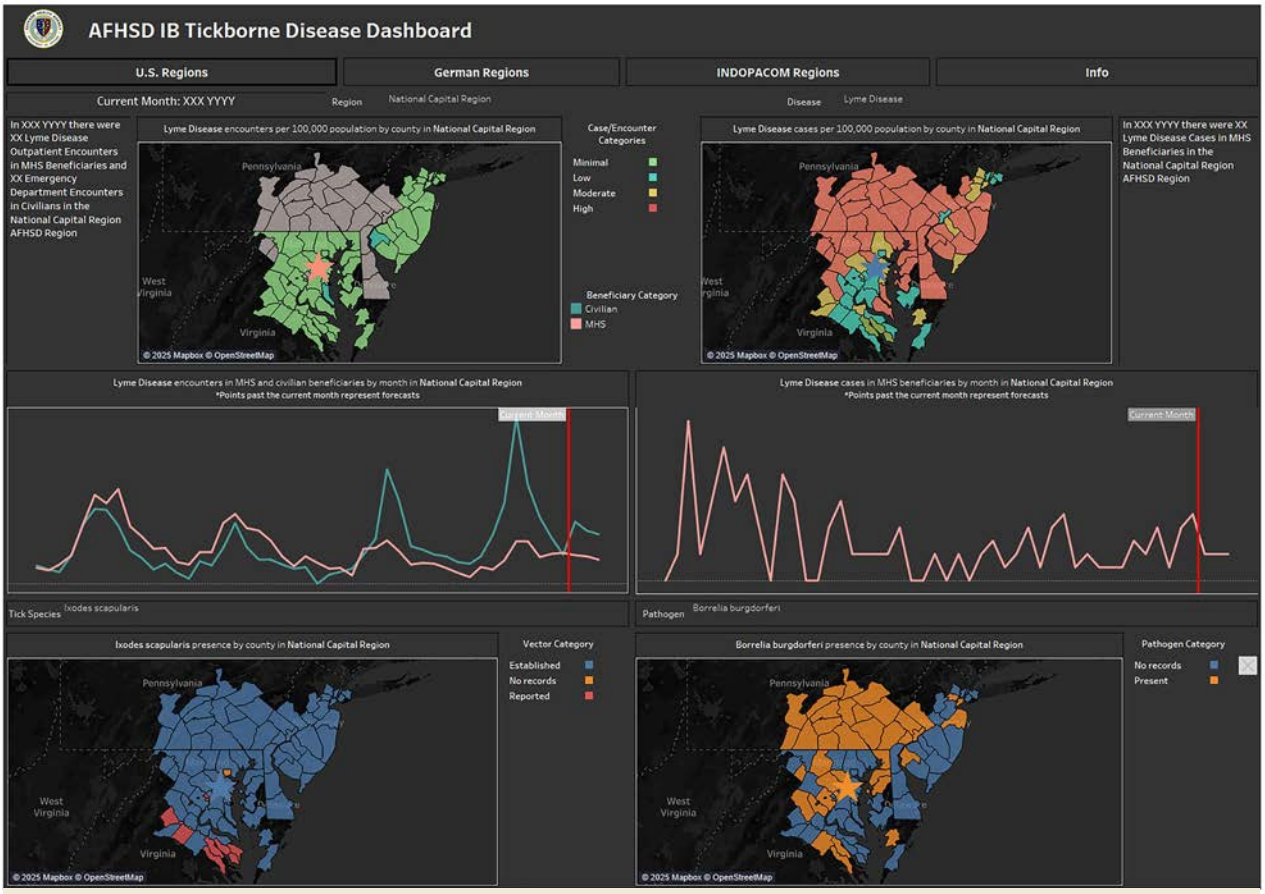
"The tickborne diseases dashboard is great! The information that is provided and how it is displayed provides great opportunity for baselining."

– HQDA G-3/5/7 | Pentagon (September 2024)

COLLABORATED WITH PRIVATE INDUSTRY PARTNERS TO COMPLETE FORECASTING PROJECTS ON INFLUENZA-LIKE ILLNESS (ILI) AND COVID-LIKE ILLNESS (CLI) FOR THE 2023-2024 AND 2024-2025 INFLUENZA SEASONS

The I&E Section conducts an annual forecasting challenge aimed at forecasting respiratory illnesses during influenza season. Participating teams submitted their forecasts, with I&E generating its own internal forecasts. In 2024, I&E successfully completed the 2023–2024 forecasting season and began the 2024–2025 season. Using advanced and new forecasting techniques and analysis of civilian and MHS beneficiary medical encounter, case, and hospitalization data, these projects produced accurate short-term forecasts within AFHSD Surveillance Regions. These forecasts provided leadership with invaluable insights, supporting proactive decision-making and timely interventions to prevent and control the spread of respiratory pathogens. I&E has continuously expanded its respiratory disease surveillance project since 2019, adding new targets and locations annually.

In June 2024, I&E, alongside ESSENCE, also published a manuscript on forecasting methods used during the 2022–2023 influenza season in the *MSMR* titled "Predicting COVID-19 and



The U.S. Regions Tab of the Tickborne Disease Dashboard found on the AFHSD-IB Tableau Page.

Respiratory Illness: Results of the 2022–2023 Armed Forces Health Surveillance Division Forecasting Challenge." This report summarized the results and lessons from AFHSD's forecasts for the 2022–2023 forecasting season. The results showed that several models accurately predicted COVID-19 cases and respiratory encounters with enough lead time for public health response by senior leaders.

FOSTERED PARTNERSHIPS WITH NEW AND EXISTING STAKEHOLDERS

In addition to the routine health surveillance products, I&E has participated in the following:

- In July 2024, I&E collaborated with Signature Science (SigSci), a web application security company, in the development of Plausibility Analysis of Epidemiological Signals (PLANES), a new R tool for forecasting validation. This tool significantly enhances the quality control of I&E's weekly respiratory illness data files and over 30k individual weekly forecasts for over 100 locations during the influenza season. By automating data checks and flagging issues for human review, PLANES eliminates the need for manual review, greatly improving data quality. I&E began testing of PLANES in winter 2023 and concluded the project in July 2024. Currently, the I&E Section continues to work with SigSci on manuscripts and other forecasting initiatives.
- I&E and DTRA have been collaborating regularly on specific forecasting initiatives crucial to DoD. I&E has requested DTRA's assistance for specific forecasting projects and continues to utilize DTRA as a resource for disease forecasting. This collaboration allows I&E to engage with experts in the field of predictive analytics and leverage their expertise for advanced projects. To promptly identify issues, improve workflows and enhance the reliability of forecasting efforts, the IB Branch aims to expand collaborations with additional external academic partners.
- In 2024, I&E, in conjunction with the IB-ARO Section, completed an evaluation of the Los Alamos National Laboratory RED Alert and Analytics for Investigation of Disease Outbreaks (AIDO) tools for their ability to support biosurveillance efforts within AFHSD. While the tools were found to have low potential for both sections, this was another example of I&E's ability to conduct critical evaluations of potential data sources and tools for use in IB products.

ESSENCE 2024
SIGNIFICANT ACCOMPLISHMENTS

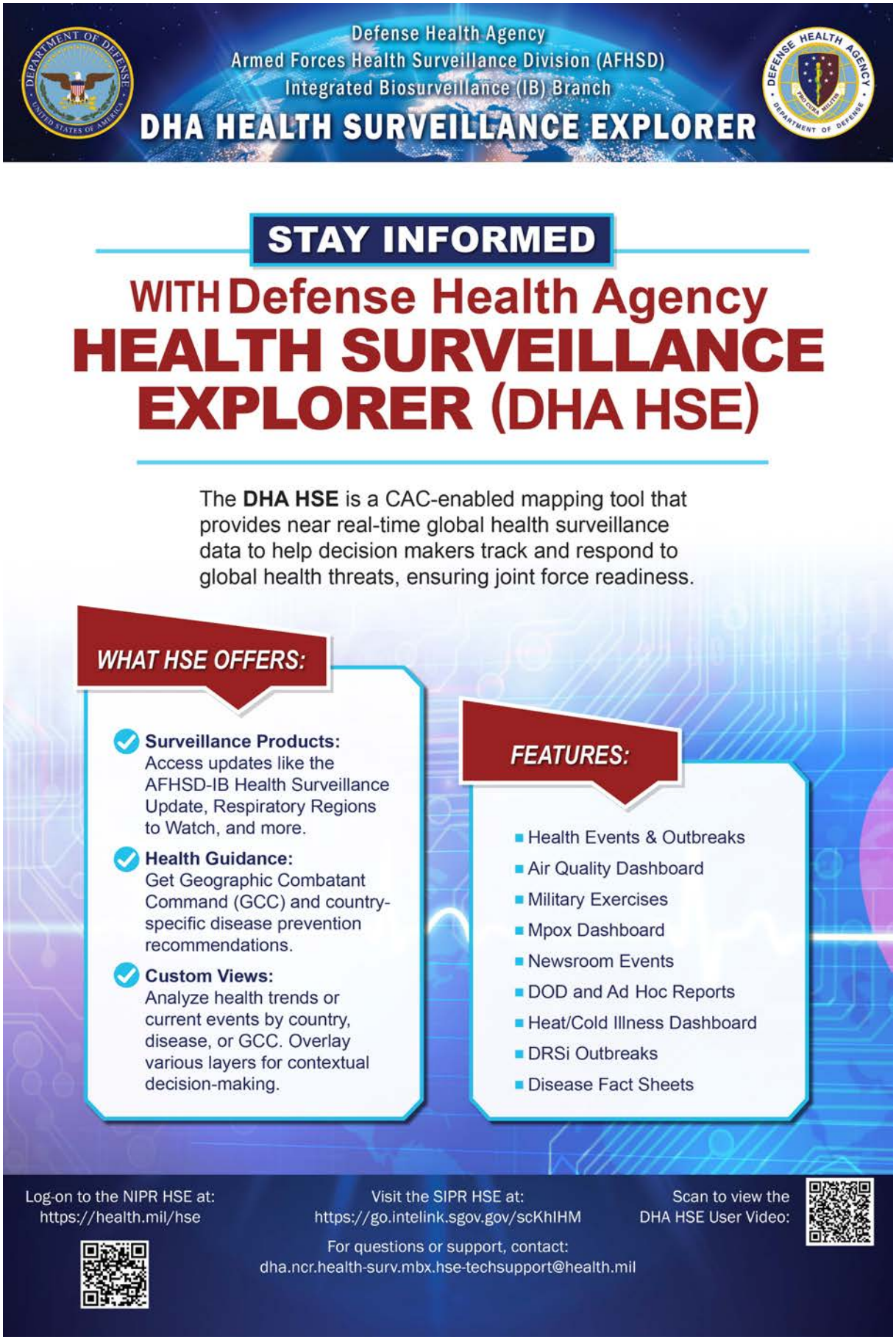
The ESSENCE program is a global and MHS monitoring capability for the early detection of imminent health threats that may impact the readiness of active-duty service members. Leveraging syndromic data, ESSENCE stands as the only global near-real time capability within the MHS for the early detection of threats to FHP. By using the same software as CDC and more than half of the U.S. state public health departments, ESSENCE enables enhanced collaboration with local civilian counterparts during outbreaks. The AFHSD, the Service-specific public health centers, and the MTFs worldwide use ESSENCE daily to monitor the health status of the MHS population in a time where concerns about possible biomedical terrorist attacks and naturally occurring emerging infections are heightened.

ESSENCE monitors the direct care of >9.4 million beneficiaries within the MHS population. In addition, the program facilitates the recognition and investigation of Tri-Service RMEs. It also provides access to both aggregate and individual-level data, crucial for analyzing the epidemiologic characteristics of health events and thereby enhancing medical situational awareness and readiness.

Below are the significant accomplishments for ESSENCE in 2024:

- Generated monthly surveillance data summaries for U.S. Army, Navy, and Air Force forward projection bases and training bases, and distributed reports describing data trends for situational awareness; 72 total reports during 2024.
- ESSENCE provided surveillance data for 33 ad hoc requests and ongoing situational awareness on health events of military significance (e.g., respiratory-related disease in California due to the wildfires, walking pneumonia, norovirus outbreaks, measles, dengue virus infection).
- Beginning April 2024, ESSENCE air quality-related respiratory illness query data were incorporated into the HSE, with twice weekly updates.
- In October 2024, the Next Generation ESSENCE initiative was launched in collaboration with the Johns Hopkins Applied Physics Laboratory. The effort includes a user engagement initiative to gather feedback that will inform the development of a requirements document describing system interface and user workflow improvement, updating the analytic algorithms to better detect public health events of concern, and updating the code base to improve efficiency.
- In December 2024, ESSENCE was successfully transitioned from being hosted on physical servers (managed by Solution Delivery Division) to the cloud (MHS Information Platform, managed by Enterprise Intelligence and Data Solutions). Data ingestion was transformed from a manual to an automated process, and a new approach, columnstore indexing, was applied to the health encounter data to compress the data and improve query performance.

In December 2024, the USCENTCOM monthly report was expanded to include summaries of ESSENCE Disease Non-Battle Injury data to meet the surveillance needs of the CCMD.


Defense Health Agency
Armed Forces Health Surveillance Division (AFHSD)
Integrated Biosurveillance (IB) Branch
DHA HEALTH SURVEILLANCE EXPLORER
STAY INFORMED
WITH Defense Health Agency
HEALTH SURVEILLANCE EXPLORER (DHA HSE)
The DHA HSE is a CAC-enabled mapping tool that provides near real-time global health surveillance data to help decision makers track and respond to global health threats, ensuring joint force readiness.
WHAT HSE OFFERS:
Surveillance Products: Access updates like the AFHSD-IB Health Surveillance Update, Respiratory Regions to Watch, and more.
Health Guidance: Get Geographic Combatant Command (GCC) and country-specific disease prevention recommendations.
Custom Views: Analyze health trends or current events by country, disease, or GCC. Overlay various layers for contextual decision-making.
FEATURES:
Health Events & Outbreaks
Air Quality Dashboard
Military Exercises
Mpox Dashboard
Newsroom Events
DOD and Ad Hoc Reports
Heat/Cold Illness Dashboard
DRSi Outbreaks
Disease Fact Sheets
Log-on to the NIPR HSE at: https://health.mil/hse
Visit the SIPR HSE at: https://go.intelink.sgov.gov/scKhIHM
Scan to view the DHA HSE User Video:
For questions or support, contact: dha.ncr.health-surv.mbx.hse-techsupport@health.mil

DHA

MISSION:

The Defense Health Agency supports our Nation by improving health and building readiness—making extraordinary experiences ordinary and exceptional outcomes routine.

VISION:

Unrelenting pursuit of excellence as we care for our joint force and those that we are privileged to serve. Anytime, Anywhere—Always.

AFHSD

PURPOSE:

To protect the total force from health threats through actionable health surveillance information and support.

GOALS:

- Flexible, responsive, and predicative to our customers
- Early warning capability of global health threats
- Inform risk management decisions across the health surveillance enterprise

Armed Forces Health Surveillance Division
www.health.mil/AFHSD | www.facebook.com/AFHSDpage/ | www.x.com/AFHSDpage