ARMED FORCES HEALTH SURVEILLANCE DIVISION

GLOBAL EMERGING INFECTIONS SURVEILLANCE BRANCH

FISCAL YEAR 2024 TO 2028 STRATEGIC PLAN

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DEFENSE HEALTH AGENCY
PRO CURA MILITIS
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CONTENTS

EXECUTIVE SUMMARY

The Global Emerging Infections Surveillance (GEIS) program was established to improve the Department of Defense's (DOD) infectious disease surveillance, prevention, and response capability to better protect the health of the Joint Force. Through its partner laboratories, the GEIS network (GEIS-N) receives laboratory-confirmed pathogen identification, genomic sequence data, epidemiological demographic and risk factor data, and other related information that, when combined, provides critical details about emerging or expanding infectious disease threats around the world that may impact the health of the Force.

The GEIS-funded portfolio of infectious disease surveillance activities is organized into three Focus Areas – Antimicrobial Resistant Infections (AMRI), Febrile and Vector Borne Infections (FVBI), and Respiratory Infections (RI). The surveillance activities conducted within each Focus Area support four cross-cutting lines of effort, including: pandemic preparedness, operational support, assessment of countermeasures, including countermeasure failures, and support to Military Treatment Facilities (MTF) and Direct Care healthcare delivery. The sustainment of laboratory capabilities and capacities at DOD laboratories worldwide allows for rapid and scalable response to novel and emerging infectious disease threats. The GEIS-N laboratory partners are strategically positioned with critical infectious disease surveillance capabilities to provide early, accurate detection of emerging infections.

The GEIS Program Office (GEIS-PO) is guided by three overarching strategic objectives that allow it to meet its purpose. Those objectives are 1) providing program management for the GEIS-N of laboratory partners, 2) conducting surveillance for emerging infections threatening the health of the Force and military operations, and 3) developing and disseminating surveillance products that provide early warning of emerging threats. To effectively meet these strategic objectives, the GEIS-PO is reliant on key resources and capabilities. The success of the GEIS program centers on sufficient staffing and subject matter expertise both within the GEIS-PO and among GEIS partner laboratories. These relationships and subject matter experts, paired with appropriate and sufficient funding levels, enable the GEIS-N to continue to provide value to the Combatant Commands, the Defense Health Agency, and other key decision-makers.

Looking beyond the next five years, the goal of the GEIS-PO is to continue to leverage its laboratory network capabilities to monitor the infectious disease threat environment and to quickly pivot resources in response to the next pandemic threat. Leveraging next generation technologies, and refining data sources and data management will improve the quality, impact, and value of GEIS products and information. Continuing to take a network approach to expanding genomic surveillance, pathogen discovery, and agnostic sequencing will also allow the GEIS-N to stay on the leading edge in terms of detecting novel viruses and pathogens. Our genomic surveillance activities must be part of other leading efforts to conduct genomic surveillance for infectious diseases worldwide.

This will require, not only solidifying our GEIS partnerships, but identifying strategic partnerships within the United States Government (USG), academic institutions, and beyond. Climate change and urbanization will continue to perpetuate the spread of disease; therefore, the GEIS program must adopt a One Health framework to better understand all domains from which diseases may emerge and spread. Finally, continuing to build and foster long standing relationships with host nation collaborators and allied partner militaries will serve to strengthen the U.S.'s posture on the global stage and ensure the U.S. continues to be the "partner of choice" for strategic engagements.

ABOUT THIS DOCUMENT

The GEIS Strategic Plan is designed to communicate the purpose of the GEIS Network (GEIS-N) to partners and other stakeholders while providing the strategic context within which the GEIS program operates. Going forward, the GEIS Program Office (GEIS-PO) will update its Strategic Plan every five years. The Fiscal Years (FY) 2024 to 2028 Strategic Plan is an update to the FY23 GEIS Strategy. The GEIS Strategic Plan defines specific infectious disease surveillance objectives relevant to the future operating environment of the Total Force and continues to align the GEIS Purpose with national and Department of Defense (DOD) guidance.

The Strategic Plan provides the foundation for other guidance documents related to program execution at multiple levels including, the Request for Proposals, the GEIS-Geographic Combatant Command (GCC) Alignment Documents, and the GEIS Business Cycle **(TABLE 1)**. As such, the Strategic Plan guides and provides context for all efforts in the GEIS-N, from laboratory-level project execution to program-level oversight and management. Successful implementation and execution of the Strategic Plan ensures GEIS-funded activities lead to a common objective, ultimately driving the program toward realizing its purpose. Cross-cutting initiatives and lines of effort that matrix across the GEIS Focus Areas are also articulated in the Strategic Plan.

Within the Strategic Plan, the surveillance priorities, and End State of the GEIS Focus Area portfolios are defined, as well as the programmatic and surveillance activities necessary to achieve the End State. Instructions are provided (where relevant) for how the GEIS Partner Laboratories (GEIS-PLs) should implement these activities and/or initiatives (e.g., standardized reporting). Additionally, each portfolio delineates major surveillance activities that they prioritize; within these activities are more detailed information on surveillance methodologies, potential gaps in knowledge and recommendations for new and novel surveillance activities. The purpose of this section is to guide GEIS-PLs in designing projects, drafting proposals, and planning surveillance activities. This section also defines the respective target pathogens and/or syndromes, priority populations, and associated surveillance questions – each tailored to specific end-user audiences.

TABLE 1. Relevant documents that support the GEIS Strategic Plan or help to translate the plan into action

SUPPORTING DOCUMENT	PURPOSE
Request for Proposals	To solicit proposals and provide guidance for submission and requirements for those receiving GEIS funding
GEIS-GCC Alignment Documents	To describe the operational country and pathogen priorities of each GCC
GEIS Business Cycle	To detail and schedule all major programmatic actions of the GEIS-PO, GEIS-PLs, and other stakeholders, and to define programmatic expectations to ensure efficient, systematic processes
GEIS Fiscal and Legal Guidance	To indicate the parameters of Defense Health Program Operations and Maintenance funding and ensure GEIS-funded projects are fiscally sound

OVERVIEW OF GEIS

ESTABLISHMENT OF GEIS

In 1997, following a Presidential Decision Directive (NSTC-7) (1), the Department of Defense (DOD) established the Global Emerging Infections Surveillance (GEIS) program to improve the Department's infectious disease surveillance, prevention, and response capability to better protect the health of the Joint Force. GEIS, a branch of the Armed Forces Health Surveillance Division (AFHSD), joined the Defense Health Agency (DHA) in 2015. The GEIS-N plays an integral role in supporting the mission of the DHA, a Combat Support Agency that leads the Military Health System's integration of readiness and health to deliver the quadruple aim: increased readiness, better health, better care, and lower cost. Data, information, and products resulting from the GEIS-N's infectious disease surveillance activities *enables combat support to the Joint Force in competition, crisis, or conflict.*

Since its inception, the GEIS program has focused on the timely and accurate detection of infectious disease threats to DOD interests around the globe. The GEIS program operates through a global network of U.S. Army, Navy, and Air Force Service laboratories positioned in strategic locations worldwide. These DOD Service laboratories are engaged on the front lines of global infectious disease surveillance and have developed strong and long-standing relationships with U.S. interagency partners and international public health authorities. The strong partnerships between the GEIS-funded partner laboratories and host nation collaborators helps to reinforce the U.S. as the "partner of choice" in times of competition. Laboratory confirmed pathogen identification, epidemiological data, and other related information are shared through these collaborations and provide critical details about emerging or expanding infectious disease threats around the world that may impact the health of the Force.

> *"The mission of DOD will be expanded to include support of global surveillance, training, research, and response to emerging infectious disease threats. DOD will strengthen its global disease reduction efforts through centralized coordination, improved preventive health programs and epidemiological capabilities, and enhanced involvement with military treatment facilities and United States and overseas laboratories."*
>
> *– Presidential Decision Directive [Clinton, 1996] National Science and Technology Council-7, Emerging Infectious Disease*

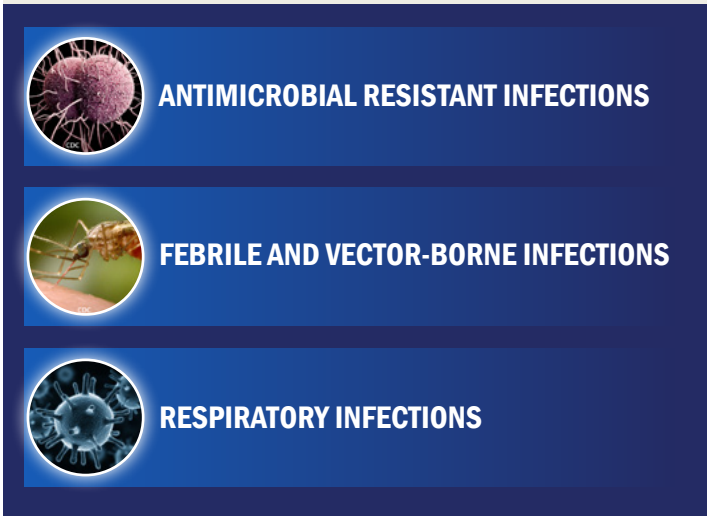
THE GEIS PROGRAM'S PURPOSE

INCREASE BATTLESPACE AWARENESS AND INFORM FORCE HEALTH PROTECTION

Both the operational posture of U.S. Forces and the threat from infectious disease have evolved since 1997. Worldwide, people are more mobile and interconnected than ever before. Changing land use patterns, human migration, climate change, rising antimicrobial resistance (AMR), and increases in human-animal interactions have introduced new opportunities for emerging pathogens to manifest themselves in human diseases and spread quickly throughout the world, as evidenced by the worldwide SARS-CoV-2 pandemic and the mpox epidemic. Given the global impact of the SARS-CoV-2 pandemic, governments are increasingly aware that infectious diseases respect neither national nor international borders.

Providing timely communication about operational public health threats is critical to enabling force health protection (FHP) decision-making and mission success. The GEIS-PO coordinates continuously with its audience of FHP decision-makers, such the GCCs and Service components, preventive medicine and infectious disease clinicians, public health professionals, and global health engagement specialists to understand their surveillance priorities. For example, the GEIS-PO coordinates directly with the GCCs to capture their Theater Campaign Plan and operational infectious disease concerns. The GEIS-PO uses this information to determine funding of the GEIS-N's surveillance efforts in three Focus Areas: Antimicrobial Resistant Infections (AMRI), Febrile and Vector Borne Infections (FVBI), and Respiratory Infections (RI). This results in the GEIS-N providing direct support to DOD decision-makers through surveillance that increases battlespace awareness, informs FHP, supports regional security objectives, and improves Joint Force effectiveness in austere environments. The combined work of the GEIS-N will allow for realization of the GEIS Purpose **(FIGURE 1)**.

Three Focus Areas



The portfolio of GEIS-funded activities, across the three Focus Areas, contributes to multiple lines of effort designed to maximize the value and impact of infectious disease surveillance for the DOD. The four lines of effort that guide the GEIS portfolio include: pandemic preparedness, operational support, countermeasure assessment (including countermeasure failures), and Military Treatment Facility and Direct Care support.

INFECTIOUS DISEASE SURVEILLANCE LINES OF EFFORT

PANDEMIC PREPAREDNESS A core function of the GEIS program is the sustainment of a global laboratory network poised to respond to novel and emerging infectious disease threats. To rapidly respond to emerging threats, there must be a permanent cadre of laboratory and health professionals dedicated to supporting surveillance testing and reporting. The GEIS program has become a vital funding and support mechanism for the

FIGURE 1. The GEIS Purpose Statement

DOD Service laboratories and has thus created a global network of expert military, civilian, and contract personnel (scientists, technicians) that have many years of specialized training and experience. This pandemic preparedness capability includes routine, ongoing surveillance of syndromes and pathogens of military relevance. The GEIS-N includes reach back support capabilities that develop and supply assays, protocols, and trainings for known and novel threats. The GEIS-N contributes to broader global health security objectives by establishing enduring, reliable partnerships with nations that have a shared stake in the security and prosperity of each region. These host nation relationships not only support FHP directly, but also facilitate broader DOD and USG collaborations. Using this approach, the GEIS-N has been able to build long-term surveillance programs that aid GCC and DOD decision-makers, local host-nation and regional collaborators, as well as support for DOD medical product development.

OPERATIONAL SUPPORT The geographic proximity of the GEIS-N to countries and regions that are vital to DOD operations permits timely and relevant operational support. The GEIS-N's critical infectious disease surveillance capabilities are combined with local knowledge and relationships to provide early, accurate detection of emerging infections, identification of infectious disease knowledge gaps, and operationally relevant characterization of endemic infections. The relationships between the GEIS-N and deployed forces also hasten the communication of surveillance findings and, therefore, widen the operational window for adjustments to FHP postures and application of preventive measures. To protect Service members from infectious disease threats while deployed or traveling to high-risk areas, robust local data on vectors, reservoir hosts, and pathogens is needed.

COUNTERMEASURE ASSESSMENT A constant in the surveillance of infectious disease threats is the emergence of pathogen, vector, and environmental characteristics that render existing medical countermeasures less effective or obsolete. To help detect and combat threats to countermeasure effectiveness, the GEIS-PO has identified medical countermeasures that are vital FHP tools that are not adequately or regularly assessed by other DOD entities. The prompt detection of changes to existing countermeasure effectiveness allows for earlier deployment of secondary or alternative preventive measures in the short term, and informs the development of new countermeasures, including vaccines, therapeutics, and personal protective equipment in the long term. An example of this within the GEIS-N is the Department of Defense Global Respiratory Pathogen Surveillance Program (DODGRPSP), which surveils for and provides information on respiratory pathogens across the DOD. Both positivity rates and genomic data on submitted samples sent for testing are included as part of the Vaccine and Related Biological Products Advisory Committee (VRBPAC) annual meeting. Contributions to this forum help inform the components of the seasonal influenza vaccine for the Northern Hemisphere to help improve overall vaccine effectiveness. Effective countermeasures, when strategically implemented in an efficient manner, improve FHP and increase operational freedom of movement and access. Due to inconsistent use and evolving pathogen dynamics in different regions, there is notable evidence of existing countermeasure failure. The GEIS-N continues to identify and conduct surveillance for pathogen evolutions that may render deployable preventatives, diagnostics, and therapeutics unusable.

MILITARY TREATMENT FACILITY AND DIRECT CARE SUPPORT The GEIS program has a rich portfolio of activities that directly support and/or enhance care provided at MTFs, improving health outcomes for Service members and beneficiaries. In support of the U.S. Combating Antibiotic Resistant Bacteria (CARB) National Action Plan (2), the GEIS-N provides real-time outbreak detection and surveillance of multidrug-resistant organisms (MDROs) across the Military Health System (MHS). These surveillance activities aim to halt the introduction, establishment and spread of MDROs within the MHS. GEIS-funding also supports healthcare delivery via comprehensive surveillance of antibiotic resistant bacteria in the MHS, including trend reports, antibiograms, and antibacterial stewardship tools to inform optimal health decisions. Similarly, GEIS-funding enables assessment of inpatient and outpatient antimicrobial use patterns to identify best practices and opportunities for improvement. Supporting the MTFs and Direct Care for DOD Service members and their families serves to improve quality of care and builds a more resilient healthcare delivery system.

CROSS-CUTTING INITIATIVES

NEXT GENERATION SEQUENCING AND BIOINFORMATICS

Genomic surveillance has become an integral component of comprehensive infectious disease surveillance programs and pandemic response worldwide, as pathogen genomic information has become easier, faster, and cheaper to generate with next-generation sequencing (NGS) technologies. The GEIS-N is strategically positioned to leverage these technologies to improve infectious disease detection, characterization, and response efforts that inform FHP decisions. Nearly two thirds of the GEIS portfolio utilizes next-generation sequencing and bioinformatics methods within the funded surveillance activities in some capacity. Whole-genome sequence data, metagenomics, and targeted-deep sequencing can provide additional precision to enhance epidemiological information and, therefore, must be integrated with ongoing surveillance activities where feasible and appropriate.

While NGS equipment is more accessible than ever before, genomic surveillance does not always yield operationally relevant information due to a lack of harmonization, analytical capabilities, and secure, accessible data transfer mechanisms. To address these challenges, in 2017, the GEIS-PO convened a group of GEIS partners with genome sequencing and bioinformatics expertise to better coordinate the development and use of NGS technologies within the network. The GEIS Next Generation Sequencing and Bioinformatics Consortium (NGSBC) was formed to promote collaboration, communication, and standardization for Next Generation Sequencing and Bioinformatics (NGS-BI) methods across the GEIS-N. The NGSBC provides quality assurance, oversight, and guidance for sequencing specific pathogens, sample types, or to meet surveillance objectives. The NGSBC serves as a mechanism for GEIS-N coordination of training and support for sequencing capability development and maintenance at OCONUS laboratories.

The GEIS-PO has five objectives for the development and maintenance of an integrated, validated, and harmonized laboratory network capable of fully harnessing NGS-BI technologies; this network will position DOD to provide critical support for pandemic preparedness and response, which is a persistent threat to U.S. Forces operating across the world. Moreover, genomic surveillance and advanced pathogen characterization can inform routine operational planning and potential public health needs. Understanding what pathogens might be circulating in a region, their origins or relationships with other pathogens, the risk for countermeasure failure and the risk of rapid transmission is important for adequately preparing our Forces to operate in various environments. The five objectives for developing this network include 1) integrated technology, capability, and maintenance to support sustainable infectious disease surveillance activities with fully integrated NGS-BI components; 2) improved data analysis, sharing, management, and results communication; 3) facilitated collaborations to harmonize surveillance activities in the GEIS-N that use NGS-BI; 4) integrated Consortium governance with an engaged leadership structure to improve coordination and management; and 5) continued, sustainable deployment of financial resources to support coordinated NGS-BI activities in the GEIS-N. As DOD and the NGS-BI Consortium transition from the COVID-19 pandemic emergency response, a renewed landscape assessment and revised strategy for GEIS genomic surveillance efforts are underway.

ONE HEALTH

One Health is a collaborative and holistic framework that recognizes the interconnectedness of human, animal, and environmental health. The One Health approach aims to address global health issues and challenges that require a multidisciplinary approach to prevent and control the spread of infectious diseases.

The GEIS-PO conducts One Health infectious disease surveillance by identifying and filling gaps in data streams that, when properly merged, may better inform surveillance questions and refine desired outcomes. While many existing surveillance activities within the GEIS-N produce data related to one or more of the core domains,

connections between these domains may not be established or sufficiently characterized. Those connections can help identify and illustrate the significant relationships and intricate transmission dynamic threats. Although it may not be feasible for a single GEIS-funded surveillance activity to achieve this cross-domain connection (such as collecting data on animal health alone), there are instances in which individual surveillance activities can significantly contribute the understanding of a particular pathogen or disease when combined in a One Health framework.

The GEIS-PO is invested in building a foundation for evaluating infectious disease threats where laboratories can apply a One Health approach, strengthen existing partnerships to help fill data and methodology gaps across the network, and modernize One Health activities to ensure the GEIS-N remains on the cutting edge of infectious disease surveillance. It is critical that these activities are executed in support of FHP, which is why there is added emphasis on targeting multiple domains of One Health and characterizing the linkages to human outcomes. That foundation will be critical in GEIS' ability to pivot to newly prioritized One Health surveillance (e.g., wastewater surveillance) within the DOD. To continue building a foundation of robust surveillance activities across One Health domains, the GEIS-PO has identified the following priorities: 1) combine existing data streams from pathogens of interest to identify possible One Health questions and objectives, 2) define the minimum necessary data elements and analyses for demonstrating a relationship between two or more One Health domains, and 3) develop a new One Health data repository or data stream.

DATA MODERNIZATION

Data modernization is necessary for speeding up decision-making, increasing resource efficiency, and interfacing with today's data-driven world. Data accessibility can have a significant impact on the GEIS-PO's ability to produce more timely and actionable information products. By updating existing technology and processes, the GEIS-N can better gather insights from the many data streams that currently exist but are inaccessible for analysis. Furthermore, ensuring mechanisms are in place for sample and data sharing across the partner network will enhance the ability of the GEIS-N to provide relevant and actionable information from surveillance activities. The GEIS-PO data modernization goals will be executed by implementing a data lake infrastructure to collect and manage data resulting from GEIS-funded surveillance activities. A data lake refers to housing and staging data in a way that allows an organization to remain flexible to answering rapidly changing questions, such as in the public health field. Adopting a data lake offers two key benefits to the GEIS-N. The first being that data can be aggregated into analysis-ready data warehouses while still maintaining the sourced data in its original format with all variables captured. Second, data lakes permit the use of various analysis software tools without the need for physical software downloads and data exports. This provides the GEIS-PO flexibility to leverage new tools as they are made available in the environment and avoid version control issues that often come with data exports. By implementing a data infrastructure, the GEIS-PO will in turn receive prompt, clean data that lends itself to granular tracking of hospital enrollments, sample milestones, verifiable lab results, etc. Taking away the quantitative data reporting burden will also allow partners to focus on FHP importance and regional context.

GEIS NETWORK ELEMENTS

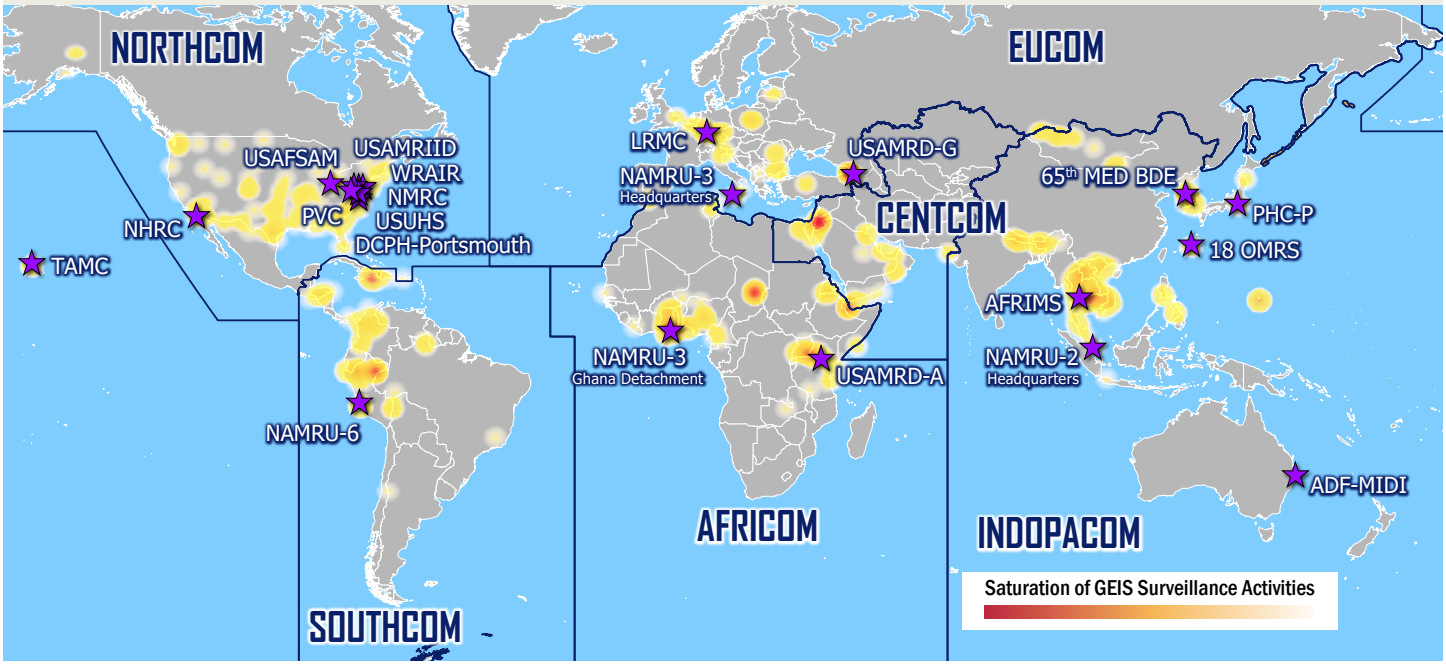
GEIS PROGRAM OFFICE

The GEIS-PO, through Defense Health Program (DHP) Operations and Maintenance (O&M) funding for bio-surveillance and genomic sequencing, supports a global network of highly qualified DOD Service laboratories positioned in key locations to provide on-the-ground infectious disease surveillance and outbreak response in support of DOD decision-makers. Each of the GEIS Focus Areas defines their strategy and direction through the creation of portfolio objectives, review of annual proposals, collection of data from funded projects, and translation of findings into products which are packaged and disseminated to GEIS audience members.

GEIS PARTNERS

The GEIS purpose cannot be achieved without the GEIS-PLs **(FIGURE 2)**. The GEIS-PLs review the GEIS Strategic Plan and GEIS-GCC Alignment Documents for guidance on how to design and conduct surveillance activities that align with GCC priorities and gaps via annual proposals. The GEIS-PLs have unique capabilities and expertise, collaborators, and knowledge of local disease threats. The merging of GEIS-PO guidance and GEIS-PL proficiencies results in a targeted, operationally relevant surveillance program. On an annual basis, GEIS-PLs submit proposals for surveillance activities in support of FHP and increased battlespace awareness. The value and relevance of data generated from the GEIS-N is due to the important forward posture of the OCONUS laboratories and the critical reach back support of CONUS laboratories. The GEIS program relies almost exclusively on its laboratory partners and collaborates on a case-by-case basis with other external partners to fill specific gaps or niches within the network. The GEIS program also collaborates and synchronizes with the MHS as well as intra- and interagency collaborators to augment health surveillance knowledge in areas of strategic interest. The GEIS program continues to enhance its network and optimize surveillance efforts by strengthening existing partnerships with other DOD and USG organizations **(APPENDIX 1)**. This ensures that the GCCs and Joint Forces have timely information concerning circulating infectious disease threats needed for FHP planning. The GEIS program strives to not only maintain existing partnerships, but also to work towards establishing new partnerships to enhance the network and ensure long-term program viability.

FIGURE 2. Map of GEIS Partner Laboratory Locations



GEIS AUDIENCE MEMBERS

The value of the GEIS program is its provision of timely, actionable surveillance products to appropriate end users that are aligned with the program's four lines of effort. Each GEIS product is considered in the context of various DOD decision-makers and is scoped to meet the targeted needs of specific audience groups. Surveillance findings from the GEIS-N are unique because they include laboratory-confirmed data on a variety of populations in locations where there may be gaps in surveillance. Products generated by the GEIS-N that are intended to communicate surveillance findings typically include additional data sources (e.g., Ministries of Health) to provide context to findings and conclusions. Thus, a diverse audience may benefit from these surveillance findings. While aiming to be inclusive of a diverse GEIS audience, the GEIS-PO continues to strive towards providing surveillance information to inform FHP. DOD decision-makers who comprise the GEIS audience and end users of GEIS surveillance products are defined in **APPENDIX 2**.

GEIS ALIGNMENT WITH NATIONAL AND DEPARTMENT OF DEFENSE POLICY

This Strategic Plan acknowledges that we are operating within an increasingly complex, interconnected health environment where emerging and re-emerging infectious diseases present significant risks to the readiness of the Joint Force and FHP. Therefore, this Strategic Plan is written to directly support and complement other existing National and DOD Guidance documents that exist to combat these ever-evolving threats.

The *2022 National Security Strategy (NSS)* (3) sets forth a plan to protect the security of the American people; expand economic prosperity and opportunity; and realize and defend the democratic values of the American way of life. The NSS reinforces the need for the U.S. to have a strong role in a divided and unstable world. The Strategy calls for investment in tools of American power and influence to build and strengthen a coalition of nations, enhancing collective influence to shape the global strategic environment and to solve shared challenges, including being prepared for the next pandemic. **The GEIS-N is well poised to support the NSS by providing early warning of infectious disease threats across One Health domains, bolstering genomic surveillance and bioinformatics capabilities, and modernizing data sharing practices.** Additionally, through long-standing partnerships with local health authorities and health engagements with partner militaries, the GEIS-N helps to reinforce the U.S. as the "partner of choice" and, through mutually beneficial collaborations, deepens our cooperation with partner nations.

The *2022 National Defense Strategy (NDS) of the United States of America* (4) outlines four priorities: to defend the homeland; deter strategic attacks against the U.S., allies, and partners; deter aggression, while being prepared to prevail in conflict when necessary; and building a resilient Joint Force and defense ecosystem. The NDS calls for several strategies to meet these priorities, including integrated deterrence, campaigning, and building enduring advantage. Integrated deterrence requires more effective coordination, networking, and innovation so that the U.S. has a seamless combination of capabilities to deter aggression from bad actors. The COVID-19 pandemic highlighted the costs and risks of future biological threats for the department and Joint Force. **The agile, and scalable outbreak response capabilities of the GEIS-N allow for detection of novel, emerging infectious disease threats with pandemic potential that may compromise the health, readiness, and performance of Service members.** The global footprint of the GEIS-N recognizes emerging infectious diseases as transboundary threats and ensures that the department can quickly respond to current and future biological threats that arise.

The purpose of the *2022 National Biodefense Strategy (NBS) and Implementation Plan (IP)* (5) is to bring together a single coordinated USG effort to protect the American people from biological threats, whether naturally occurring, accidental, or deliberate in origin. A critical assumption of the NBS is that infectious diseases do not respect borders, and an infectious disease threat anywhere is an infectious disease threat everywhere. As such, **the GEIS-N is well-poised to support the NBS with laboratory and biosurveillance capabilities**

and capacities to quickly pivot resources if a threat is detected. Recognizing that humans, animals, plants, and our environment are all interconnected, the GEIS-N conducts surveillance across One Health domains, lending to a more comprehensive understanding of how infectious disease emerge and are transmitted. Maintaining the capabilities of the GEIS-PLs is essential for rapidly detecting pathogens, reporting laboratory-confirmed findings, and sharing samples and information within the DOD and USG, and across to international partners and collaborators. Through the GEIS NGSBC, pathogen genome sequence data and other analytical information is shared within the GEIS-N, and posted to repositories such as GENBANK and GISAID, as appropriate. Within the AMRI portfolio, the GEIS-N directly supports the CARB NAP with surveillance for antibiotic resistant pathogens worldwide, meeting Goal 3 of the NBS IP to "ensure biodefense enterprise preparedness to reduce the impacts of bioincidents" and objective 3.1.4 to "strengthen healthcare-associated infections and antibiotic resistant pathogen capacities".

The GEIS Strategic Plan directly supports the DHA Director's priority of *enabling combat support to the Joint Force in competition, crisis, or conflict*. GEIS-funded surveillance activities enable pandemic preparedness and support operational readiness across the GCCs. GEIS surveillance activities are also aligned with the DHA Director's priority of building a resilient healthcare delivery system by enhancing the care provided by the MHS and continuously assessing and informing countermeasures to protect the entire DOD population. The GEIS Strategic Plan is aligned with the *DOD Directive 6420.02* (6)*, "DOD Biosurveillance"*. The GEIS-N enables and provides timely, actionable surveillance data that aims to inform combat support decision-making and enhance battlespace awareness. While the primary purpose of the GEIS program is to inform FHP, GEIS indirectly supports global health security and is therefore informed by the Global Health Security Agenda (GHSA) (7), the Office of the Secretary of Defense Cable, *Policy Guidance for DOD Global Health Engagement,* and the resulting DOD Instruction (8).

GEIS STRATEGY

To meet its purpose and optimize return on investment, the GEIS-PO has identified three objectives and sub-categories that support these objectives. Successful execution of the GEIS program's strategic objectives is assessed by a set of core metrics and Key Performance Indicators (KPIs) **(Table 4)**.

TABLE 2. Items & Definitions included in the GEIS Strategic Plan

ITEM	DEFINITION
Core Metrics	Measures established to assess processes and track performance
Key Performance Indicators	Measures established to monitor and evaluate progress towards targets
Targets	Pre-established benchmarks the GEIS program aims to achieve

PROGRAM OFFICE STAFFING AND SUPPORT

The GEIS-PO consists of approximately six U.S. Military (MIL) and/or Public Health Service (PHS) Officers and approximately ten contractors (CTRs). The GEIS-PO Headquarters staff include the GEIS Chief, GEIS Focus Area Chief, Scientific Program Manager, Senior Biosurveillance Specialist, Senior Data Strategist, Senior Molecular Epidemiologist, Data Analyst, Laboratory Support Specialist, Business Resource Support Specialist and Operations Coordinator. The Focus Areas are each staffed by a Focus Area Lead (MIL or PHS) and a Portfolio Manager (CTR). The composition and personnel of the GEIS-PO will continue to evolve to incorporate the latest advances in laboratory and data analysis, ensuring the greatest return on investment across the entire portfolio.

The GEIS-PO develops and maintains robust processes and procedures to guide the GEIS-N, including the publication of an annual GEIS Business Cycle to outline major deliverables and deadlines for activities that occur over the course of the fiscal year. Efficient execution of routine programmatic activities is critical to ensuring that GEIS-funded partners are notified of their funding amounts at the start of the FY (or as soon as possible thereafter) and enables execution of GEIS-funded projects in support of the GCCs. The GEIS-PO coordinates the business cycle timeline with key stakeholders in the review process to include internal DHA offices, external Scientific Review Boards (SRBs), and the Office of the Joint Staff Surgeon (OJSS)/GCCs. GEIS business cycle documents include the annual Request for Proposals (RFP), GEIS Strategic Plan and the GEIS-GCC Alignment Documents and annual proposals. At the start of each FY, a copy of the GEIS Business Cycle is provided to all funded partners and organizations on the GEIS Distribution List.

COORDINATION AND COLLABORATION

The GEIS-PO coordinates closely with the DHA Office of General Counsel (OGC) to ensure funded projects follow DHP O&M fiscal and legal guidance. In collaboration with the DHA J8 and resource managers, the GEIS-PO closely tracks and monitors funding to ensure projects are on track to meet Office of the Secretary of Defense (OSD) targets for obligations and expenditures. The GEIS-PO coordinates directly with the GCC Command Surgeons and GCC and Service component FHP Officers to capture operational infectious disease priorities. These priorities are communicated to the GEIS network through the GEIS-GCC Alignment Documents in the annual Request for Proposals. Once proposals are submitted, they undergo careful review both internally by the GEIS-PO and externally by SRBs, the DHA OGC, and other groups or institutions are needed.

PROPOSAL MANAGEMENT AND EVALUATION

The GEIS Proposal Management Information System (ProMIS) is the web application used to submit proposals and associated attachments to the GEIS-PO. All partners submitting a proposal are required to register for an account in ProMIS. The ProMIS Dashboard also hosts updated GEIS Strategic Guidance documents and a GEIS-PO points-of-contact (POC) list.

There are three categories of proposal submissions to the GEIS-PO – extension, pilot, and provisional proposals.

EXTENSION PROPOSALS are on-going efforts that have been funded by GEIS consecutively for one or more years. Extension proposals address high-priority infectious disease concern(s) and help maintain capabilities or proficiencies vital to outbreak response and pandemic preparedness, so they and benefit from regular, ongoing surveillance activity. Extension proposals may include large-scale surveillance efforts across multiple countries, targeted surveillance efforts in specific populations or locations of interest, and advanced characterization efforts that provide additional support beyond traditional surveillance.

PILOT PROPOSALS are new (e.g., have not received funding previously) activities that fill a current gap in surveillance or that represent novel, innovative approaches to surveillance with potential for long-term adoption in the GEIS-N. To be considered a successful pilot proposal, submissions should clearly indicate the surveillance gap the effort is intended to address, as evidenced by citing literature or standard practices along with specific outcomes against which to measure success. Successful pilot proposals may also have collaborators in position to support the effort (e.g., agreements in place and well-established connections). These proposals should also reasonably demonstrate assurance that all funding committed can be successfully obligated or executed within the FY period and that the statement of work can be completed within a clearly defined and limited timeframe (usually 1-2 years).

PROVISIONAL PROPOSALS are any new (e.g., have not received funding previously) activities that are intended for a short time frame to answer specific surveillance questions indicated in the annual RFP. Provisional proposals are likely to be smaller in scope, with clear outputs and/or outcomes defined that could possibly lead to future work SHOULD that outcome be found. Thus, provisional proposals involve more inherent risk by pursuing elusive surveillance targets and questions in a short time frame. The GEIS-PO, along with outside proposal reviewers, will seek to fund provisional proposals with risk-reward characteristics that best match GCC needs.

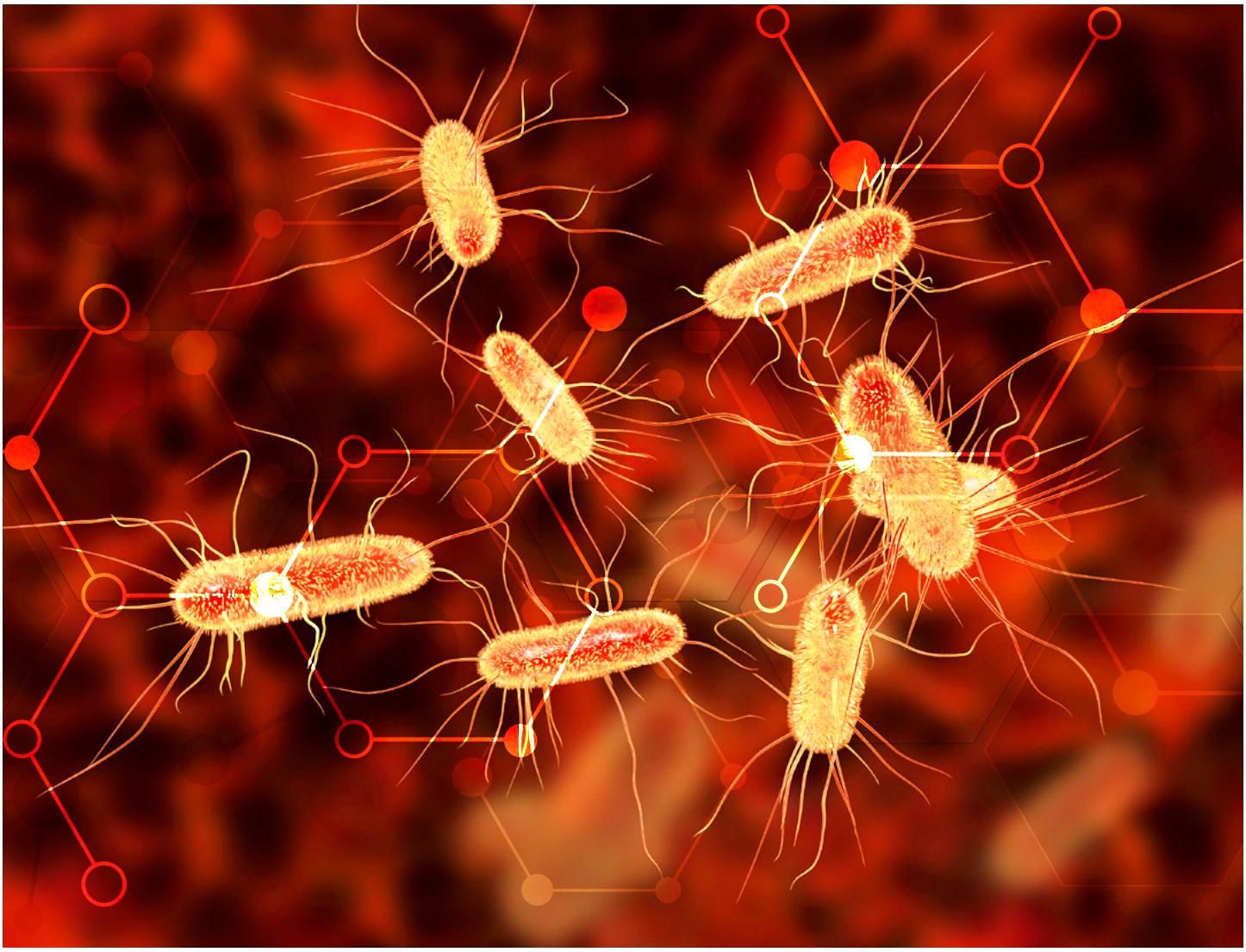
The GEIS Proposal Review process includes scoring each proposal against a series of metrics across three categories as follows: 1) **Surveillance**: to evaluate the scientific elements of the proposed work to determine if it is feasible, uses appropriate study design and analytic techniques, and can partially or completely answer the surveillance questions put forth in the proposal; 2) **Products**: to determine if proposals and/or laboratory partners are likely to produce force health protection-relevant data that result in valuable, actionable products that will be useful to GEIS audience members; and 3) **Program Management**:

to determine if proposals and/or laboratory partners support GEIS and GCC strategic priorities, demonstrate fiscal stewardship, and have a history of strong performance and productivity. More recently, the GEIS-PO has established core metrics and key performance indicators to evaluate implementation and execution of the GEIS program goals and objectives. In general, proposals that score higher tend to be awarded the most funding while those that score the lowest are not funded. Feedback and scores for each proposal are shared with the submitting investigator.

PROJECT MONITORING

The GEIS-PO requires timely reporting on surveillance findings and programmatic and budgetary updates throughout the FY through several distinct reporting processes. These reports are used to ensure accountability, monitor productivity, and demonstrate the value of our program to the Combatant Command and to senior leadership. The reporting requirements are as follows:

- **Immediate (SPOT) Reports** include surveillance findings of High or Moderate threats.
- **Monthly Data-to-Decision (D2D) Reports** include surveillance data and routine findings.
- **Quarterly Budget Reports** provide updates on receipt, obligation, commitment, and expending of funds.
- **Annual Programmatic Reports** provide updates on scientific and programmatic accomplishments.



OBJECTIVE 2

CONDUCT SURVEILLANCE FOR EMERGING INFECTIONS THREATENING HEALTH OF THE FORCE & MILITARY OPERATIONS

ONGOING SURVEILLANCE OF OPERATIONALLY-RELEVANT INFECTIOUS DISEASE THREATS

Surveillance activities conducted through strategically positioned GEIS-funded laboratories enable early, accurate detection of infectious disease threats in locations where Service members are or could be deployed. Furthermore, continued surveillance of known threats enables epidemiological studies designed to understand the distribution of pathogens over time among DOD-relevant populations in diverse geographical locations. Routine sample collection and pathogen identification provides the foundation for advanced characterization of militarily relevant pathogens to better understand transmission of disease and inform development of medical countermeasures, such as vaccines and therapeutics.

FIGURE 3. USAMRD-G Detects Highly Resistant *Acinetobacter baumannii*

Through phenotypic and genotypic analysis of antibiotic resistant bacterial isolates recovered from clinical specimens in the country of Georgia, **USAMRD-G** and **MRSN** detected the emergence of the first instance of presumptive pan-drug resistant *Acinetobacter baumannii* in **USAMRD-G's** six-year history of AMR surveillance program. **USAMRD-G** identified three isolates from different hospital intensive care units that displayed resistance to all tested drug classes, including colistin and carbapenems. In addition to the array of antibiotic resistance genes detected in all three isolates, two isolates were highly related and carried rare plasmid-mediated factors conferring carbapenem resistance, suggesting a common infectious source. Conversely, the colistin resistant phenotype observed in all three isolates was attributed to chromosomal mutations on the pmrCAB operon rather than plasmid-mediated gene transfer. This finding illustrates the multiple mechanisms by which antimicrobial resistance can emerge and hints at a possible transmission chain. The comprehensive approach to AMR surveillance employed by **USAMRD-G** not only informs clinicians and microbiologists about the mechanisms and drivers of resistance in circulating bacterial pathogens, but also helps guide decision-makers in their risk assessment of AMR threats for Service members living and working in diverse geographic locations.

MAINTAINING PARTNER LABORATORY CAPABILITIES AT CORE DOD SERVICE LABORATORIES FOR PANDEMIC PREPAREDNESS AND RESPONSE TO EMERGING THREATS

Maintaining and enhancing core capabilities across the DOD Service laboratories allows for a flexible and responsive surveillance network that can be rapidly leveraged to pivot to detect and respond to the next outbreak. Continued investment in cutting-edge technologies, such as mobile genetic sequencing platforms, will improve the GEIS-N's ability to detect operationally relevant threats before they degrade or negatively impact mission success.

FIGURE 4. 65th MED BDE uses portable sequencing device to test samples during a hantavirus outbreak

In conjunction with local national partners, the **65th MED BDE** used a portable MinION sequencing device to perform whole genome sequencing of *Hantaan orthohantavirus* (Hantaan virus, HTNV) which is harbored by *Apodemus agrarius*, a striped field mouse. HTNV causes hemorrhagic fever with renal syndrome (HFRS) and poses a critical public health threat worldwide. These activities highlight the potential of the portable nanopore sequencer for rapid generation of accurate genomic sequences of HTNV for quicker decision making in point-of-care testing of HFRS patients during a hantavirus outbreak.

REACH BACK SUPPORT FOR IMPROVED PATHOGEN DETECTION AND ADVANCED CHARACTERIZATION OF MILITARILY-RELEVANT INFECTIOUS DISEASE THREATS

Within the GEIS network are several reach back laboratories with advanced capabilities for characterizing pathogens of military relevance. These reach back partners also provide additional services to GEIS-funded partners, including assay and/or reagent development, training, and troubleshooting.

FIGURE 5. USAMRIID provides Sudan virus assays to support outbreak response

The **United States Army Medical Research Institute of Infectious Diseases (USAMRIID) Diagnostic Systems Division (DSD)** provided Sudan virus real-time RT-PCR assays to **USAMRD-Africa** for activities in Uganda and Kenya to support those countries' outbreak response and U.S. FHP in the region. Utilizing the established GEIS network facilitates outbreak response by the USG in an actionable timeframe, provides the Combatant Commands with infectious disease surveillance data and information, and supports public health and U.S. medical diplomacy in our partner countries.

OBJECTIVE 3

DEVELOP & DISSEMINATE SURVEILLANCE PRODUCTS THAT PROVIDE EARLY WARNING OF EMERGING THREATS

The GEIS-N conducts surveillance that is designed to provide near-real time data on infectious disease threats to inform DOD decision-makers. Timely communication about operationally relevant infectious disease threats is critical to enabling GCC FHP decision-making and mission success. The GEIS-PO routinely engages with diverse audience members **(Appendix 2)** to solicit input on their surveillance needs; the GEIS-PO develops products to address those needs, and the audience members provide feedback on the products to ensure that information is relevant, accessible, and valuable. Development and dissemination of timely, actionable surveillance products that meet the audience members' needs requires effective data synthesis and translation to ensure that findings are disseminated to decision-makers and other partners in the network.

FIGURE 6. The GEIS Program Office develops and shares interactive dashboards

The **GEIS Program Office** has developed several interactive dashboards hosted on the GEIS CarePoint site that display surveillance data and serve as a tool for FHP decision-making. For example, the Camp Lemmonier and Chabelley Airfield Vector Surveillance and Control Dashboard has been used by leadership and personnel at Camp Lemmonier, Djibouti to inform proactive assessments of the potential for malaria outbreaks and to drive decisions around logistics of pest management and control. This product has allowed for continuous and consistent access to information in an operationally relevant location with considerable personnel turnover.

RESOURCE NEEDS

To effectively achieve its purpose and meet objectives, the GEIS program is reliant on key resources and capabilities. The success of the GEIS program centers on sufficient staffing and subject matter expertise both within the GEIS-PO and among GEIS-PLs. The GEIS program values the long-standing relationships, collaboration, and the subject matter expertise within the GEIS-N. These relationships and expertise, paired with appropriate and consistent funding levels, enable the GEIS-N to continue to provide value to the GCCs, DHA, and other key decision-makers. Central to the GEIS Business Cycle is ensuring that resources are aligned with operational infectious disease priorities. Where the GEIS-N is not able to address these priorities, the capabilities and resources of inter- and intra-agency collaborators are leveraged.

TABLE 3. Essential resources and capabilities for GEIS Program execution

1	Sufficient **funding for partners** to conduct surveillance to address decision-maker priorities
2	Sufficient **staffing and subject matter expertise** to carry out activities within the GEIS-N
3	Improved and enhanced **program infrastructure and technology solutions**
4	Organizational **support** from the GCCs and DHA for GEIS-funded surveillance activities
5	Sustained **relationships** with partner countries and laboratories
6	Enhanced **collaboration and communication** with the GCCs, interagency and other stakeholders

GEIS FOCUS AREA SURVEILLANCE PRIORITIES

Each of the GEIS Focus Areas details surveillance categories that provide guidance to partners in drafting proposals. These surveillance categories 1) prioritize pathogen targets; 2) indicate perceived gaps in current surveillance efforts; 3) note preferred partnerships and methodologies; and 4) request submissions with new/novel approaches to surveillance. All Focus Areas prioritize U.S. Service member and beneficiary populations as the target population of interest and require a clear link to FHP for surveillance activities and outcomes. In addition, each of the Focus Areas has cross-cutting initiatives (e.g., One Health, NGSBI, data modernization) woven throughout their portfolios that help to increase return on investment and enhance data and information resulting from current and future funded efforts.

Please note that once the Focus Areas portfolios are finalized for the fiscal year, a summary of each is displayed through comprehensive project dashboards on the GEIS CarePoint site. These programmatic dashboards provide key information on funded efforts within each Focus Area, including the surveillance sites, target pathogens, and project points-of-contact.

ANTIMICROBIAL RESISTANT INFECTIONS (AMRI)

As a globally positioned force, the U.S. military is at increased risk for exposure to MDROs and transmission of such organisms within the MHS and military communities. (9) (10) The GEIS-N is a named agency tasked to carry out CARB objectives under Goal 2 (Strengthen National One Health Surveillance Efforts) and Goal 5 (Improve International Collaboration and Capacities for Antibiotic Resistance). In support of these national and DOD guidance documents, the GEIS-PO will continue to coordinate global surveillance efforts on behalf of the DOD in support of FHP decision-makers.

The GEIS-PO has consolidated the Antimicrobial Resistance/Sexually Transmitted Infections (AMR/STI) and the Enteric Infections Focus Areas to become the newly formed Antimicrobial Resistant Infections (AMRI) Focus Area. The intent of this merging is to streamline the Focus Area, reduce redundancies, harmonize methodologies, and enable flexibility to allocate funding resources to the most impactful activities. Both former Focus Areas share similar surveillance priorities, including describing antimicrobial resistance patterns and leveraging NGS technologies to further characterize pathogens of interest. The newly formed AMRI Focus Area will continue to surveil for high threat multi-drug resistant organisms associated with healthcare-associated and wound infections, sexually transmitted infections (STIs), and enteric infections. Militarily relevant pathogens of interest across those domains, include: 1) ESKAPE-E+ (*Enterococcus faecium*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa*, *Enterobacter* spp., *Escherichia coli*), *Candida auris*, 2) *Neisseria gonorrhoeae* (NG) and *Mycoplasma genitalium* (MG), and 3) *Campylobacter* spp., pathogenic *E. coli*, *Salmonella* spp., *Shigella* spp. etc.

The AMRI Focus Area **END STATE** is increased global surveillance of MDROs and other militarily relevant infections, whether nosocomial, community-acquired, wound, sexually transmitted, or gastrointestinal. This End State will be achieved through an integrated and collaborative laboratory network conducting surveillance across human, animal, and environmental domains, ultimately to improve the health and readiness of U.S. Forces.

SURVEILLANCE ACTIVITIES

The surveillance categories in the AMRI Focus Area include: surveillance of ESKAPE-E+ pathogens, surveillance of sexually transmitted infections, and surveillance of acute gastroenteritis/acute diarrheal disease. Most studies within the AMRI Focus Area should also seek to accomplish the following when conducting surveillance on GEIS target pathogens: 1) perform phenotypic characterization and antimicrobial susceptibility of isolates

as identified in the target microorganisms list; 2) characterize antimicrobial resistance and/or virulence genes using real-time polymerase chain reaction (PCR) or conventional PCR, NGS, or other molecular techniques; and 3) support genomic and isolate repositories and bioinformatics analysis by shipping isolates to the appropriate reach-back resource (e.g., MRSN for ESKAPE-E+, USU GC Reference Laboratory & Repository for NG and MG, and NHRC for bacterial enteric isolates). The GEIS AMRI Focus Area encourages any projects that support, engage with, and conduct surveillance during both U.S. and foreign military exercises and key engagements, such as Cobra Gold, Balikatan, and Noble Partner. Conducting surveillance for enteric infections and ESKAPE-E+ pathogens during these exercises is of tremendous value in building relationships with key partners and provides relevant FHP data.

CATEGORY #1: ESKAPE-E+ SURVEILLANCE

The AMRI Focus Area supports a comprehensive surveillance approach that examines patterns and distribution of ESKAPE-E+ and linking those findings with FHP posture and relevant human clinical outcomes.

LABORATORY-BASED (STRAIN-BASED) SURVEILLANCE

The AMRI Focus Area seeks to fund projects that can collect and identify positive MDRO laboratory samples or isolates from clinical and reference laboratory partners for further phenotypic and advanced genotypic characterization. This surveillance methodology increases sample size numbers and allows for expansion to additional priority countries, regions, facilities, etc. Investigators can expect to collect minimal, if any, clinical data through laboratory-based surveillance but are encouraged to cooperate with their country and treatment facility partners to collect as many data elements as possible under a non-human subject research category. For example, additional data on antibiotic use (driving selection pressure for MDROs), sites of infection, and clinical outcomes are meaningful data points. GEIS-PLs are encouraged to communicate any limitations regarding clinical and epidemiologic data collection to the GEIS-PO for awareness. Data from laboratory-based surveillance is used to describe trends in phenotypic resistance and antimicrobial susceptibility of target pathogens. Downstream, isolates collected from laboratory-based surveillance can be shared with reach back laboratories, like the MRSN, for whole genome sequencing, which informs the global distribution of known and/or novel antimicrobial resistance genes. The AMRI Focus Area also seeks to inform GEIS audience members of burden of MDROs by time, population, and location and on movement of AMR molecular markers worldwide. The AMRI Focus Area will use data generated from laboratory-based surveillance to develop customizable data dashboards that the GCCs and other stakeholders can access to inform FHP posture and clinical operations. Partners funded for surveillance of ESKAPE-E+ pathogens must share isolates with MRSN for confirmatory testing, advanced characterization, and genomic sequencing.

TRAUMA RELATED INFECTION SURVEILLANCE

Stakeholders across the GCCs continue to have interest in expanding surveillance of trauma system practices and trauma-related MDRO infections. As a globally positioned fighting force, the U.S. Military is at increased risk for exposure to MDRO infections that often occur following battlefield injury. (9) (10) Wounds and trauma-related combat injuries are at high risk for infection with MDROs, which further complicate health outcomes. (11) (12) The AMRI Focus Area maintains support for this surveillance category with two main considerations: 1) Given that most wound and trauma infections are derived not only from the point of injury, but rather, through seeding from environmental, skin, or nosocomial routes, surveillance of environmental reservoirs is necessary for understanding routes of transmission. Projects surveilling aggregate source pathways (e.g., water, soil, food, etc.) are strongly encouraged under this surveillance category; 2) There remains a place for direct human subject study involving patient enrollment projects that focus on sampling from the wound site itself. However, these projects alone are insufficient to fully describe the range of pathogens associated with infections via wound and trauma mechanisms. These projects are additionally difficult to connect to FHP relevant context for many GEIS partners, so strong FHP justification will be required. In both cases, partners funded for surveillance of ESKAPE-E+ pathogens must share isolates with MRSN for confirmatory testing, advanced characterization, and genomic

sequencing. This will further augment understanding of MDRO burden and movement of AMR molecular markers worldwide.

MILITARY HEALTH SYSTEM SURVEILLANCE

The AMRI Focus Area will continue to support initiatives as directed in the CARB National Action Plan. (2) The WRAIR MRSN should continue to provide MDRO surveillance and outbreak support in the MHS. The EDC should continue to improve access to information on susceptibility trends, antibiograms, and antibiotic stewardship tools to inform optimal health decisions. The PVC should continue to provide antimicrobial resistance patterns to DHA leadership and MTFs within the Markets, Small Markets and Stand-Alone Medical Treatment Facility Organizations, and Defense Health Agency Regions. Combined, the MRSN, EDC, and PVC should continue to seek ways to unify data on MDROs and antimicrobial utilization across their programs to provide valuable, comprehensive, and usable information in the MHS. For example, one goal should seek to link together MDRO genomic information (e.g., lineages, resistance genes, timing of resistance gene development within clinical course) with clinical data (e.g., antibiotic course, patient outcome, patient risk factors) and larger epidemiologic information (e.g., MTF antibiotic use patterns, antibiograms) in a meaningful way.

CATEGORY #2: *NEISSERIA GONORRHOEAE* AND *MYCOPLASMA GENITALIUM* STI SURVEILLANCE

The AMRI Focus Area will support surveillance for both *N. gonorrhoeae* and *M. genitalium* in high-risk, symptomatic populations. These two pathogens are prioritized due to their ability to evade current antibiotic therapies. (13) Gonococcal (GC) strains with reduced susceptibility to third generation cephalosporins continue to emerge and spread, presenting an increasing threat of untreatable gonorrhea. Given the demographics of the U.S. Military population (e.g., globally positioned, young, sexually active men and women), the risks of acquiring a difficult to treat STI are higher than that of the general U.S. population. (14) (15) Additionally, the MHS routinely uses molecular methods for GC diagnostics and does not culture GC as part of clinical care; therefore, urethritis is often treated empirically. Reduced culture capabilities in the MHS diminishes the ability to track resistance trends among Service members and beneficiaries. Furthermore, MG is not currently considered a reportable medical event, therefore, the burden of this pathogen is not well understood in the U.S. or globally. The USU GC Reference Laboratory & Repository serves as the primary reachback support for characterizing resistance patterns of NG and MG isolates. This is a long-standing partnership and capability in the GEIS Network. Partners funded for surveillance of NG and MG should share isolates with USU for confirmatory testing and advanced characterization, thereby adding to our understanding of the distribution and transmission of resistance, and contributing to a global repository of isolates for future research studies. This further supports the AMRI Focus Area priority of informing GEIS audience members of MDRO burden by time, population, and location and on movement of AMR molecular markers worldwide.

CATEGORY #3: ACUTE GASTROENTERITIS (AGE) AND ACUTE DIARRHEA (AD) SURVEILLANCE

TRAVELERS' DIARRHEA SURVEILLANCE

Enteric pathogens represent an FHP threat to the U.S. Military due to their potential to cause outbreaks, negative impacts on force readiness via lost duty days, and decreased performance. (16) (17) Travelers' diarrhea remains a high-priority concern for U.S. Service members overseas. (18) Viruses such as norovirus and rotavirus remain notable causes of enteric infection outbreaks both in the U.S. and OCONUS. However, the majority of OCONUS travelers' diarrhea is caused by bacterial pathogens, most commonly enterotoxigenic *Escherichia coli*, *Campylobacter jejuni*, *Shigella* spp., and *Salmonella* spp. The potential for antimicrobial resistance among enteric pathogens is of increasing importance and projects in this category are encouraged to include antimicrobial susceptibility testing in their study design. GEIS-PLs participating in the Global Travelers' Diarrhea (GTD) Study should seek to

increase their sample size numbers and coordinate with NHRC for advanced characterization and whole genome sequencing of bacterial isolates.

NON-GTD SURVEILLANCE

As a globally positioned force, the U.S. Military is at increased risk for colonization and infection with enteric pathogens beyond the enrollment criteria and case definitions of the GTD Study. There is a need to characterize prevailing circulating enteric pathogens in areas of operational importance to include pathogen type, virulence factors, and antimicrobial resistance. Projects investigating AGE and AD in overseas locations should focus enrollments on U.S. Military, U.S. Civilians, and other expatriate populations not fitting the GTD case definition first, then local national foreign military personnel to maximize FHP relevance. Surveillance for enteric pathogens among overseas local civilian populations will still be considered, but they will require strong justifications and descriptions of their FHP relevance or antimicrobial resistance threat. GEIS-PLs coordinating projects in this area should coordinate with NHRC for advanced characterization and whole genome sequencing of bacterial isolates.

FEBRILE AND VECTOR-BORNE INFECTIONS (FVBI)

Vector-borne and febrile zoonotic pathogens historically have had a significant impact on U.S. military operations and are expected to not only continue, but to worsen into the future due to rapid landscape disruption and climate change. The threat of vector-borne and zoonotic pathogens is increased by the limited diagnostic and treatment options available to providers in the austere and unstable environments typical of military operations. Vector-borne and zoonotic pathogens are often associated with undifferentiated febrile illness and thus are difficult to distinguish clinically, adding urgency to overcoming challenges in diagnosis and control. Timely and accurate surveillance can help inform solutions to these challenges. Surveillance efforts within the FVBI portfolio are intended to provide timely, accurate, and actionable data for DOD decision-makers and the global public health community to reduce risk for disease. The FVBI Focus Area supports efforts across the GCCs that increase the knowledge surrounding priority syndromes and pathogens.

The FVBI Focus Area **END STATE** is to increase FVBI surveillance coverage through an integrated and collaborative GEIS-N to provide relevant information that will inform FHP posture across the GCCs, improve awareness and understanding of emerging diseases and countermeasure effectiveness, enhance detection and diagnosis of FVBI pathogens, and, ultimately, protect the health/readiness of the Joint Force.

SURVEILLANCE ACTIVITIES

There are three main surveillance categories for the FVBI Focus Area: vector, malaria countermeasure effectiveness, and acute febrile illness (AFI) surveillance. The FVBI Focus Area currently recommends that GEIS partners consider the following guidance when developing proposals for pilot or provisional efforts and when updating extension proposals to align with current priorities. This is not an exhaustive list, so the GEIS-PO will also accept and consider proposals for topics not listed here.

CATEGORY #1: VECTOR SURVEILLANCE

The FVBI Focus Area continues to emphasize the need for surveillance of arthropod-borne pathogens, vectors, and reservoir hosts of FHP-relevant infections, particularly in DOD priority locations with changing or little-known vector-borne infection risks. Target locations and sampling strategies must be carefully selected to maximize knowledge of hidden or emergent hazards. Successful proposals expressly define these parameters, justifying choices and aims to fill surveillance gaps, maximize return on investment, and increase battlefield awareness.

Proposals should seek to identify known and emerging pathogens **of human consequence** in arthropod vectors, with emphasis on viruses, bacteria, and parasites prioritized by the military infectious disease Research & Development community (see Military Infectious Disease Research Program's Threat Prioritization List).

Furthermore, proposals should focus on **timely** (within the past three-year period) interrogation of specimens and samples to monitor pathogen exposure and other emergent risks to human health. To better support a cross-domain One Health framework, proposals should integrate vector surveillance activities in projects or regions concurrent with human and/or animal surveillance to increase FHP value. To continue to stay on the leading edge, proposals should: 1) utilize high complexity technologies and automated vector identification in appropriate surveillance settings to speed time to findings; and 2) develop new or improved risk tools and/or models at local or regional levels to better inform FHP decision-makers.

INSECTICIDE RESISTANCE SURVEILLANCE

Pyrethroid-treated uniforms remain the first line of defense in vector-borne disease prevention, secondary to insecticide treated nets and topical insect repellents. However, many mosquitoes in OCONUS areas have adapted at least partial resistance to pyrethroids—including permethrin—and jeopardized the effectiveness of current FHP prevention strategies. The increase in **acaricide** and **insecticide resistance (IR)** prompted a shift in surveillance projects from solely pathogen surveillance to also integrated surveillance that assesses IR status and distribution of resistant mosquito and tick species.

The FVBI Focus Area therefore **encourages insecticide resistance surveillance proposals that**: 1) assess IR in urban and peri-urban settings; 2) close IR knowledge gaps and provide local guidance, especially in support of military exercises; 3) conduct field and laboratory IR testing in medically important vectors; and 4) support assessments at installations near where U.S. military Service members are operating.

CATEGORY #2: MALARIA COUNTERMEASURES EFFECTIVENESS SURVEILLANCE

The U.S. military relies on rapid diagnostic tests (RDT) to definitively diagnose malaria cases in forward-deployed settings, as they do not require extensive training or cumbersome equipment. The only RDT approved by the U.S. Food and Drug Administration and available for use by U.S. military personnel is the BinaxNOW® malaria test (Abbott), which relies on the detection of the *Plasmodium falciparum* histidine-rich protein (PfHRP). Understanding the geographic distribution and prevalence of *pfhrp2/3* mutants is highly important, as it will better characterize the accuracy of RDTs used by the U.S. military and permit data-driven decisions on the use of RDTs at the provider level. (19)

As antimalarial resistance is on the rise, the FVBI Focus Area will also continue to fund mapping of *Plasmodium* spp. antimalarial resistance of DOD-approved chemoprophylaxis to inform FHP measures worldwide, while taking care to avoid overlap and duplication with other surveillance and funding programs, particularly within the USG.

Proposals covering malaria topics should seek to assess molecular, *in vitro*, and *ex vivo* antimalarial resistance testing on DOD-relevant antimalarial drugs (see HA-Policy 13-002 in the Appendix) already authorized or under investigation for use by Service members. The FVBI Focus Area will also prioritize proposals that have adopted **standardized malaria reporting criteria** and/or templates that will help inform FHP posture consistently across relevant GCCs. For example, efficacy studies should follow closely the WHO-published methodology. Molecular marker studies should focus on those related to resistance of DOD-relevant antimalarial drugs already authorized or under investigation for use by Service members, including:

- *pfcrt* K76T, K76N, K76I
- *pfmdr1* N86Y, increased copy number
- *pfk13* C580Y, R539T, I543T, F446L, N458Y, P547L, R561H, Y493H
- *pfatp6* A623E, S769N
- *pfcytb* Y268S/C/N

Proposals for malaria surveillance focusing on *Plasmodium falciparum* histidine-rich protein (*pfhrp2/3*) gene deletions should follow WHO methodology to ensure regional cohesion of projects. Proposals should seek to: 1) Measure the prevalence of suspected false-negative HRP2 RDT results among symptomatic patients at health clinics with *P. falciparum* infection detected by microscopy or a *pf*-Plasmodium lactate dehydrogenase (pLDH) RDT; 2) Detect the parasite density and frequency of *pfhrp2/3* gene deletions in the above cohort; 3) Determine the predictive value of false-negative HRP2 RDT results for *pfhrp2/3* gene

deletions in different settings; 4) Identify provinces in which the prevalence of *pfhrp2/3* gene deletions causing false negative PfHRP2/3 RDTs is at or above 5%, warranting a change in RDTs; and 5) Assess malaria incidence, prophylaxis use and compliance among DOD personnel.

The GEIS-N continues to refine its niche within USG-led malaria efforts. To further maximize the value of limited funding for DOD infectious disease surveillance, the FVBI Focus Area will prioritize efforts to detect emerging risks that threaten the effectiveness of DOD-authorized diagnostics and treatment methods for malaria. Conversely, the FVBI Focus Area will ***reduce or eliminate*** malaria surveillance proposals that focus on: population-based surveillance, risk factor and epidemiology studies; therapeutic efficacy trials, presence/absence-only studies of malaria vectors and parasites, capacity building and host-country training, including standalone microscopy capability.

CATEGORY #3: ACUTE FEBRILE ILLNESS SURVEILLANCE

The main objective of AFI surveillance is to detect and characterize pathogens associated with undifferentiated AFI and to determine the symptom or clinical profiles of those pathogens to improve assessment of acute febrile illness risk to U.S. Service members. Understanding the etiologies of AFI in a region can guide diagnostics and military treatment facility case management, to minimize lost duty days and help identify gaps in surveillance systems, laboratory capacity, and FHP measures. The GEIS-PO encourages proposals which seek to utilize standardized study design methodologies and data elements. Such standardization can facilitate creation of more comprehensive surveillance products and region-specific analyses.

A targeted element of AFI surveillance is the detection of potentially new pathogens—that is, identifying previously unknown etiologies associated with human illness. Conducting single-pathogen focused studies has historically led to an excess of negative sample results, thus limiting evidence/data for actionable purposes. Alternatively, projects that cast a large, multiplexed net to screen for numerous pathogens often fail to clearly show relevance for FHP. Despite the large number of assays utilized to screen samples from AFI patients for specific pathogens, no pathogen is identified in 50% or more of those instances.

Therefore, the GEIS-PO encourages AFI surveillance proposals that: 1) identify and target surveillance populations identified by GCCs as high priority (e.g., allied partner militaries); 2) produce pathogen identification and genetic characterization information in a timely manner; 3) utilize resource-efficient workflows and high-throughput screening methods; 4) apply advanced characterization to high priority samples (e.g., collected in the last three years, collected from high priority countries, etc.) with already-identified pathogens; and 5) leverage metagenomic sequencing using NGS technologies for pathogen discovery and to assay for markers or genes of resistance.

RESPIRATORY INFECTIONS (RI)

Historically, military populations have been at high risk for acute respiratory infections, especially among recruits and deployed personnel. The living conditions under which U.S. military members operate are frequently austere, crowded, and stressful, which makes these individuals particularly vulnerable to infection and transmission of respiratory pathogens compared to civilian populations. (20) Viral respiratory pathogens are highly transmissible, can mutate frequently (e.g., influenza and coronaviruses), and have 'spilled over' from animal to human populations in the past. This suggests that there is a true risk of the emergence of a novel respiratory pathogen and/or variants of circulating pathogens with pandemic potential. The RI Focus Area is designed to inform FHP decision making across the GCCs and enhance global health security by coordinating global surveillance networks that promote rapid detection of respiratory infections, particularly those with pandemic potential, thus enabling action to limit disease spread and maintain readiness of military members.

Based on this context, the RI Focus Area **END STATE** is increased global respiratory surveillance capacity through an integrated and collaborative GEIS laboratory network conducting surveillance across human and animal populations, ultimately to improve the health and readiness of U.S. Forces through the prevention, mitigation, and control of the transmission of respiratory pathogens.

SURVEILLANCE ACTIVITIES

The RI Focus Area requires that funded activities report standardized data using the data collection form provided by the GEIS-PO. The RI Focus Area also promotes genomic data sharing among GEIS-PLs, as sharing data is essential to facilitate the translation of results into knowledge, products, and procedures that improve FHP. Investigators should continue submitting data to widely used repositories (e.g., GenBank/GISAID). Partner laboratories should share genome repository accession number(s) with DCPH-Dayton for all human influenza samples sequenced.

CATEGORY #1: HUMAN RESPIRATORY SURVEILLANCE

The RI Focus Areas seeks to prioritize collection of respiratory surveillance data that can influence empiric treatment selection and inform prevention and mitigation efforts related to disease transmission and infection. The RI Focus Area will therefore continue to support year-round surveillance and genetic sequencing of known and unknown respiratory pathogens, vaccine effectiveness studies, and studies designed to examine potential shift and drift within influenza subtypes that might be associated with increased severity and/or transmission of respiratory infections. We aim to estimate the incidence/prevalence of influenza-like illness and severe acute respiratory infections, identify geographic or temporal distribution, calculate the effectiveness of vaccines or therapeutics, and identify risk factors associated with military relevant respiratory pathogens such as influenza, coronaviruses, adenoviruses, enteroviruses, rhinoviruses, and RSV. Influenza and SARS-CoV-2 sequencing are especially of interest in Service members and recruit populations where risk of respiratory disease is high, including shipboard settings and training centers. Projects that direct surveillance efforts in smaller sub- populations of Service members such as recruits, cadets, medical officers, shipboard units, and pre- and post-deployment units, are of interest. These are of special interest regarding outbreak investigations as well, as they offer a unique 'closed' population in which preventive and mitigation efforts can be evaluated.

Surveillance of influenza and coronaviruses are key priorities due to the potential for severe disease and widespread transmission, which poses a threat to FHP. Due to the nature of respiratory pathogens, these may change over time and new priority pathogens may be added. While routine surveillance in many projects includes influenza testing, surveilling for novel or emerging variants of influenza is of interest given the potential for severe disease and high transmissibility observed in past influenza pandemics. Sequencing of influenza samples directly informs the DOD phylogenetic analysis for the Vaccines and Related Biological Products Advisory Committee's (VRBPAC's) annual influenza vaccine strain-selection meeting. The RI Focus Area will support proposals that utilize WGS or targeted deep sequencing approaches for advanced characterization of influenza samples, as appropriate. Partners should share genome repository accession number(s) with the central coordination laboratory and DOD Global Respiratory Pathogen Surveillance Program leads at Defense Centers for Public Health – Dayton (DCPH-D) (formerly known as USAFSAM). Considering the severity and impact of the recent human coronavirus, SARS-CoV-2, pandemic, proposals that focus on testing for and further characterizing human coronaviruses (including seasonal coronaviruses) are a priority in the RI portfolio.

CATEGORY #2: ANIMAL INFLUENZA SURVEILLANCE

The RI Focus Area encourages alignment of animal influenza surveillance with the GEIS Strategic Plan One Health framework. Given the dynamic nature of how influenza viruses move through populations of animals, whether seasonally or in their acquisition of new genes, the threat of pandemic influenza continually poses a threat to human and animal health. The data from animal-focused surveillance activities can act as an early-warning for respiratory outbreaks or to identify novel pathogens with the potential to spill-over into humans, which is a potential threat to FHP. Expansion of One Health activities should include testing new domains, new animal populations, and/or environmental sampling in new relevant locations of FHP interest. The RI Focus Area prioritizes the characterization of domestic and/or wildlife reservoirs and risk factors for respiratory

infection within the human-animal interface in areas where this is not well-characterized. Proposals should also apply techniques and methods for characterizing One Health relationships among human-animal-environmental interfaces. While the primary pathogen of interest in this category is influenza, projects that examine other respiratory pathogens within this population (i.e., SARS-CoV-2 circulating in mink) are also of interest if the FHP relevance can be clearly articulated. Animal hosts of interest include (but are not limited to): swine, poultry (chicken, turkey), waterfowl, migratory birds, and bats. Environmental elements of interest include (but are not limited to): farms (free-range, indoor), migratory settings, semi-enclosed settings, residential settings, and open-air markets. While many of the OCONUS DOD Service laboratories that conduct animal surveillance, perform their testing onsite, the RI Focus Area requires respiratory samples (particularly influenza) be further characterized/typed. In other words, positive and negative test results alone are not sufficient to be able to judge the level of risk it might pose to FHP. The RI Focus Area recommends partnering with a GEIS-funded reach back laboratory to do this and to ensure results are reported back to GEIS-PO.

CORE METRICS AND KEY PERFORMANCE INDICATORS

To ensure that all components of the GEIS-N are properly resourced to implement and execute the program objectives, the GEIS-PO has established core metrics, including a set of Key Performance Indicators (KPIs) (as defined in **Table 4**). The core metrics and KPIs will be reviewed annually for appropriateness and relevance and updated or replaced as necessary.

TABLE 4. GEIS Core Metrics & Key Performance Indicators to be used to assess for program evaluation

OBJECTIVE 1: Provide **PROGRAM MANAGEMENT** for the GEIS Network of Laboratory Partners

TYPE	MEASURE
Core Metric	The annual GEIS Business Cycle and key strategic guidance documents are evaluated and updated by the 1st and 2nd quarter, respectively, each fiscal year
Core Metric	The GEIS Annual Request for Proposals (RFP) and funding recommendations for the fiscal years' surveillance portfolio are completed by the 3rd and 4th quarter, respectively, each fiscal year
Core Metric	A program evaluation framework is reviewed and updated for appropriateness and relevance annually
Core Metric	An analysis and summary of the quality of surveillance and programmatic reporting including minimum required variables, data points, and FHP context as applicable by the 4th quarter of each fiscal year.
Core Metric	An analysis and summary of compliance of Data-to-Decision reporting is conducted and disseminated to GEIS-PLs by the 4th quarter of each fiscal year
KPI	100% of the expected GEIS annual budget is earmarked for infectious disease surveillance and supporting activities by Q1 of each fiscal year
KPI	100% of GEIS-directed DHP O&M funds are obligated by 30 September each fiscal year
KPI	100% of financial, programmatic, and surveillance data reports from GEIS partners are submitted within 10 business days of the designated suspense and follow reporting guidelines.
KPI	<10% of GEIS-funded projects addressing high priority pathogens and/or countries are limited or fully reduced due to funding cuts or constraints

OBJECTIVE 2: Conduct **SURVEILLANCE** for Militarily-Relevant Pathogens in Support of GCC Priorities to Inform Force Health Protection

TYPE	MEASURE
Core Metric	A network-wide laboratory capabilities survey is updated and disseminated to the GEIS-N each year to ensure GEIS-PLs are staying on the leading edge in terms of appropriate disease surveillance technologies and/or methodologies
Core Metric	The GEIS NGSBC and other reach back partners assess capabilities of GEIS-PLs through proficiency testing to ensure the laboratories remain on the leading edge in terms of capabilities and instrumentation
KPI	80% of GEIS-funded project have implemented a data quality assurance plan
KPI	100% of GEIS-funded surveillance projects aligned with at least one priority pathogen OR country for the targeted GCC(s)
KPI	60% or more of GEIS-funded surveillance projects meet quarterly milestones
KPI	70% or more of GEIS-funded surveillance projects report new data and surveillance findings each month through the Data-to-Decision Initiative

OBJECTIVE 3: Develop and Disseminate Surveillance **PRODUCTS** to Stakeholders that Provide Early Warning of Emerging Threats

TYPE	MEASURE
Core Metric	Comprehensive surveillance reports (e.g., Monthly Surveillance Reports and Focus Area-Specific Reports) for relevant diseases and/or pathogens of FHP interest are prepared and disseminated weekly, monthly, quarterly and/or annually, as appropriate to relevant GEIS audience members
Core Metric	An online interface (e.g., CarePoint) for the GEIS-N and audience members is maintained and updated with surveillance products, data visualizations/dashboards, and molecular and immunological assays for relevant diseases and/or pathogens of FHP interest weekly, monthly, quarterly, and annually, as appropriate
Core Metric	Routine engagements with GEIS audience members (e.g., biennial GEIS-GCC Coordination meetings) are conducted to ensure GEIS products are meeting the needs of end users
KPI	100% of new data and surveillance findings are reviewed by the GEIS-PO each month and synthesized into products for GEIS audience members at regularly recurring intervals
KPI	100% of submitted “SPOT reports” determined to be of high or moderate threat are disseminated within 24 hours to 7 days, respectively, to relevant GEIS audience members

CONCLUSION

This Strategic Plan provides a framework for the next three to five years to guide GEIS-PL surveillance activities around the globe. It will be reviewed annually to ensure that it remains relevant to the challenges of the future security environment and serves to guide focused and actionable infectious disease surveillance and outbreak response activities that support DOD decision-makers globally.

APPENDIX 1: GEIS PARTNERS AND COLLABORATORS

GEIS PARTNER LABORATORIES	LOCATION
18th Operational Medical Readiness Squadron	Kadena Air Base, Japan
65th Medical Brigade	Camp Humphreys, South Korea
Armed Forces Research Institute of Medical Sciences	Bangkok, Thailand
Defense Centers for Public Health – Dayton	Dayton, OH, United States
Defense Centers for Public Health – Portsmouth	Portsmouth, VA, United States
Landstuhl Regional Medical Center	Landstuhl, Germany
Naval Medical Research Unit No. 2	Singapore
Naval Medical Research Unit No. 3	Sigonella, Italy
Naval Medical Research Unit No. 3 – Ghana Detachment	Accra, Ghana
Naval Medical Research Unit No. 6	Lima, Peru
Navy Entomology Center of Excellence	Jacksonville, FL, United States
Naval Health Research Center	San Diego, CA, United States
Naval Medical Research Command	Silver Spring, MD, United States
Pharmacovigilance Center	Falls Church, VA, United States
Public Health Command – Pacific	Honolulu, HI, United States
Tripler Army Medical Center	Honolulu, HI, United States
U.S. Army Medical Research Directorate – Africa	Nairobi, Kenya
U.S. Army Medical Research Directorate – Georgia	Tbilisi, Republic of Georgia
U.S. Army Medical Research Institute of Infectious Diseases	Frederick, MD, United States
Uniformed Services University of the Health Sciences	Bethesda, MD, United States
Walter Reed Army Institute of Research	Silver Spring, MD, United States
OTHER DOD COLLABORATORS	**LOCATION**
Center for Global Health Engagement	Rockville, MD, United States
Defense Threat Reduction Agency Biological Threat Reduction Program	Fort Belvoir, VA, United States
Infectious Diseases Clinical Research Program	Rockville, MD, United States
Military Infectious Disease Research Program	Frederick, MD, United States
Navy Environmental Preventive Medicine Unit No. 2	Portsmouth, VA, United States
Navy Environmental Preventive Medicine Unit No. 5	San Diego, CA, United States
U.S. GOVERNMENT INTERAGENCY COLLABORATORS	**LOCATION**
Centers for Disease Control and Prevention	Atlanta, GA, United States
Food and Drug Administration	Silver Spring, MD, United States

APPENDIX 2: DESCRIPTION OF GEIS AUDIENCE MEMBERS

GEIS AUDIENCE MEMBER	DESCRIPTION OF ROLE
Force Health Protection Officers (GCCs and Service components)	FHP Officers at both the GCC and Service component levels are responsible for maintaining situational awareness of pathogens in the area of responsibility (AOR) and provide key information to Command and Service component leadership for the development and implementation of FHP policy and other actions to protect Service members in the AOR. FHP Officers play a significant role in shaping FHP Guidance on a regular basis, and are informed by cumulative knowledge gained about infectious pathogens circulating in the AOR. They are frequently tasked with responding to Requests for Information on infectious disease threats in their AOR. In general, Service component FHP Officers make more situationally specific, actionable recommendations around prevention than GCC FHP Officers, as they are often work more closely with deployed units in theater through collaboration with Preventive Medicine Clinicians and specialists. As such, FHP Officers at the GCC and Service component levels are primarily interested in GEIS-N surveillance findings that inform FHP policy and preventive measures, such as the use of vaccines, personal protective equipment, and other countermeasures, as well as the failure of existing measures to prevent infection
Command Surgeons & Staff	The Command Surgeon serves as the senior medical advisor to the combatant commander, and the Office of the Command Surgeon (including the staff) oversees military medical operations across the AOR, providing policy guidance to the component surgeons representing the Services in the AOR. The broad vision of the Command Surgeon and their staff is to sustain the health of the Forces, support operations, strengthen partner-nation military medicine capabilities, and shape medical stability operations through partnership building. The Command Surgeons and staff may use the GEIS-N surveillance findings as a resource to maintain battlespace awareness around syndromes, pathogens, and vectors in the AOR, provide input to FHP Guidance documents to prevent infections in the AOR and to inform military-military medical and global health engagements
Joint Staff Surgeon	The Joint Staff Surgeon is the senior medical leader in the Joint Force, serving as the principal medical advisor to the Chairman of the Joint Chiefs of Staff. This individual is "responsible for ensuring that the Joint Force is medically ready to deploy and medically sustained in a deployed environment." Responsibilities include coordinating health service support and FHP capabilities and deployment health surveillance. The Joint Staff Surgeon may use GEIS-N findings as a resource to provide input to FHP Guidance documents and other preventive guidance across the services, as well as to maintain awareness of when and where more targeted surveillance may be needed for specific pathogens
Medical Operations/ Evacuation Planners	Medical Operations and Evacuation Planners are responsible for developing medical plans; ensuring appropriate health care is provided for designated civilians, multinational military personnel, and detainees; developing mass casualty treatment and evacuation plans, and coordinating layered medical communications among component medical units, among other tasks. GEIS-N surveillance findings can inform planners of pathogen threats in the AOR, which may impact medical and evacuation planning, such as Service member and patient movement into, out of, and around an AOR
Medical Logisticians	The primary role of medical logisticians is to "promote standardized medical equipment, joint interoperability of operational medical capabilities, and efficiency in the acquisition and lifecycle management of medical material." GEIS-N surveillance findings may inform the need for specific medical supplies, such as vaccines, personal protective equipment, treatment, and other countermeasures in an area where Service members may be at higher risk of infection
Operational Medical Providers	Operational Medical Providers are primarily responsible for the care and treatment of military personnel in the deployed setting. These individuals may benefit from GEIS-N surveillance findings that provide situation awareness of the pathogens that are present in their AOR and that can inform them on the proper diagnosis and treatment of infectious diseases they may see in their patient population
MTF Medical Providers	Military hospitals and clinics are the core of the Military Health System, providing direct care to Service members and other beneficiaries. MTF Medical Providers must maintain awareness of infectious disease threats to the patients treated at their MTF, to include those that have deployed or traveled internationally. GEIS-N surveillance findings can inform these providers on the proper diagnosis and treatment of infectious diseases they may see in their patient population

GEIS AUDIENCE MEMBER	DESCRIPTION OF ROLE
Preventive Medicine Physicians	Preventive medicine physicians specialize in promoting health, preventing disease, and managing the health of communities and defined populations by combining population-based public health skills with the knowledge of primary, secondary, and tertiary prevention-oriented clinical practice. In general, Preventive Medicine physicians provide technical consultation on public health issues when units are deployed in theater and can offer general subject matter expertise when in garrison. Among a variety of required responsibilities when deployed in theater, a Preventive Medicine physician may be responsible for the analysis of epidemiologic interactions between pathogens, their reservoirs, and hosts in different settings. Preventive Medicine physicians benefit from detailed, specific GEIS-N surveillance findings that enable them to better understand epidemiologic interactions and then make scientifically informed recommendations around preventive and treatment measures
Infectious Disease Physicians	Infectious disease physicians provide medical care in the deployed setting, as well as CONUS MTFs where they are often involved in the treatment of patients that present with diseases acquired while traveling internationally. Infectious disease physicians are also assigned to DOD research facilities, where many of them have served as PIs on GEIS-funded activities. They rely on a variety of resources to treat infections, such as the Clinical Practice Guidelines for combatant command trauma systems. While GEIS-N surveillance findings more frequently support recommendations around preventive measures, findings from specific projects (such as within the Antimicrobial Resistant Infections portfolio) may inform impacts on treatment measures, such as drug resistant and difficult-to-treat infections
Clinical Ancillary Services & Staff	This category includes non-physician/provider professionals in clinical settings, such as infection control nurses, technicians, and other hospital staff. Differing roles may use GEIS-N surveillance findings in varying ways. For example, an infection control nurse may use antibiogram data to inform infection control measures such as isolation and/or contact precautions, personal protective equipment, and sanitation
Service Laboratory Leadership	Commanding Officers and Executive Officers oversee operations at DOD Service laboratories where GEIS-funded surveillance projects and activities are executed. These individuals maintain awareness of the surveillance findings resulting from projects occurring in their laboratories as well as projects funded at other DOD laboratories. Maintaining awareness of surveillance findings resulting from their own laboratory as well as other laboratories may inform decisions around future surveillance activities and development of products that communicate surveillance findings
Global Health Engagement Specialists	DOD Global Health Engagement Specialists may reside within the Services or in other DOD policy offices, such as the Office of the Assistant Secretary of Defense. These specialists advise on global health matters such as policy, humanitarian assistance and disaster relief, health-related stability operations, health diplomacy, and health security threats. Maintaining awareness of where the GEIS-N is conducting surveillance and in-country partnerships (such as mil-mil engagements) can inform global health engagement planning and coordination
Public Health Professionals	There are a variety of roles within the DOD that comprise this category, including Preventive Medicine and Public Health Department medical providers (who might not receive formal training in preventive medicine), public health nurses and nurses that work in preventive medicine, environmental science officers, entomologists, and preventive medicine technicians. In general, these individuals are responsible for informing prevention, risk mitigation, and treatment measures, and would primarily benefit from GEIS-N surveillance findings to support the implementation of these measures
Veterinary Professionals	Veterinarians play a role in FHP through food protection and quality assurance, providing veterinary medical care to military working dogs and other government-owned animals, evaluating zoonotic disease threats, and advising on potential hazards to the Forces. As the GEIS-N conducts surveillance in these categories, findings may provide value to veterinary professionals, informing risk mitigation measures around food safety and zoonotic threats to the forces, including threats to working dogs and other forms of zoonotic transmission from local and wildlife animal populations to Service members

APPENDIX 3. GEIS NETWORK ROLES & RESPONSIBILITIES

Each element of the GEIS-N (e.g., GEIS-PO, GEIS-PLs, Scientific Review Board (SRB) members, DHA, OJSS/GCCs) is responsible for specific activities for strategy implementation and execution, but they should be aware of the expectations and roles of the other elements – for transparency, accountability, and coordination. The role each element has in GEIS Strategy Implementation Plan is as follows:

THE GEIS-PO is the central hub for operations of the GEIS-N; Program Office staff are essential in the coordination of all GEIS-N elements, processes, and resource allocation. For program implementation, the GEIS-PO is responsible for ensuring that strategic objectives are identified, supporting actions are implemented to achieve the objectives, and resources are in place to support the Strategic Plan. Specific responsibilities of the GEIS-PO for implementation include identifying and sharing the GEIS Strategic Plan for the rest of the GEIS-N; tracking the necessary resources and ensuring that they are identified and in place throughout the year, capturing and sharing GCC priorities, monitoring progress and performance, and identifying potential program or process improvements. The GEIS-PO compiles requirements for funding GEIS-PL surveillance projects, develops and disseminates critical FHP information, and maintains communications with stakeholders and subject matter experts. The GEIS-PO also collects, analyzes, and synthesizes infectious disease surveillance findings that are produced by GEIS-PLs, and reports the findings to stakeholders and decision-makers within the GEIS-N. The GEIS-PO is a critical link in execution, ensuring GCCs and other key decision-makers obtain relevant information to inform FHP decisions.

THE GEIS-PLS are DOD Service laboratories and other partners positioned at strategic locations within the GCCs that execute GEIS-funded infectious disease surveillance activities. For successful program implementation, GEIS-PLs should review GCC priorities and submit annual proposals in response to GEIS-N guidance documents, policies, and procedures and adhere to deadlines for reporting (SPOT, monthly, quarterly, annually) surveillance findings directly to the GCC and/or the GEIS-PO (product dependent). GEIS-PLs should build and enhance relationships with the GCCs and the host nation government, non-governmental organizations, and populations where surveillance is conducted. GEIS-PLs should coordinate activities through their internally identified GEIS Coordinators and reach out to the GEIS-PO regularly with updates, issues, or questions. The GEIS-PLs submit proposals to the GEIS-PO for ongoing projects and new surveillance activities on an annual basis. GEIS-PLs execute the surveillance projects and share critical infectious disease surveillance data with the GEIS-PO, profiling emerging and circulating infectious disease pathogens in their respective AOR to inform decision- and policymakers. This increases awareness of disease threats in the AOR and enables FHP planning for operational contingencies and exercises. The GEIS-PLs are crucial to program execution since the information they provide enhances FHP situational awareness in their respective GCC regions.

GEIS SCIENTIFIC REVIEW BOARD members support the GEIS-PO Focus Areas with representatives from GEIS-PLs and collaborating interagency organizations. The SRB members provide subject matter expertise to Focus Areas to ensure scientific feasibility and relevance, methodological soundness, and optimal return on investment of GEIS-funded projects. For program implementation, the SRB members should confirm interest and availability to serve in this role, understand roles and responsibilities for the annual proposal review cycle, and be familiar with the GEIS program and GCC priorities. The expert advice and recommendations that the SRB members provide helps to guide GEIS-funded infectious disease surveillance projects and facilitates meeting the GEIS purpose. Therefore, the Focus Area SRB contributions to the GEIS-N are crucial to program execution, as they help ensure that GEIS is funding infectious disease surveillance that is sound, and capable of producing desired, relevant data.

THE OFFICE OF THE JOINT STAFF SURGEON/GCC provides surveillance priorities (countries/locations and pathogens) from the Surgeon's cell for each GCC. This input is essential for directing the GEIS program and is a key consideration for the GEIS-PO funding decisions. For program implementation, the GCCs should provide the GEIS-PO with priorities, review the resulting GEIS-GCC Alignment Documents, and provide GEIS-PO with feedback on the submitted proposals from the GEIS-PLs. This review ensures that GCC theatre priorities are accurately reflected and addressed by the GEIS-N. This is crucial to program execution, since the GEIS-PLs

use the GEIS strategy documents along with other relevant information as guidance for focusing on regional surveillance activities.

DEFENSE HEALTH AGENCY COMPONENTS (OGC, RM, IHD, J9) ensure that GEIS-funded surveillance projects are in accordance with fiscal legal policies and guidelines and are not redundant with other work that receives DHA funds. For program implementation, GEIS-PLs need to have clear and shared understanding of what types of projects can be funded and need to know how the GEIS program DHP O&M funding is tracked throughout the year. The DHA Components provide the GEIS-PO with input and concurrence on funding determinations during the review of annual proposals.

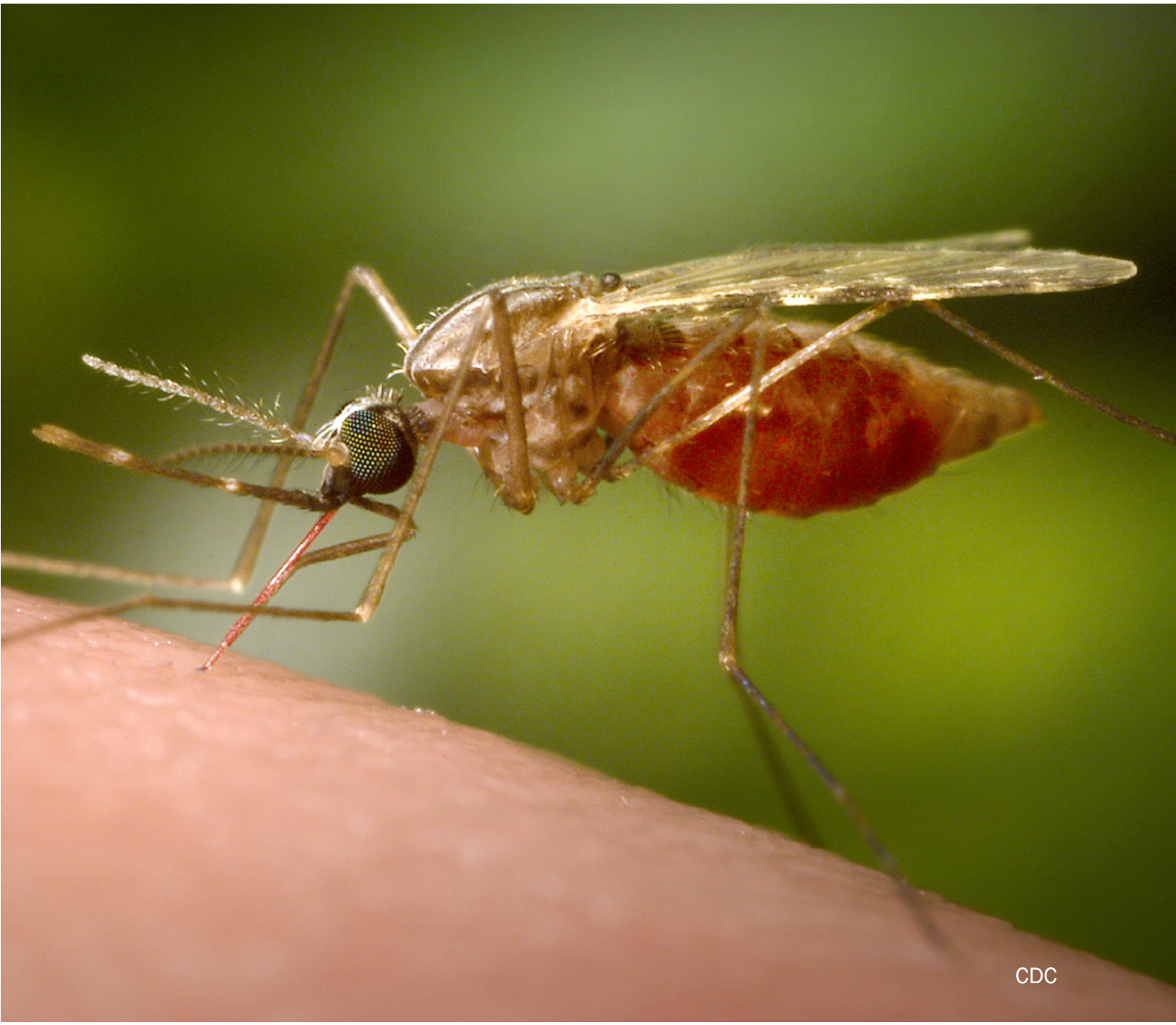
APPENDIX 4: SUPPORTING LABORATORIES

The following tables provide key information to find and request reach back support for projects in the GEIS portfolio.

LABORATORY	SUPPORT AVAILABLE
Naval Health Research Center (**NHRC**)	Bacterial sequencing support for enteric pathogens
Naval Medical Research Command (**NMRC**) Infectious Diseases Directorate	Rickettsial diseases surveillance support; proficiency testing
NMRC Biological Defense Research Directorate (**BDRD**)	Pathogen sequencing and advanced characterization, pathogen discovery, training, assay development and supply
U.S. Air Force School of Aerospace Medicine (**USAFSAM**)	Primarily respiratory pathogen surveillance support including testing, sequencing and advanced characterization; assay and protocol development and reagent supply
Uniformed Services University (**USU**) Gonococcal Repository & Reference Laboratory (**GC-RRL**)	Confirmatory testing and advanced characterization of *N. gonorrhoeae* and *M. genitalium,* protocol evaluation, training, troubleshooting, and proficiency testing
U.S. Army Medical Research Institute of Infectious Diseases (**USAMRIID**) Center for Genomic Sciences (**CGS**)	Pathogen sequencing and advanced characterization, pathogen discovery, training, assay development and supply
U.S. Army Medical Research Institute of Infectious Diseases (**USAMRIID**) Diagnostic Systems Division (**DSD**)	Assay and protocol development; assay and reagent supply, training;
Walter Reed Army Institute of Research (**WRAIR**) Multi-drug Resistant Organism Repository and Surveillance Network (**MRSN**)	Bacterial sequencing, advanced characterization and training
Walter Reed Biosystematics Unit (**WRBU**)	Primarily vector surveillance support, including pathogen sequencing and advanced characterization, pathogen discovery, training, assay development and supply
WRAIR Viral Diseases Branch (**VDB**)	Viral pathogen sequencing and advanced characterization, pathogen discovery, training

AFFILIATED: *GEIS collaborators who may have other funding streams within and external to GEIS that can support aspects of GEIS-PL surveillance*

LABORATORY	SUPPORT AVAILABLE
US Department of Agriculture (**USDA**) Center for Medical, Agricultural, and Veterinary Entomology (**CMAVE**)	Provides consultation and testing capacity for insecticide resistance testing and protocol development.
Navy Entomology Center of Excellence (**NECE**)	Insecticide resistance and arbovirus surveillance
WRAIR One Health Branch (OH)	Educational resources and special consultation



ABBREVIATIONS AND GLOSSARY OF GEIS TERMS

ABBREVIATIONS

AOR: Area of Responsibility

18 OMRS: 18th Operational Medical Readiness Squadron

65 MED BDE: 65th Medical Brigade

AFHSD: Armed Forces Health Surveillance Division

BAACH: Brian Allgood Army Community Hospital

CDC: Centers for Disease Control and Prevention

CGHE: Center for Global Health Engagement

DCPH-D: Defense Centers for Public Health - Dayton

DCPH-P: Defense Centers for Public Health - Portsmouth

DHA: Defense Health Agency

DHA-IHD: Defense Health Agency Immunization Healthcare Division

DHP: Defense Health Program

DOD: Department of Defense

DoS: Department of State

DTRA BTRP: Defense Threat Reduction Agency Biological Threat Reduction Program

FDA: Food and Drug Administration

FHP: Force Health Protection

GCC: Geographic Combatant Command

GEIS: Global Emerging Infections Surveillance

GEIS-N: GEIS Network

GEIS-PLs: GEIS Partner Laboratories

GEIS-PO: GEIS Program Office

GHSA: Global Health Security Agenda

J9: DHA Research and Development Directorate

LRMC: Landstuhl Regional Medical Center

MHS: Military Health System

MIDRP: Military Infectious Disease Research Program

MTFs: Military Treatment Facilities

NAMRU-2: Naval Medical Research Unit – 2

NAMRU-3: Naval Medical Research Unit – 3

NAMRU-6: Naval Medical Research Unit – 6

NASA: National Aeronautics and Space Administration (NASA)

NATO: North Atlantic Treaty Organization

NCE: No Cost Extension

NECE: Navy Entomology Center of Excellence

NEPMU 2: Navy Environmental Preventive Medicine Unit – 2

NEPMU 5: Navy Environmental Preventive Medicine Unit – 5

NEPMU 7: Navy Environmental Preventive Medicine Unit - 7

NGSBC: Next-Generation Sequencing and Bioinformatics Consortium

NGS-BI: Next-Generation Sequencing and Bioinformatics

NHRC: Naval Health Research Center

NMRC: Naval Medical Research Command

NRL: Naval Research Laboratory

OGC: Office of General Counsel

O&M: Operations and Maintenance

OJSS: Office of the Joint Staff Surgeon

OSD: Office of the Secretary of Defense

PHD: Public Health Division

PVC: Pharmacovigilance Center

RFI: Request for Information

RM: Resource Management

ROI: Return on Investment

SOPs: Standard Operating Procedures

SRB: Scientific Review Board

TAMC: Tripler Army Medical Center

TCP: Theater Campaign Plan

US: United States

USDA: United States Department of Agriculture

USAFSAM: US Air Force School of Aerospace Medicine

USAMD-AFRIMS: US Army Medical Directorate-Armed Forces Research Institute of Medical Sciences

USAMRD-A: US Army Medical Research Directorate-Africa

USAMRD-G: US Army Medical Research Directorate-Georgia

USAMRIID: US Army Medical Research Institute of Infectious Diseases

USMA: US Military Academy (West Point)

USUHS: Uniformed Services University of the Health Sciences

WHO: World Health Organization

WRAIR: Walter Reed Army Institute of Research

GLOSSARY OF GEIS TERMS

DOD Service Laboratories: Partners who have a long-standing presence in their regions, sustained local partnerships, and the ability to execute long-term strategic activities in their areas of operation

Extension Proposal: Any active (e.g., previously funded) effort that addresses high-priority infectious disease concern(s) benefiting from regular, ongoing surveillance that the GEIS-PO intends to continue supporting

Focus Area Roadmap: Document that describes Focus Area (e.g., Enteric Infections) surveillance priority efforts for funding over a three-year time frame; reviewed annually and updated as necessary

Force Health Protection (FHP): Measures to promote, improve, or conserve the behavioral and physical well-being of DOD personnel to enable a healthy and fit force, prevent injury and illness, and protect the force from health hazards (see JP 4-02, *Joint Health Services*)

GEIS Audience Members: Includes DOD decision-makers, such as GCC and Service component FHP Officers, preventive medicine and infectious disease clinicians, public health professionals, and global health engagement specialists.

GEIS Business Cycle: An annual timeline for administrative, programmatic, and financial milestones completed by the GEIS-PO, GEIS-PLs and other network partners

GEIS Partner Laboratories (GEIS-PLs): Laboratories, programs, and agencies executing GEIS-funded work and/or regularly sharing data or information with the GEIS-N

GEIS Strategic Guidance Documents: A suite of documents provided each year in the annual RFP to describe strategic, surveillance and operational priorities and guide proposal submissions, including: the GEIS Strategic Plan and GEIS-GCC Alignment Documents

No Cost Extension: GEIS-funded projects that have not yet completed all scientific milestones within the fiscal year funding was received and that will require continued reporting into subsequent fiscal years

Pilot Proposal: Any new (e.g., has not received funding previously) activity that fills a current gap in surveillance or that represents novel, innovative approaches to surveillance that the GEIS-PO may consider funding long term

Provisional Proposal: Any new (e.g., has not received funding previously) activity with limited scope that is intended for a short time frame to answer specific surveillance questions indicated in the annual RFP

Request for Proposals (RFP): Document released by the GEIS-PO to solicit annual surveillance projects as competed or sustainment proposals

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