



Armed Forces Health Surveillance Center

Fiscal Year 2011 Report







Director's Letter

Friends and colleagues,

The Armed Forces Health Surveillance Center (AFHSC) has come a long way in just four short years, thanks to the dedicated efforts of our staff and the invaluable contributions from our customers, collaborators and partners! True synergy of health surveillance capabilities has developed due to the integration of our legacy organizations.

The public health and global surveillance assets in the Department of Defense enjoy greater coordination and visibility, providing decision-makers with actionable information to protect our men and women in uniform. Meeting the needs of force health protection and readiness is our goal; relevance to this goal should be asked with all of our engagements. AFHSC also cultivates global health security in its work with our international partners – benefitting not only our uniformed service members, but also other U.S. government and global communities.

The 2011 AFHSC Annual Report summarizes our history and the progress made on our many programs and initiatives. You will learn about our data collection process, development of analyses and reports, documentation of surveillance standards and key contributions to surveillance through the Global Emerging Infections Surveillance and Response System (GEIS). You will gain insight into our efforts to improve coordination with the combatant commands, provide epidemiological training, disseminate information through the website and foster peer-reviewed publications of research and analysis.

Despite our success, there is more work to be done. The standardization of surveillance definitions and practices will continue to evolve. It is critical that AFHSC continue to collaborate with and support our colleagues at the services' public health centers. We have heard the message from our combatant commands to improve production of integrated health products, raising their situational awareness in their respective areas of responsibility. We will strive to achieve our goals while observing carefully the necessary resource constraints on the entire federal government.

AFHSC presents this annual report with honor, and yes, some pride. I honor the staff with whom I have been privileged to work. I honor the services and external partners for their exceptional contributions in producing AFHSC products. I am proud of the products that our AFHSC staff and partners deliver.

Thank you for taking the time to read about the capabilities and accomplishments of the AFHSC. Hopefully, you will have a better appreciation for the diversity of our activities and products and for the breadth of our partner network.

Very Sincerely,
CAPT Kevin L. Russell,
Director
Medical Corps, U.S. Navy

Vision/Mission

Vision:

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

Mission:

Provide *timely, relevant, actionable, and comprehensive* health surveillance information in order to promote, maintain, and enhance the health of military and military-associated populations. AFHSC sets out to:

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

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The Basics of AFHSC



The History of AFHSC

The Deputy Secretary of Defense established the Armed Forces Health Surveillance Center (AFHSC) in February 2008 to be the central epidemiological health resource for the U.S. military. The Department of Defense (DoD) formed AFHSC by merging the capabilities and resources of the Army Medical Surveillance Activity (AMSA), the DoD Global Emerging Infections Surveillance and Response System (DoD-GEIS) and the Global Health Surveillance Activity of the Force Health Protection Directorate of the Office of the Assistant Secretary of Defense for Health Affairs.

AFHSC assumed responsibility for AMSA's Defense Medical Surveillance System (DMSS) and the DoD Serum Repository (DoDSR). As the central repository of medical surveillance data for the U.S. Armed Forces, DMSS contains up-to-date and historical data on diseases and medical events (e.g., hospitalizations, ambulatory visits, reportable medical events, laboratory tests, immunizations and casualty data) affecting service members throughout their military careers. DMSS contains over two billion data records on nine million service members and other beneficiaries of the Military Health System.

AFHSC publishes summaries of notifiable diseases, trends of illnesses of special interest and field



reports describing outbreaks and case occurrences in its Medical Surveillance Monthly Report (MSMR), a publicly available peer-reviewed publication for disseminating DoD medical surveillance information.

The DoDSR was developed in 1985 to store blood serum collected during the DoD testing program for HIV infections and was later designated to receive serum specimens collected before and after operational deployments. The DoDSR is the world's largest repository of its kind with over 54 million serial serum specimens from over 10 million individuals.

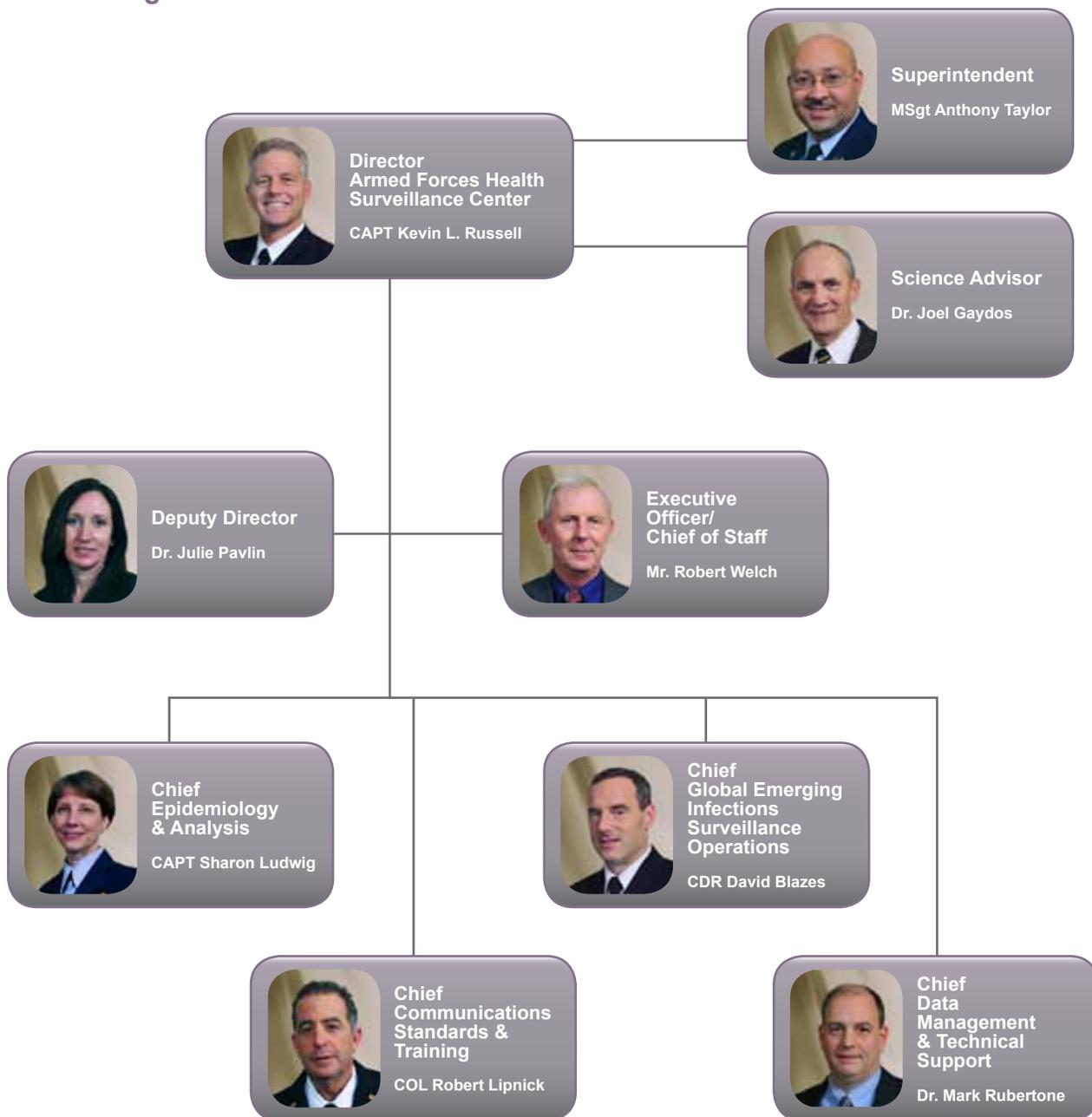
The AFHSC also serves a key role in biosurveillance, a rapidly growing scientific field that detects disease in people, plants and animals, to understand the threats from emerging infectious diseases relevant to the military. DoD's mission was expanded through a presidential directive to include support of global surveillance, training, research and response to emerging infectious disease threats. DoD-GEIS was established in 1997, with a central hub at the Walter Reed Army Institute of Research (WRAIR). GEIS coordinates AFHSC's global emerging infectious disease surveillance and response initiatives among a network of partner organizations and executes a militarily relevant surveillance program involving respiratory infections, gastrointestinal infections, febrile and vector-borne infections, sexually transmitted infections and antimicrobial resistant organisms.



In February 2011, after operating for nearly three years at separate locations, the entire staff of AFHSC moved into renovated offices in Silver Spring, Md., where the DoDSR had been housed for 10 years. AFHSC nearly doubled its footprint in this government-leased office to provide workspace for up to 90 staff and increased the freezer capacity of the DoDSR to 100 million samples.

AFHSC is organized into four divisions: Communications, Standards and Training (CST), Data Management and Technical Support (DMTS), Epidemiology and Analysis (E&A) and the Global Emerging Infectious Surveillance Operations (GEIS OPS).

AFHSC Organizational Structure



AFHSC Finances



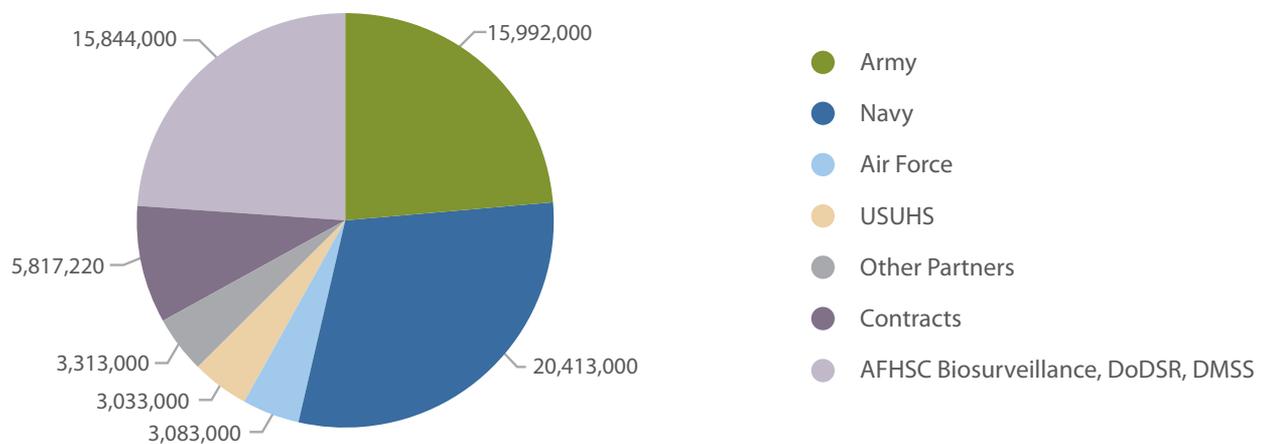
The AFHSC budget was \$67.5 million in fiscal year 2012. AFHSC distributed nearly 70 percent of its funds to laboratory partners following an extensive internal and external proposal review process and a formal briefing and concurrence by the Executive Agency Directorate, Office of the Army Surgeon General, the Force Health Protection Integrating Council (FHPIC) and the Deputy Assistant Secretary of Defense, Force Health Protection and Readiness.



Recipients of the funding include the Army and Navy overseas laboratories: the U.S. Army Armed Forces Research Institute of Medical Sciences (AFRIMS), U.S. Army Medical Research Units in

Kenya and the Republic of Georgia (USAMRU-K and -G), Naval Medical Research Unit 2 (NAMRU-2), NAMRU-3 and NAMRU-6. Several CONUS-based military and university partners, including the Naval Health Research Center (NHRC), WRAIR, the U.S. Air Force School of Aerospace Medicine (USAFSAM), Uniformed Services University of the Health Sciences (USUHS) and The Johns Hopkins University Applied Physics Laboratory (JHU/APL) also received funding in support of their robust programs. The remaining funds at AFHSC were in support of its divisions and headquarters to include biosurveillance initiatives, contracts, meetings, MSMR and other infrastructure costs.

FY12 AFHSC Financial Management and Accountability



FY12 Defense Health Program (P-8) funding: One year funding to AFHSC and Partners. Total \$67,495,220

The Elements of Military Health Surveillance



Essential Tools of Surveillance: The DMSS, DMED and DoDSR

The DMSS and the DoDSR are longstanding and vital assets to U.S. Armed Forces medical surveillance. The DMSS and DoDSR were originally designed for routine HIV screening purposes, but their functions were expanded in the early 1990s to encompass all diseases and injuries of military importance, deployment health, and the prevention and control of diseases relevant to the protection of U.S. forces.

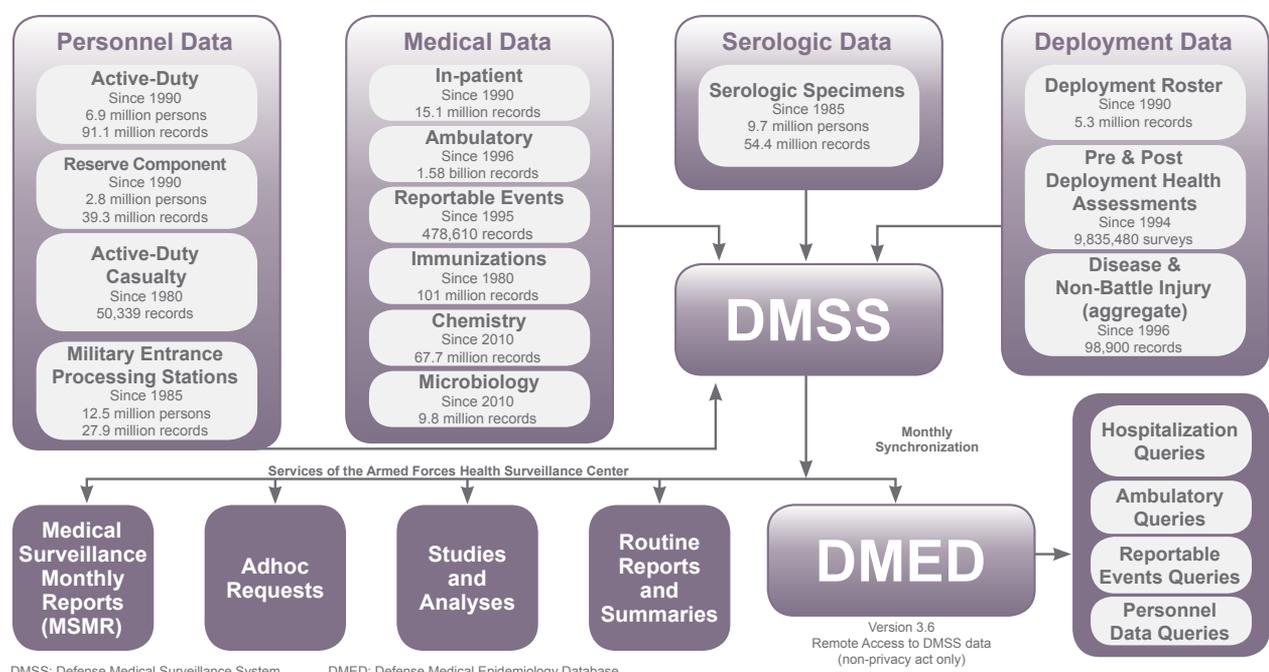
Following the Persian Gulf War, investigations of medical complaints of veterans were hindered because relevant records were often inaccessible or non-existent. Available records often lacked uniformity and accuracy and were generally not automated. In partial response, deployment medical surveillance became a priority of the DoD. Over the years, advances in information management technology have enabled the development of a comprehensive public health surveillance system for the military.

The DMSS receives data from multiple sources and integrates it in a continuously expanding longitudinal surveillance database for all individuals who have served since 1990.

All records in the DMSS are maintained in person, place and time frames of reference. Such data organization facilitates efficient and powerful analyses of morbidity among service members using traditional epidemiologic parameters.

AFHSC made significant improvements to its technical and functional capabilities with a new DMTS system that went on-line in early 2012. Leveraging the lessons learned over the past 20 years, the changes make DMSS easier to use and more efficient to operate and decreases maintenance.

DMSS Structure and Functional Relationships as of March 2012





DMSS now operates on a new industry standard processor architecture, operating system and Commercial-Off-The-Shelf applications. Servers were consolidated to increase use and minimize maintenance with a small staff of information technology personnel. Storage resources were separated from processor technology and the back-end storage resources were consolidated into a single unified and tiered environment. A state-of-the-art power and cooling environment was installed to utilize industry best practices.



Oracle Database 11g was selected to deliver industry leading performance, scalability, security and reliability on a Linux platform. The database features allow AFHSC to easily manage the most demanding transaction processing, business intelligence and content management applications. The Informatica Suite of products was chosen to harness the power of timely, relevant and trustworthy data.

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



DMED is available to authorized users—including U.S. military medical providers, epidemiologists, medical researchers, safety officers or medical operations/clinical support staff—responsible for surveying health conditions in the U.S. military and conveying this information to commanders for monitoring and enhancing the health of the active-duty component. Civilian collaborators in military medical research and operations may also have access to DMED with appropriate documentation. The application for access to DMED is available through the AFHSC website at www.AFHSC.mil.

The DoDSR contains over 54 million serial blood-derived serum specimens collected from nearly 10 million active-duty and reserve service members throughout their careers. The DMSS database and its associated longitudinal surveillance record link to these specimens. The availability of serial serologic specimens in the DoDSR that can be linked to relevant demographic, occupational and medical information within the databases at AFHSC establishes a unique and powerful resource to support the conduct of military medical surveillance, clinical care and seroepidemiologic investigations.

Supporting the Services' Requests for Medical **Surveillance**



Each service is represented at the AFHSC by a liaison officer. These officers assist their respective services' public health authorities and commanders in accessing health surveillance information from DMSS. AFHSC has also recently gained its first environmental science liaison officer, who links environmental and occupational health communities and explores new data sources such as the Defense Occupational and Environmental Health Readiness System (DOEHRs) that is maintained by the U.S. Army Public Health Command (USAPHC). While still in its infancy, this database integration with DMSS now makes it possible to connect specific individual hazards with diagnosed health outcomes.

The liaison officers are responsible for coordinating requests from their respective services and presenting them at the Review of Requests and Reports (R3) meeting. Requests can also come in through the AFHSC website at www.afhsc.mil or other AFHSC subject matter experts and personnel.

At the R3 meetings, AFHSC senior epidemiologists, preventive medicine physicians and key scientific

advisors review the methodology and feasibility of each request. Once the R3 approves a request, the title and project log are entered into a privacy-protected computer tracking system. Analysts within the Epidemiology and Analysis (E&A) division write the computer code to generate the data analysis and provide results in the form of summary tables or limited de-identified data sets. After careful review, the results are sent to the requestor.



Producing Epidemiological Analyses and Reports

The E&A division serves a crucial role at AFHSC by providing data-based epidemiological information to DoD policymakers, military commanders, service surgeons general and public health centers, researchers and preventive medicine professionals. The division carries out requests that fall into two general categories: *Ad hoc* analyses and routine reports.

Ad hoc analyses are carried out in response to external requests for research, serum studies and internally generated inquiries about military public health information needs recognized by AFHSC. In 2011, E&A completed 477 *ad hoc* analyses and one-time reports that contained summary tables and charts or de-identified data sets.

In 2011, AFHSC provided specimens to WRAIR researchers for conducting the largest serum study ever supported by the DoDSR. One goal of the study was to determine the frequency with which service members—who are potential blood donors while in theater—became infected with Hepatitis B and C viruses during deployment. While analysis of the data is ongoing, this study is intended to inform senior defense officials on screening and vaccination policy among forces entering theater, risk assessment of unscreened blood product transfusions, the predictive

values of rapid laboratory test results and clinical decision-making in the field. Senior Military Health Care System leaders may also use the data analysis results to reduce Hepatitis B and C virus transmission among personnel and develop care for those infected.

Another *ad hoc* analysis looked at deployment-related environmental exposures related to open-air trash burning. In 2010, AFHSC responded to congressional representatives' concerns that service members' ocular and respiratory conditions and some cancers might be attributable to "burn-pit" exposure. The resulting summary report, produced in collaboration with the USAPHC and the NHRC, was titled "Epidemiological Studies of Health Outcomes among Troops Deployed to Burn Pit Sites." This year, when the Institute of Medicine (IOM) released a burn pits review that had been requested by the Department of Veteran Affairs (VA), AFHSC recognized a need to update and refine the 2010 study. These 2011 updates will be part of the VA response to the IOM report.

Other *ad-hoc* analysis categories included mental health (46), injuries such as traumatic brain injury (77), infectious disease (42), vaccines (35) and deployment-related illness and injury (68).

When military leaders find *ad hoc* or one-time reports to be helpful, they sometimes request regular updates on a weekly, monthly, quarterly, semiannual or annual basis. Such periodic updates constitute the routine reports category of requests fulfilled by E&A. Among topics contained in these reports are communicable diseases, training-related injuries, mental health, traumatic brain injury and deployment health.

E&A produced 577 routine reports in 2011. The periodic reports are critical in guiding military operational and medical commands on health



issues related to the forces. For example, the AFHSC produces and distributes the “Weekly Influenza Surveillance Report” during the influenza season. This report provides weekly summaries of respiratory illness activity among Military Health System beneficiaries by geographical regions. Using ICD-9 codes from hospitalization and outpatient encounters, the report uses two categories for this surveillance: Influenza-Like-Illness and Pneumonia and Influenza.

The Installation Injury Reports summarize active-duty service members’ injuries based on DMSS health encounter data and the results are presented according to service (except the Coast Guard) and location of occurrence. The summaries are recalculated monthly for the three preceding months since health encounter data may lag. The most

recent data is available on the AFHSC website at www.afhsc.mil.

Epidemiologists are always looking for new data sources that help more accurately answer medical surveillance questions. For instance, ICD-9 code diagnoses for infectious diseases ideally should be confirmed with microbiology results. Although AFHSC received laboratory data for many years, analysts were unable to use the information because it was too difficult to search. With funds from GEIS OPS, the Navy and Marine Corps Public Health Center (NMCPHC) developed methods to search the laboratory data and the results are now included in AFHSC surveillance reports. The AFHSC used microbiology data for the first time in 2011 to complete analyses on hepatitis E, malaria, hepatitis B, and cervical abnormalities.

AFHSC Periodic Reports in One Year

Report Name
DOD Communicable Disease
JTR Communicable Disease
Influenza Surveillance
Malaria YTD Korea
Monthly Malaria Case Finding Report
Meningococcal Report Line Listing
AFPMB Report for Arthropod Borne Hemorrhagic Fever
AFPMB Report for Mosquito Borne Encephalitis
AFPMB Report for Dengue/Hemorrhagic Fever
AFPMB Report for Lyme Disease
AFPMB Report for West Nile Fever
AFPMB Report for Leishmaniasis
Annual HIV Update
Injury Installation Reports
Lost Duty Application
Force Health Protection Council Metrics
Reserve Lost Duty Metrics
Ill, Injured and Wounded Report
TRADOC Injury Report
TMDS D&I Report
USASOC Special Reportable Events
Army Annual Injury Report
USCG Burden of Disease
TRADOC Heat Injury Report
TRADOC Cold Injury Report
Smallpox Vaccine Adverse Events—Cardiac
Reportable Events Vaccine Adverse Events (VAERS)
Total versions of Reports: 81
Total number of Reports: 757

Disease Reports Injury Reports Mental Health/PTSD/TBI

Report Name
HA PTSD Monthly
DCoE TBI Diagnoses for DTM
TBI Positive Screenings Line Listing
USASOC Mental Health and TBI Monthly Report
HA Mental Health Report
USASOC Mental Health and TBI Quarterly Report
HA TBI
DoD Consolidated TBI Healthcare Encounter Report
AFSOC Mental Health and TBI Quarterly Report
AFSOC Mental Health and TBI Annual Report
Weekly MedEvacs Report for DMDC
DMSS Counts
MHS Dashboard Measures
Special Surveillance: Amputations, DVT, Leish, ARDs
MSMR Special Surveillance MVA
MSMR Deployment Health
EUCOM RMES Monthly Report
Disease and Injury Distribution by Service
PreDeployment Health Assessment (DD2795) Summary
PostDeployment Health Assessment (DD2796) Summary
PostDeployment Health Reassessment (DD2900)
Civilian PreDeployment Health Assessment (DD2795)
Civilian PostDeployment Health Assessment (DD2796)
Civilian PostDeployment Health Reassessment (DD2900)
Deployment Health Compliance Report
Deployment Health Civilian in Compliance Report
Deployment Health Report
Army DD2900 Delinquency Report
USCG PHA, PDHA, PDHR

Special Reports Deployment Vaccine Reports

Developing Standard DoD Surveillance Practices



Following epidemiologic best practices, AFHSC produces standard case definitions that allow public health practitioners in the DoD to measure disease trends and related biological phenomena in different environments and situations over time. The Surveillance Methods and Standards (SMS) Working Group has documented, developed and disseminated case definitions and methodologies used by the AFHSC for routine surveillance and reporting. This effort is the first to document methods unique to AFHSC and the DMSS. The SMS Working Group identifies case definitions based on topic timeliness, military relevance, potential public scrutiny and importance to military leadership.

AFHSC published its first set of guidelines on its website in March 2011. By the end of the year, 43 conditions in 10 categories, including traumatic brain injuries, mental health disorders, diabetes mellitus, influenza, malaria, and heat and cold weather injuries, were published. The AFHSC surveillance case definitions are designed for use with Administrative Health Care data derived from the U.S. Military Electronic Health record (EHR) contained in the DMSS and other available data sets. AFHSC surveillance case definitions are developed by health care providers and epidemiologists serving on the SMS Working

Group. Many of the case definitions were originally created by staff of the MSMR for that publication. AFHSC and DoD topic experts are consulted in the development process when needed.

The AFHSC maintains and publishes the Tri-Service Reportable Events Guidelines and Case Definitions, which are standard clinical case definitions used by the DoD to guide military public health officers, health care providers, and laboratories in identifying and reporting specific diseases and injuries. The document includes conditions reported to civilian authorities as well as military-specific reportable diseases and injuries. The goals of this document are to achieve consistent and standard data for reportable events tracked across the services.

The guidelines are developed with input from the three services and the DoD Joint Preventive Medicine Policy Group (JPMPG). The first set of Tri-Service Reportable Event guidelines was published in 1998. The guidelines were revised in 2009 and are currently undergoing another revision. More information regarding the guidelines and case definitions can be found at www.afhsc.mil.



Publishing the Medical Surveillance Monthly Report



Launched in 1995, the MSMR is the flagship publication for AFHSC and features articles on evidence-based estimates of the incidence, distribution, impact and trends of illness and injuries among U.S. military service members and associated populations. The MSMR's target audience is health care providers and public health professionals throughout the U.S. Military Health System and DoD health care planners, policymakers and policy analysts. The publication has 1,067 subscribers for its print edition and more than 500 email subscribers. The online issue is viewed an average of 1,483 times during the first 60 days after it is posted on the AFHSC website at www.afshc.mil. The MSMR began publishing in full color in August 2011.

The MSMR was selected by the National Library of Medicine in 2011 to be indexed in MEDLINE, a database of over 19 million references to articles published in 5,600 current biomedical journals worldwide. All 2011 MSMR articles are now searchable among the 5,600 peer-reviewed journals on PubMed, a part of a series of databases maintained by the U.S. National Library of Medicine's National Center for Biotechnology Information.

Thirty-eight articles were published in the MSMR in 2011, including reports of two norovirus outbreak investigations and epidemiologic summaries of mental health disorders, overweight/obesity, motor vehicle-related deaths and noise-induced hearing injuries that threaten the health of service members. The MSMR also published a series of articles on associations between repeat deployments and deployment-related illnesses and injuries. The MSMR accepts submissions on relevant topics related to military health issues; approximately 20 percent of MSMR articles in 2011 were submitted by authors not affiliated with its editorial staff. All 157 issues of the MSMR can be viewed on the AFHSC website at www.afshc.mil.

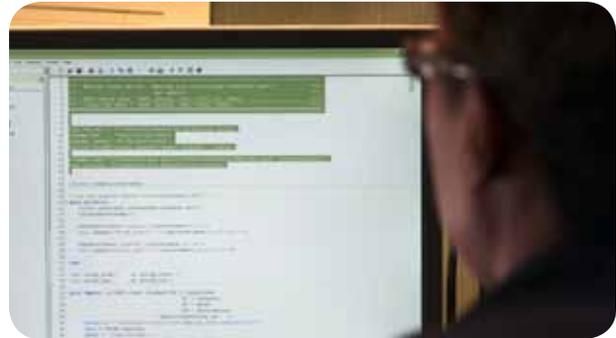


Training Residents in Epidemiology

As a key DoD source for health surveillance and epidemiologic training, AFHSC hosts preventive medicine residents from WRAIR and USUHS for a four- to six-week practicum rotation under the supervision and mentorship of senior staff. Residents enhance their understanding of the complexities of health surveillance systems, their knowledge of epidemiology, and their critical analytical skills. They also gain experience in AFHSC daily operations. Central to their practicum, residents design and execute a data analysis project using the DMSS. Residents begin with a hypothesis, test it through designing an epidemiologic study, analyzing and interpreting data and generating a written final report and oral presentation.

Since 2008, AFHSC has trained 37 residents from the three services (Army 54 percent, Navy 27 percent and Air Force 19 percent). Resident projects have examined such topics as trends and rates of pathologic gambling among active component personnel, chlamydia infection rates among deployers and non-deployers and carpal tunnel syndrome.

Approximately half of the resident projects completed during their rotations are published in



the MSMR or other peer-reviewed journals. In 2011, two of eight residents from the 2011-2012 academic year received recognition for outstanding abstract presentations at the American College of Preventive Medicine Conference. Three residents were finalists for a regional competition called the 4th National Capital Region Military Research Symposium.

The work of the residents has proven valuable to DoD and government policymakers. Information from one resident project on poisoning-related hospitalizations and risk factors for self-inflicted poisoning in the active component, published in the MSMR (November 2011), was used in a presentation by the Army's Vice Chief of Staff during a U.S. Congressional meeting on treatment for overdose and similar issues.





THE MEDICAL SURVEILLANCE MONTHLY REPORT (MSMR) A GLANCE AT SIXTEEN YEARS OF U.S. MILITARY HEALTH



2009: Novel H1N1 Influenza: Outbreak aboard the USS Boxer

Rubella Outbreak



Brown Recluse Spider Bites among Trainees



Hyponatremia from Water Intoxication



Lightning Injuries



Malaria in Afghanistan



Amputations



Hospitalizations Before and After Deployments



Overweight and Obesity



Women's Health



1995

1996

1997

1998

1999

2000

2001

2002

2003

2004

2005

2006

2007

2008

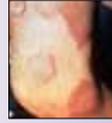
2009

2010

2011



Vivax malaria in Korea



Leprosy



Migraine Headaches



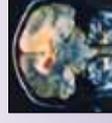
Achilles Tendon Rupture



Eye Injuries



Abnormal Findings on Medical Exams

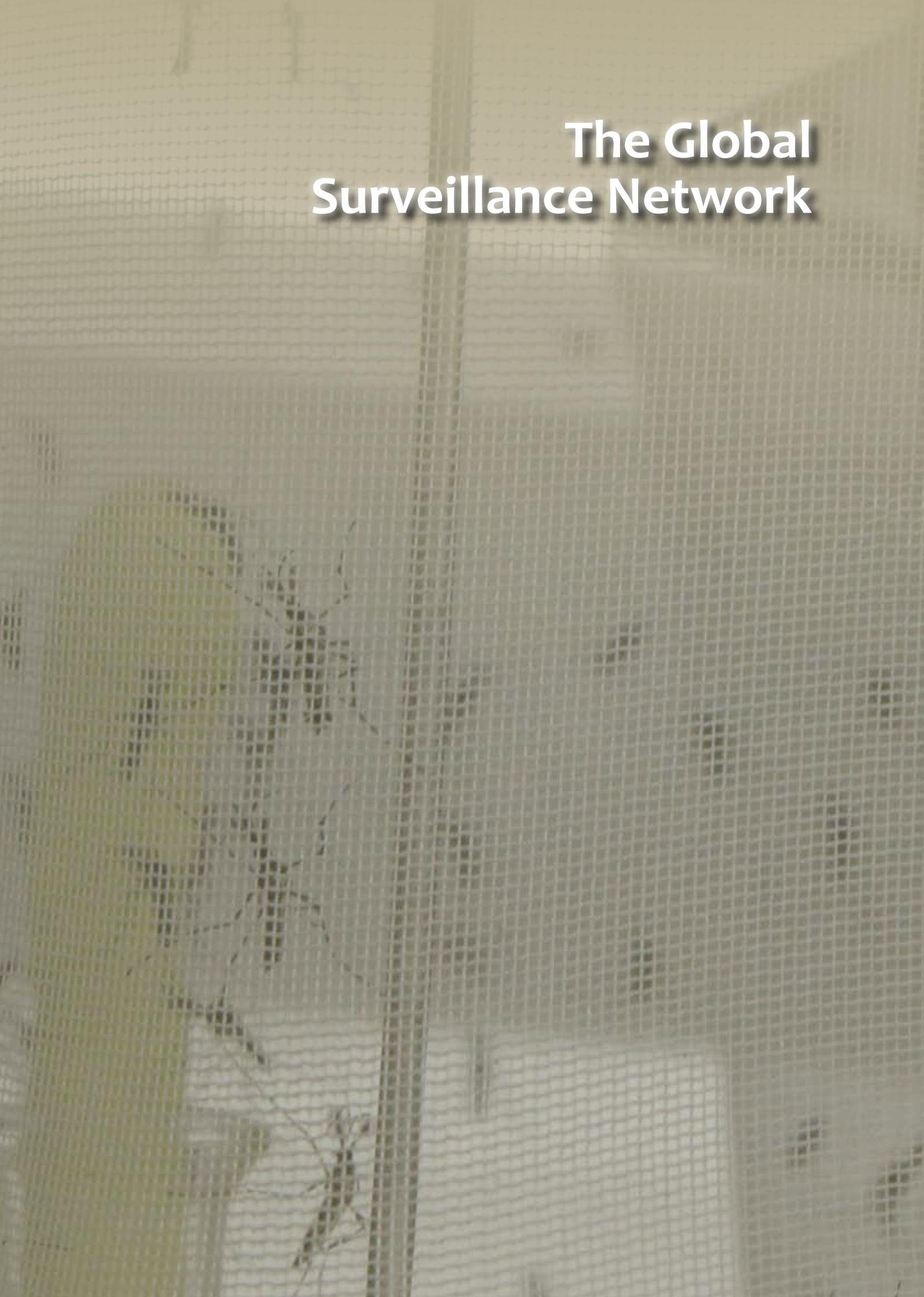


Traumatic Brain Injury



Sexually Transmitted Infections

The Global Surveillance Network



Maintaining the Global Emerging Infections Surveillance and Response **System**

The GEIS Operations (OPS) division continued to develop, implement, support and evaluate an integrated global emerging infections surveillance and response system. Force health protection of U.S. service members and those of their allies remains the strategic focus of its initiatives. GEIS OPS recognizes that adequate global public health provides for country-level and regional stability critical to U.S. national security interests.



A wide range of global surveillance efforts are supported across all emerging infectious disease (EID) surveillance pillars through a holistic approach that includes: surveillance and response; training and capacity building; research innovation and integration; and assessment and communication of value added. The division receives strategic guidance on its surveillance efforts from various agencies of the U.S. government, the Office of the Assistant Secretary of Defense for Health Affairs (OASD-HA), and the FHPIC. Key guiding documents include the International Health Regulations (IHR (2005)), the Presidential Decision Directive NSTC-7, Presidential Policy Directive-2 (PPD-2) and Homeland Security Presidential Directive-21 (HSPD-21).

By effectively communicating information from its surveillance activities, AFHSC supports increased public awareness and understanding of important

global issues and shaping of public health decisions. Surveillance findings are routinely provided to the respective Ministries of Health (MoH) and defense departments of the host partner countries. All GEIS partners are highly encouraged to present and publish their findings in medical journals and at scientific meetings.

GEIS engagements are organized around five syndromically-defined emerging infectious disease “pillars,” each with activities spread throughout the globe. Key GEIS partners are the six DoD overseas research laboratories, which each operate a regional disease surveillance network and the three U.S.-based DoD reference laboratories (NHRC, USAFSAM, and WRAIR). These nine DoD laboratories develop regional partnerships with local ministries of agriculture, defense, and health, as well as public and private universities and various non-governmental organizations, to conduct endemic and global emerging infectious disease surveillance and response missions. Surveillance and capacity building efforts reached 76 countries in 2011. The main consumers of AFHSC disease surveillance information include OASD-HA, FHPIC, Defense Health Board, Combatant Commands (CCMD), service-specific public health assets, and interagency collaborators that include the U.S.



National Security staff, the U.S. Department of Health and Human Services and the World Health Organization (WHO).

GEIS OPS Network and Major Laboratories Map on the next page.

GEIS OPS funding is typically distributed to support two different kinds of surveillance activities—ongoing sustainment initiatives and novel proposals. Approximately two-thirds of GEIS OPS support is for sustainment, representing funding for ongoing initiatives meant to maintain a robust global EID surveillance portfolio that is standardized across all regions. The remaining one-third of funding support is awarded to competitive proposals submitted in response to an annual request for proposals that address novel EIDs or surveillance efforts that affect the DoD and global health communities. Both types of support go through rigorous evaluation by internal and external review committees each year; this process resulted in distribution of \$45.4 million in 2012.

In 2011, several initiatives were implemented to improve oversight of the surveillance and research programs. Steering committees were created for each of the five pillars and strategic guidance documents were drafted that included goals, objectives and external review procedures.

GEIS Outbreak Response

Outbreak response is an integral part of the partner collaboration with host country health systems. GEIS network partners assisted in a total of 73 outbreak response efforts in fiscal year 2011.

NAMRU-3 scientists provided support to the Yemeni Ministry of Health during a large outbreak of cases of acute febrile illness in late 2010. Molecular testing documented Chikungunya virus (CHIKV) for the first time in Yemen and attributed the outbreak to both CHIKV and dengue virus. NAMRU-3 also provided training for CHIKV diagnosis to MoH staff and made recommendations for implementation of a successful vector control program. Another key

AFHSC-GEIS Outbreak Response Activities, FY2011, By Partner

Partner	Number of Outbreaks	Countries	Pathogens/Conditions
Armed Forces Medical Examiner (formerly AFIP)	2	Kenya, USA	Rift Valley fever (RVF), adenovirus
AFRIMS	4	Cambodia, Nepal	Influenza, cholera
NAMRU-2	3	Cambodia	Malaria, <i>S. suis</i> , leptospirosis
NAMRU-3	4	Pakistan, Yemen, Egypt	Dengue, Crimean-Congo Hemorrhagic fever (CCHF), <i>E. coli</i>
NAMRU-6	21	Peru, El Salvador	<i>A. baumannii</i> , leishmaniasis, leptospirosis, varicella, pneumonic plague, influenza, dengue, <i>E. histolytica</i> , tuberculosis, <i>K. pneumonia</i> , rabies (animal), Bell's Palsy, gastroenteritis
NASA	3	Afghanistan, South Africa, Botswana, Namibia, Kenya, Somalia	CCHF, RVF, dengue
NHRC	11	USA, Costa Rica	Adenovirus, influenza, pneumonia, Group A beta-hemolytic streptococci, norovirus
USAPHC	1	USA	Group A beta-hemolytic streptococci
USAPHCR-Europe	4	Germany, United Kingdom, Afghanistan	Influenza, <i>E. coli</i> , rabies
USAFSAM	1	USA	Norovirus
USAMRIID	1	Kenya	RVF
USAMRU-K (& Global Viral Forecasting Initiative)	15	Kenya, Somalia, Cameroon	Yellow fever, acute febrile illness, dengue, cholera, several veterinary diseases
WRAIR	3	Kenya, Peru, USA	RVF, Orthobunyavirus, CCHF

GEIS Partner Network



GEIS Network and Major Laboratory Partners

- U.S. Army Armed Forces Research Institute of Medical Sciences (AFRIMS) – Thailand
- Naval Medical Research Unit 2 (NAMRU-2) – Hawaii
- NAMRU-3 – Egypt
- NAMRU-6 – Peru
- 65th Medical Brigade – Korea
- U.S. Army Medical Research Unit (USAMRU) – Kenya
- USAMRU – G – Republic of Georgia
- Landstuhl Regional Medical Center – Germany
- Naval Health Research Center – California
- U.S. Air Force School of Aerospace Medicine – Wright Patterson Air Force Base, Ohio
- Navy and Marine Corps Corps Public Health Center – Virginia
- U.S. Army Public Health Command – Maryland
- Walter Reed Army Institute of Research – Maryland
- Naval Medical Research Center – Maryland

contribution by the GEIS partner network was USAMRU-K's provision of diagnostic and entomological assessment support for the response to a dengue serotype 3 outbreak among African Union Mission military peacekeepers and civilians along the Kenya-Somalia border during September-October 2011.

Surveillance Activities

Surveillance activities are central to the GEIS mission, enabling the partner network to provide relevant information to decision-makers within the military to aid disease prevention and treatment. The following are key 2011 accomplishments from surveillance activities for each of the GEIS pillars:

Respiratory Infections

Collaboration between NAMRU-6, USAFSAM, NHRC, and WRAIR identified a novel sub-clade of the 2009 A/H1N1 influenza virus possessing a re-emergent hemagglutinin D222N gene mutation associated with increased respiratory illness severity among patients in Ecuador, Mexico and Washington, D.C. Identifying such changes in circulating influenza virus subtypes which impact disease severity and transmissibility are vital for the military as these changes can affect the effectiveness of treatment and prevention.



GEIS, NHRC and USAFSAM detected a decrease in vaccine effectiveness (VE) for the live-attenuated influenza vaccine, especially with regards to A/H1N1 protection. These findings supported the

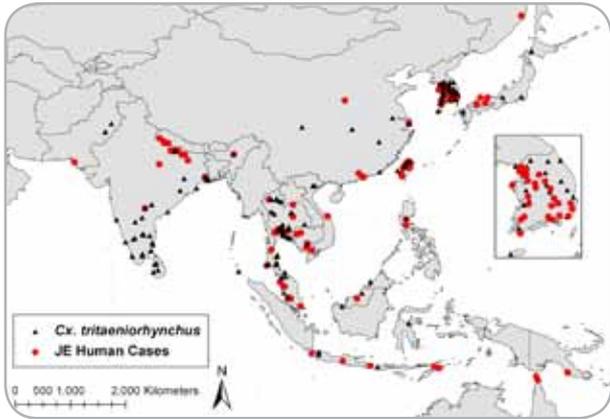


subsequent investigation by NHRC of serologic responses among vaccinated recruits which found modest differences between the live-attenuated and inactivated vaccines. More importantly, the study also found evidence of decreased seroprotection against the currently circulating 2011 influenza strains when compared to the 2009 strains, possibly due to genetic drift. This could have had negative implications for force health protection and global health during the 2011-2012 influenza season if there was a significant mismatch. Results from these studies were provided to the Vaccine and Related Biological Products Advisory Committee which recommends the components incorporated in the seasonal influenza vaccine that is produced for DoD personnel and the U.S. non-military population.

Febrile and Vector-borne Infections

In Nepal, AFRIMS researchers and the Centers for Disease Control and Prevention (CDC) partners detected the country's first known cases of CHIKV and bartonellosis. As a result, researchers increased clinical suspicion for these infections among the participating study sites and have provided information for epidemiological efforts to detect and control infections.

GEIS is also engaged in developing predictive modeling of diseases of military and public health relevance, similar to previous efforts involving the



viral zoonosis Rift Valley Fever. Last year, USUHS personnel collaborated with investigators in Korea and AFRIMS to develop and refine ecological niche models for predicting mosquito densities and the resultant transmission of Japanese encephalitis (JE). The JPMGP used information obtained from the models for their JE vaccination policy review. The National Center for Medical Intelligence used the data and models to produce risk assessments for their products, while deployed entomology and preventive medicine personnel can use the information in the VectorMap program to help determine vector locations and disease transmission risks.

Gastrointestinal Infections

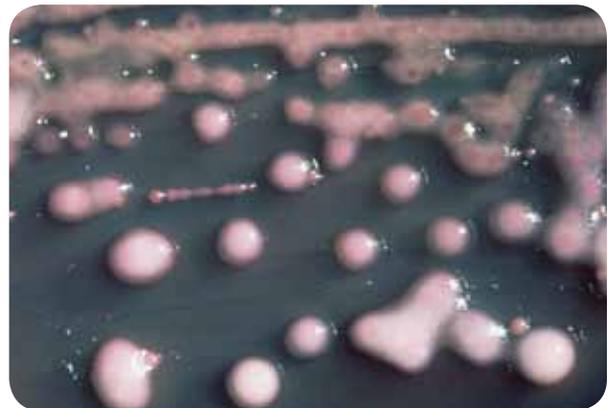
Results from gastrointestinal studies in civilian populations in Kenya (USAMRU-K) and Peru (NAMRU-6) showed that *Shigella spp.* is the most prevalent bacterial pathogen in Kenya, while *Shigella spp.* and *Campylobacter spp.* are the most frequently identified organisms associated with



diarrhea in Peru. Acute gastroenteritis surveillance among U.S. military at Camp Lemonier, Djibouti (NAMRU-3) identified norovirus as the most common viral pathogen. Understanding the distribution of all these pathogens and the populations they affect helps the DoD and the global public health community to better target infection prevention and control activities.

Sexually-transmitted infections

NAMRU-3, NAMRU-6, and USAMRU-K have focused on conducting antibiotic susceptibility testing of *Neisseria gonorrhoeae* (GC) in high-risk civilian and local military populations in Djibouti, Kenya and Peru. The rapid spread of antibiotic-resistant GC has emphasized the need for a network to monitor the spread as a priority for the global STI community. The DoD laboratories are well situated to contribute knowledge in regions—such as South America and Africa—where there is a lack of data.



Antimicrobial Resistance

NAMRU-3 and NAMRU-6 supported hospital-acquired infection surveillance in Egypt, Jordan and Peru to better inform public health policymakers and improve treatment options for service members and the broader medical community. The results in Egypt and Peru showed over 60 percent of *K. pneumoniae* isolates in the region were producers of extended-spectrum β -lactamase (ESBL), and over half of *Staphylococcus aureus* isolates were resistant to the antibiotic methicillin.

Promoting Training and Capacity Building



Another component of the GEIS OPS mission is to improve the abilities of deployed military forces and foreign governments to effectively engage in biosurveillance activities through expanded laboratory capacities, electronic disease surveillance and professionally trained personnel. These partnerships lead to improved disease control in the host nation, improved public health information for U.S. and coalition force health protection and development and field testing of new technologies that can be shared with global partners.

GEIS OPS supported significant improvements to its partner laboratories by providing new equipment

in Bulgaria, Burkina Faso, Cote d'Ivoire, Egypt, Ghana, the Ukraine (all via NAMRU-3), the Republic of Georgia (USAMRU-G), Kenya and Tanzania (USAMRU-K) and Afghanistan (WRAIR and NAMRU-3). These investments resulted in improved diagnostic capability by the local partners in support of improved disease surveillance and global reporting as specified under the IHR (2005).

NAMRU-3 provided regional support of surveillance programs for Crimean-Congo hemorrhagic fever, human respiratory viruses (including avian influenza), hospital-acquired and antibiotic-resistant infections and novel pathogens causing severe febrile illnesses. NAMRU-6 and NAMRU-2 were instrumental in the development of electronic biosurveillance capabilities for the Peruvian and Cambodian military forces with the installation of the AFHSC-funded Suite for Automated and Global Electronic bioSurveillance (SAGES) developed by JHU/APL. The Army U.S. Public Health Command Region-South (PHCR-South) was instrumental in the coordination of influenza surveillance activities in Central America, while scientists from the University of Florida assisted researchers in Romania to investigate the origin of swine influenza.



Fostering Research, Innovation and **Integration**

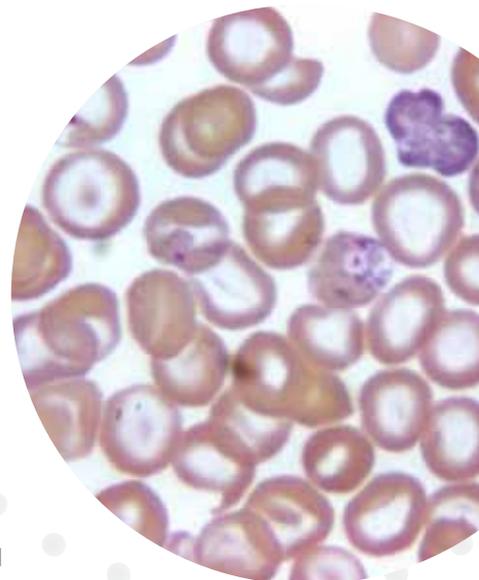
GEIS OPS invested in epidemiologic research to improve the understanding of genetic variability across disease strains and diagnostic products and evaluate diagnostic and transportation media in forward deployed settings. The division funded the Lovelace Respiratory Research Institute, which collaborated with NHRC, to monitor the effect of a new adenovirus vaccine that was being given to all U.S. military basic trainees by the late fall of 2011. The study characterized vaccine-targeted adenovirus 4 and 7 strains in order to evaluate vaccine efficacy and monitor vaccine breakthrough events. Typing of over 500 human adenovirus



(HAdv) strains obtained between 2006 and 2010 enabled description of trends in the circulation of the prevalent genomic variants of adenovirus types 4 and 7 most likely to be those encountered by vaccinated recruits in the future. The findings also showed a new genomic variant of HAdv-4, tentatively designated 4a6 and exhibiting a novel Xho I profile, identified in one isolate from a case of Influenza-Like-Illness at the Marine Corps Recruit Depot in San Diego in 2006. That isolate remains the only one of that variant detected among the analyzed samples, suggesting a very low prevalence.

Timely processing of laboratory specimens is important to any surveillance activity. AFHSC funded development of two new Joint Biological Agent Identification and Diagnostic System (JBAIDS) kits that will increase the speed and accuracy of diagnosing influenza among military personnel in deployed settings. The diagnostic kits, which received FDA clearance, test for six influenza targets plus assay controls (Universal A, Universal B, Seasonal H1, Seasonal H3, Swine A, and Swine H1N1 (2009)). In November 2011, the kits were delivered to forward deployed CENTCOM sites and Navy large deck ships to allow for more timely identification of novel strains.

NAMRU-3 developed and validated a novel fluorescence resonance energy transfer real-time polymerase chain reaction (PCR) assay to simultaneously diagnose and speciate strains of the parasite that causes the disease leishmaniasis. About 90 percent of cases of the most severe form of the disease, visceral leishmaniasis, occur in countries such as Afghanistan. NAMRU-6 also implemented the capacity to conduct real-time PCR for the rapid quantitative detection of *Plasmodium* species in blood from humans. Preliminary results from experiments during standardization and validation phases have provided concordant results with those from conventional PCR. As a result, a rapid quantitative multiplex real time PCR for the simultaneous detection of *P. falciparum*, *P. vivax*, *P. malariae* and *P. ovale* in blood samples will be established for malaria diagnostics.



Meeting the Needs of the Combatant Commands



Combatant Command Coordination and Surveillance **Training**



The AFHSC funded and co-hosted nine global health conferences, workshops and tabletop exercises in partnership with the geographic CCMD and USUHS' Center for Disaster and Humanitarian Assistance Medicine in 2011. Representatives from 36 countries attended the engagements to improve the ability of partner

nations to plan, detect and respond to public health emergencies with particular focus on complying with IHR (2005) and promoting regional cooperation. Participants shared priorities, successes, challenges, and lessons learned from past public health emergencies.

- AFHSC conducts a quarterly coordination forum with each CCMD to enhance communication with stakeholders and DoD partners. GEIS partner laboratories are able to discuss their projects and interact directly with CCMD leaders. Furthermore, CCMD leadership convey their priorities to the AFHSC and DoD partners, allowing greater comprehension of geopolitical forces and the tailoring of future research efforts. Finally, this forum improves coordination of future AFHSC-COCOM training engagements to make sure the events align with the broader CCMD public health portfolio.



Conducting Laboratory Training Around the **World**

GEIS Funded Training Initiatives, By Geographic Area, FY2011

Combatant Command (CCMD)	No. Training Initiatives	No. Countries	No. Trainees*
United States Africa Command	55	17	1668
United States Central Command	74	18	1310
United States European Command	15	15	496
United States Northern Command	16	10	376
United States Pacific Command	20	22	462
United States Southern Command	23	14	233
TOTAL	203	96	4545

*Where exact figures are not known, estimates of no. of trainees provided



Graduates of the CEIDR two-year program receive two weeks of residential training in Gainesville, Fla. on public health laboratory knowledge and skills to use in their work overseas with GEIS partners.

AFHSC sponsored a variety of training events on issues relevant to the U.S. military public health system, including infectious and non-infectious disease surveillance, malaria, pandemic influenza and other health issues among recruits.

GEIS also supported training activities for 3,691 individuals in 49 countries. General laboratory training occurred in Laos and Cambodia (NAMRU-2), Kenya (USAMRU-K and USAMRIID), Sierra Leone (USAMRIID) and Sri Lanka (WRAIR). Training in Bulgaria focused on detection of arboviruses (NAMRU-3) and biosafety in the Republic of Georgia (USAMRU-G). USAMRU-K and WRAIR were directly involved in improvements that will eventually lead to professional accreditation of laboratories in Kenya and Afghanistan. GEIS funded the University of Florida's Certificate in Emerging Infectious Disease Research (CEIDR), which trains 20 individuals from partner countries each year.



Spreading the News on Medical Surveillance



AFHSC Conferences and Events

AFHSC hosted the two-day DoD Malaria Stakeholder Meeting in August 2011. Key DoD representatives from the CCMD, services' headquarters and public health hubs and pest management, infectious disease, training and research communities discussed prevention, policies and priorities to reduce the impact of malaria on U.S. military forces. Participants identified gaps in surveillance, prevention and treatment programs, clarified malaria-specific CCMD requirements, reached consensus on chemoprophylaxis policy issues, discussed improvements to service member compliance with protective measures and collaborated on clinical decision support tools. Based on the

results from this meeting, a new chemoprophylaxis policy for deployed forces is under review and should be released in 2012.

AFHSC sponsored a one-day workshop to discuss the challenges associated with military public health surveillance in deployed, overseas, regional, and joint base settings as part of the 2011 Armed Forces Public Health Conference. The curriculum focused on controversies surrounding the difference between public health practice and research and the limitations associated with utilizing administrative and personnel data sources for public health surveillance.

CCMD List of Conferences

USAFRICOM

- April 2011 - AFRICOM Malaria Symposium (Stuttgart, Germany)

USCENTCOM

- July 2011 - Infectious Diseases and Disaster Response Conference (Abu Dhabi, UAE)
- June 2011 - Infectious Disease Border Issues Conference (Amman, Jordan)
- October 2010 - Emerging Infectious Disease Conference (Amman, Jordan)

USEUCOM

- May 2011 - Countering Biological Threats: National Implementation of the Biological Weapons Convention (Tbilisi, Georgia). Multinational Outbreak Response and Bioterrorism Investigation Demonstration
- October 2010 - Trilateral Civilian-Military Forum on Outbreak Response and Bioterrorism Investigation (Chisinau, Moldova)

USNORTHCOM

- June 2011 - NORTHCOM Surgeon's "One Health" Conference (Colorado Springs, CO)

USPACOM

- September 2011 - PACOM International Disease Surveillance Conference (Kurumba, Maldives)

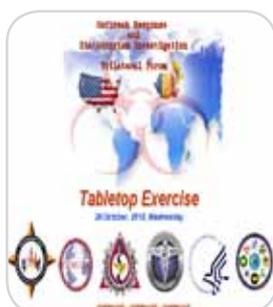
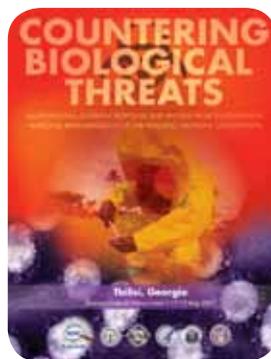
USSOUTHCOM

- May 2011 - Medical Response Belize 2011 (Belmopan, Belize)

AFHSC Website and Applications

The AFHSC website (www.afhsc.mil) disseminates the center's surveillance products, activities and reports. The website received 467,000 hits in 2011, a 21 percent increase from a year earlier. Among the 12,000 reports, products and databases are:

- Surveillance Case Definitions
- Conferences, Events and Engagements
- Global Emerging Infections Surveillance information
- DMED database
- DoDSR information
- Reports, Publications and Studies
- MSMR issues (1995–present)



AFHSC Publications

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

In 2011, GEIS partners published 152 manuscripts in peer-reviewed journals and prepared 136 posters and presentations for 45 international conferences. These papers and presentations helped in furthering our understanding of the risk regarding disease transmission and severity, as well as disease prevention. Their impact is best exemplified by the recent selection of two NAMRU-6 articles in 2011 by the Peruvian Society of Emerging and Tropical Infections as important infectious disease articles in Peru.

A large number of AFHSC projects and protocol studies are initiated in response to specific questions or needs for data. Many of these are done by junior staff members with supervision by senior managers. To ensure that mentoring opportunities are not lost and that worthy projects and studies are identified for development and submission of abstracts and manuscripts, the AFHSC director initiated the Director's Abstract & Publication Development & Mentoring Program (DAPDAMP)

A DAPDAMP Working Group convenes regularly to review entries and identify future professional meetings and conferences that may be suitable for presentations by AFHSC staff members. The DAPDAMP provides a structure for the identification and review of AFHSC projects that are suited for mentoring and the development of abstracts and archived reports. Since some work done by the AFHSC staff is of great interest to the Department of Defense (DoD) and other government agencies, AFHSC staff are encouraged to consider submission of selected reports to the Defense Technical Information Center (DTIC), which serves the DoD community as a central resource for scientific and technical information. In 2011, a plan was initiated for the development and archiving of AFHSC Technical Reports.







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