THE HENRY J. KAISER FAMILY FOUNDATION

REPORT

The U.S. Department of Defense and Global Health: Infectious Disease Efforts

October 2013

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The Henry J. Kaiser Family Foundation

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INTRODUCTION

The Department of Defense (DoD) supports a range of activities addressing infectious diseases, efforts that are an important part of broader U.S. government global health efforts. With U.S. military personnel deployed to over 160 countries around the world,[1] including many with endemic and imported infectious diseases, DoD places a high priority on protecting personnel from such diseases in order to maintain force health and operational readiness. For these reasons, DoD has long made and continues to make significant investments in infectious disease prevention, research and development, and other activities.

This report builds on the recent KFF publication *The U.S. Department of Defense and Global Health* to examine DoD's work related to infectious diseases in more detail. The report provides an overview of these activities, detailing how they are organized and funded in the department as well as how they are coordinated with other U.S. government (USG) and external partners. It also spotlights DoD efforts that address two of the most important infectious disease challenges in the world – HIV/AIDS and malaria – areas in which DoD has long been involved.

METHODOLOGY

Data used in this study were collected through a comprehensive desk review of official documents and the literature and then supplemented by interviews with selected DoD and non-DoD personnel. This study also drew on data collected and interviews conducted to originally inform the KFF report *The U.S. Department of Defense and Global Health*.

This report examines DoD's infectious diseases activities that are global health-related; bioterrorism, biodefense, and other related activities are not included, as they are generally viewed as distinct from global health efforts. As a result, threat reduction activities ("activities … undertaken to better prevent, detect, contain, and/or ameliorate the impacts of natural and intentional biological events on U.S. national security"[2]) are not extensively examined in this report, except where they complement and most directly intersect with DoD's non-bioterrorism infectious disease work. See Appendix A for a list of acronyms used in this report.

HISTORY AND CONTEXT

Infectious diseases have been a persistent threat to the health and readiness of the U.S. armed forces. From the early days of the Continental Army (when smallpox outbreaks threatened troops' ability to fight and defeat the British forces) to the wars in Iraq and Afghanistan (where outbreaks of Q fever, leishmaniasis, and other diseases have occurred among service members) the military has had to plan for and protect against an array of infectious diseases.[3] In fact, infectious diseases have caused greater morbidity and mortality than battle injuries in many past conflicts.[4]

Consequently, the U.S. military has made understanding, preventing, and treating infectious diseases a priority throughout its history, investing in infectious disease efforts that have led to a number of scientific, medical, and public health contributions.[5] Often these contributions have benefited servicemen's health as well as civilian and global health. Some examples of these contributions include:

- medical research milestones, such as the development of many infectious disease drugs and vaccines (including drugs to treat malaria, the first typhoid vaccine, and the first inactivated influenza vaccines) and

- the discovery of how yellow fever is transmitted, as well as promising ongoing research, such as the development of HIV and malaria vaccines;
- advances in prevention and control approaches, such as techniques for reducing HIV among African militaries through prevention education and capacity building as well as addressing skin diseases that were prevalent in Vietnam through the 1960s-1970s Operation Safe Step;[6] and
- a network of overseas laboratories and medical research facilities, which provide bases for infectious disease medical research, disease surveillance, and support and capacity building in partner nations.

BOX 1. EXCERPTS FROM SELECTED KEY U.S. NATIONAL AND DOD STRATEGIC AND OTHER DOCUMENTS RELEVANT TO DOD'S INFECTIOUS DISEASE EFFORTS RELATED TO GLOBAL HEALTH[7]

"Emerging Infectious Diseases," Presidential Decision Directive/National Science and Technology Council-7 (PDD/NSTC-7) (White House, 1996)

- "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. DoD will ensure the availability of diagnostic capabilities at its three domestic and six overseas laboratories, using existing DoD resources. DoD will make available its overseas laboratory facilities, as appropriate, to serve as focal points for the training of foreign technicians and epidemiologists."

***Quadrennial Defense Review* (DoD, 2010)**

- "The rising demand for resources, rapid urbanization of littoral regions, the effects of climate change, *the emergence of new strains of disease* [emphasis added], and profound cultural and demographic tensions in several regions are just some of the trends whose complex interplay may spark or exacerbate future conflicts."

***National Security Strategy* (White House, 2010)**

- "The threat of contagious disease transcends political boundaries, and the ability to prevent, quickly detect and contain outbreaks with pandemic potential has never been so important. An epidemic that begins in a single community can quickly evolve into a multinational health crisis that causes millions to suffer, as well as spark major disruptions to travel and trade. Addressing these transnational risks requires advance preparation, extensive collaboration with the global community, and the development of a resilient population at home."

In recent decades, the national security implications of infectious diseases has drawn greater policy attention, and concerns about the consequences and risks of epidemics and pandemics in a globalizing world have grown.[8] The language of U.S. government and DoD strategy and policy documents has increasingly reflected such concerns and heightened the importance of the U.S. military and DoD role in preventing and responding to these threats (see Box 1). For example, Presidential Decision Directive/National Science and Technology Council 7 (PDD/NSTC-7, released in 1996) not only highlighted the national security importance of emerging infectious diseases but also directed the department to expand its efforts in this area, utilizing its unique capabilities.[9]

INFECTIOUS DISEASE ACTIVITIES: PRIORITIES AND ORGANIZATION

DoD efforts address many infectious diseases (see Box 2) and encompass a broad range of activities that are planned, programmed, budgeted, and executed by multiple organizations across the department.

These include the Departments of the Air Force, Army, and Navy; the Office of the Secretary of Defense, the Organization of the Joint Chiefs of Staff, and the Combatant Commands. Each has its own organizational culture, budget, and priorities, though these various elements are coordinated through a chain of command and control.

BOX 2. DOD EFFORTS RELATED TO GLOBAL HEALTH ADDRESS A RANGE OF INFECTIOUS DISEASES[10]

Bacterial Infections
- Campylobacter jejuni
- Cholera
- Enterotoxigenic Escherichia coli (ETEC)
- Leptospirosis
- Murine typhus
- Q Fever
- Salmonella
- Scrub typhus
- Shigella
- Tuberculosis

Parasitic Infections
- Cryptosporidia
- Cyclospora
- Leishmaniasis
- Malaria

Viral Infections
- Chikungunya
- Dengue
- Hepatitis A & E (Viral Hepatitis)
- HIV/AIDS
- Influenza
- Japanese encephalitis
- Noroviruses
- Yellow Fever

The broader classes of:
- Antimicrobial resistant organisms
- Enteric diseases (diarrheal diseases, gastrointestinal infections)
- Febrile and vector-borne infections
- Respiratory infections
- Rickettsial diseases
- Sexually-transmitted infections

NOTES: Some of these groupings overlap.

This section provides an overview of DoD's infectious disease activities[11] categorizing them into two broad areas: *force health protection and readiness* (FHP) and *partnership engagement*. FHP and partnership engagement are two of the three main "focus areas" of DoD's global health-related activities identified in the recent KFF report *The U.S. Department of Defense and Global Health*.[12]

FORCE HEALTH PROTECTION AND READINESS

In order to protect the health and well-being of its personnel, DoD supports an array of FHP activities in the areas of: medical research and development (R&D), health surveillance, and FHP education and training for U.S. personnel. For each of these areas, the activities, priorities, and DoD organizations involved are described below.

MEDICAL RESEARCH AND DEVELOPMENT

DoD has a sizeable medical R&D portfolio related to infectious diseases, covering activities such as developing both preventive countermeasures (including vaccines) and treatments and ranging from early stage research to clinical trials and product development. In addition to utilizing laboratories and other resources within the U.S., the department's R&D work is further facilitated by its network of overseas labs and partners. Recent

projects have targeted a range of infectious diseases, including diarrheal diseases, bacterial infections (such as cholera, tuberculosis, and enteric diseases), viral infections (such as yellow fever, dengue, chikungunya, and HIV/AIDS), and parasitic diseases (such as malaria and leishmaniasis).

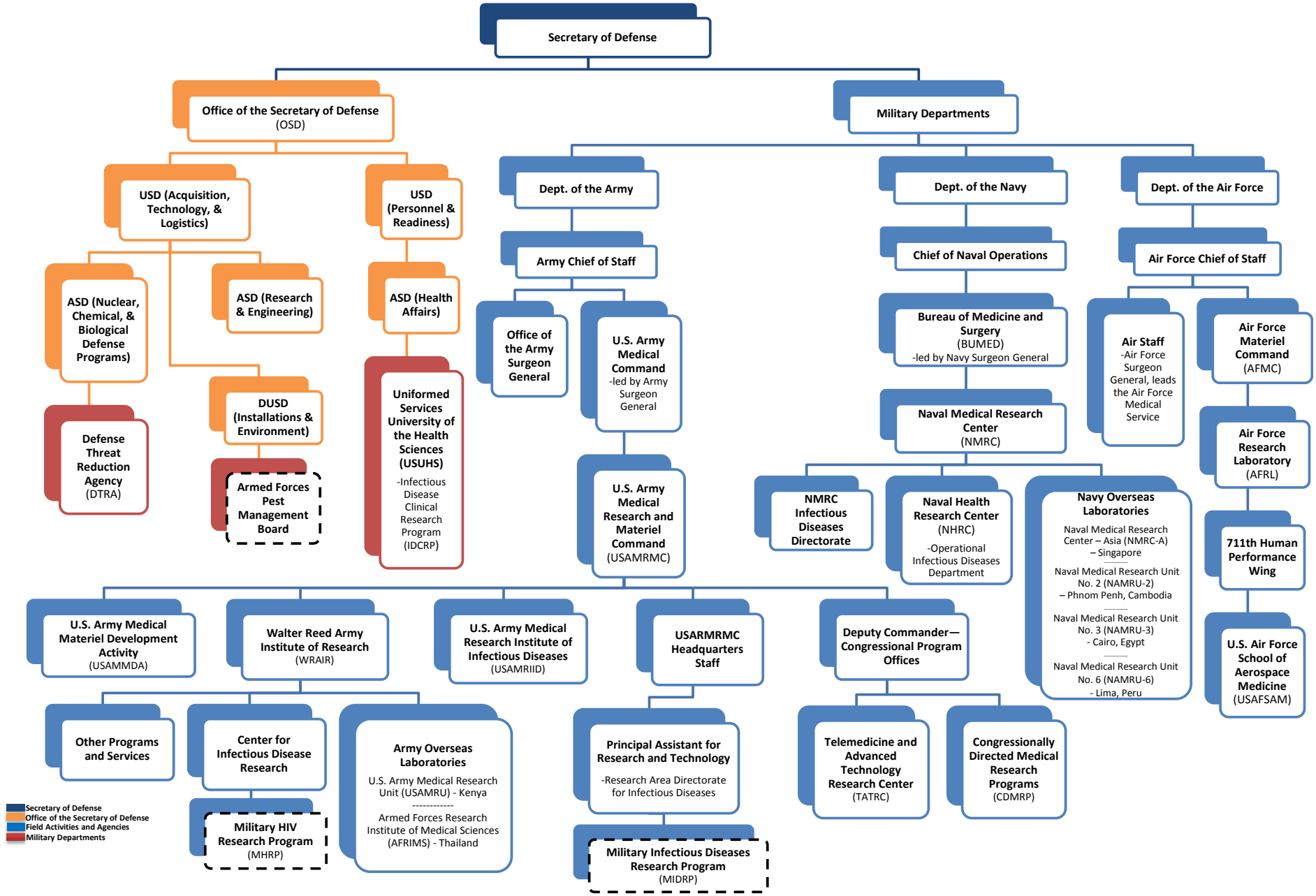
Although the processes by which programs determine their research priorities can vary, the department's R&D generally places highest priority on those diseases that pose a "significant threat" to U.S. military operations; significant threats "are those that have the potential to incapacitate a large number of deployed forces over a short time period, thus hindering the ability of warfighters to accomplish their mission."[13] Factors like "the geographical distribution of a disease; the lack of an effective vaccine, treatment, or other control measures; the mode of transmission; and the historical impact during past wars" also influence the importance of an infectious disease to the military.[14] Currently, DoD's list of military infectious disease priorities is topped by malaria, dengue, and diarrheal diseases.[15] DoD typically supports specific R&D projects addressing these priority diseases based on scientific merit.[16] Additionally, at times, Congress has directed the military to support medical R&D on a specific infectious disease; in FY 2012, for example, Congress directed DoD to support additional research on, among other things, malaria and tuberculosis.[17]

Organization

Though the Air Force and Navy contribute to DoD medical R&D in this area, the Army is "responsible for programming and funding all DoD naturally occurring infectious disease research requirements," which means it is the designated DoD lead on infectious disease research in order to preclude "duplication of effort" across the military departments.[18] Key DoD organizations involved in these activities include (see Figure 1):

- the Military Infectious Diseases Research Program (MIDRP), which is part of the Research Area Directorate for Infectious Diseases (RAD-1) within the U.S. Army Medical Research and Material Command's (USAMRMC) Office of the Principal Assistant for Research and Technology. Since the U.S. Army leads DoD infectious disease research, MIDRP serves as a coordinating mechanism for U.S. military infectious disease efforts and funding across the military services, ensuring this portfolio "focuses on the prevention, diagnosis, and treatment of naturally occurring disease-causing microorganisms with major potential to reduce mission effectiveness."[19] Additionally, vaccines are a MIDRP priority.[20]
- the Walter Reed Army Institute of Research (WRAIR), which oversees a large proportion of DoD's infectious disease R&D activities conducted both within and outside the continental United States. Within the U.S., its Center for Infectious Disease Research has several divisions whose work includes malaria, HIV, bacterial diseases, and viral diseases R&D. Overseas, the U.S. Army Medical Research Unit (USAMRU) in Kenya and the Armed Forces Research Institute of Medical Sciences (AFRIMS) in Thailand – which also have field sites across their respective regions - allow DoD personnel and DoD partners' staff (including those from, for example, academic institutions, the World Health Organization, and host countries' Ministries of Health or Defense) to conduct in-country research. They, along with the Navy overseas laboratories described below, serve as DoD's forward research centers for a number of infectious diseases. (See "Spotlight on HIV/AIDS and Malaria Efforts" section for further discussion of the Military HIV Research Program (MHRP) and the Military Malaria Research Program at WRAIR.)
- the Naval Medical Research Center (NMRC), which oversees most Naval medical R&D related to infectious diseases. The research of its Infectious Diseases Directorate targets malaria, bacterial causes of traveler's diarrhea, dengue fever, and scrub typhus and is largely focused on vaccine discovery and testing.[21] Under

FIGURE 1. ORGANIZATION OF DOD MEDICAL RESEARCH AND DEVELOPMENT ACTIVITIES FOCUSED ON INFECTIOUS DISEASES*



NOTES: -- line around a box indicates a joint activity across military departments.

NMRC, the Naval Health Research Center (NHRC) Operational Infectious Diseases Department performs research and conducts active surveillance for diseases that affect military personnel and their dependents, with an emphasis on respiratory and enteric pathogens. Overseas, the three Naval Medical Research Units (NAMRUs) allow in-country research, like the Army labs described above; they are NAMRU-2, which is a satellite laboratory in Cambodia; NAMRU-3, which is in Egypt but has a Ghana field detachment; and NAMRU-6, which is in Peru. Additionally, the newly established Naval Medical Research Center - Asia (NMRC-A) in Singapore will also conduct infectious disease research, surveillance, and outbreak response activities.[22]

- the Infectious Disease Clinical Research Program (IDCRP), which operates at the Uniformed Services University for Health Sciences (USUHS) through the Henry M. Jackson Foundation for the Advancement of Military Medicine.[23] The result of an interagency agreement between USUHS and the National Institutes of Health's National Institute of Allergy and Infectious Diseases (NIH/NIAID) in 2005, IDCRP's purpose is to facilitate collaborations between DoD and NIAID investigators as well as other partners in order to "leverage the robust clinical and pharmacoeconomic data repositories archived by the MHS [military health system]" and to provide "critical support to expand the portfolio of the existing DoD HIV clinical research network to encompass other infectious diseases of military importance." Through its network of military hospitals and collaborating research facilities, IDCRP "incorporates and conducts protocols within its network" and "executes investigator and centrally driven multicenter clinical research."[24]

Other important DoD organizations and programs involved in medical R&D include the Congressionally Directed Medical Research Programs Office (CDMRP), which oversees extramural grants for research as specified by Congress; the Telemedicine and Advanced Technology Research Center (TATRC), which oversees some related DoD R&D and advanced technology efforts as specified by Congress; and the U.S. Army Medical Materiel Development Activity (USAMMDA), which works with both Army labs and non-DoD organizations to develop and acquire infectious disease products that are needed by the U.S. military.[25]

Related to this work but typically viewed as part of threat reduction, the medical biological defense R&D conducted by DoD sometimes addresses naturally occurring and emerging infectious diseases with the potential to be used as biological agents, such as anthrax and novel influenza viruses; these activities are carried out by a number of DoD organizations, such as the U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID) and NMRC's Biological Defense Research Directorate, and are sometimes supported by the Defense Threat Reduction Agency (DTRA).[26]

Coordination

DoD R&D activities are often carried out in coordination with, and sometimes in collaboration with, other USG agencies as well as external partners, including the private sector, academia, and non-governmental organizations. Though coordination may occur informally, there are also formal mechanisms like interagency working groups meant to reduce duplication of effort; in fact, such coordination is stressed by DoD guidance in some cases.[27]

Several mechanisms facilitate DoD R&D collaborations, including interagency agreements,[28] cooperative research and development agreements (CRADAs),[29] collaborative grants,[30] co-location of resources and facilities, and participation in technical working groups, conferences, and international networks. For example, several military medical research partnerships exist between the U.S. and foreign militaries, including those

that support several of the DoD overseas labs; an interagency agreement between AFRIMS and NIH/NIAID governs their collaboration on researching shigellosis and conducting clinical trials of vaccines against this and other enteric pathogens; [31] and several overseas labs serve as World Health Organization (WHO) Collaborating Centers.[32] As a result, even as DoD's research in this area remains distinct in trying to meet specific military needs related to these diseases, all of these efforts help to ensure that the department's work contributes to and is coordinated with non-DoD efforts on these diseases to some extent.

HEALTH SURVEILLANCE

DoD supports a number of infectious disease surveillance activities in order to prevent, track, and respond to infectious disease outbreaks among its forces as well as outbreaks in areas in which its personnel currently or may operate. This work contributes not only to DoD's force health protection and military planning activities but also to the public health efforts of other organizations, like the Centers for Disease Control and Prevention (CDC) and WHO.

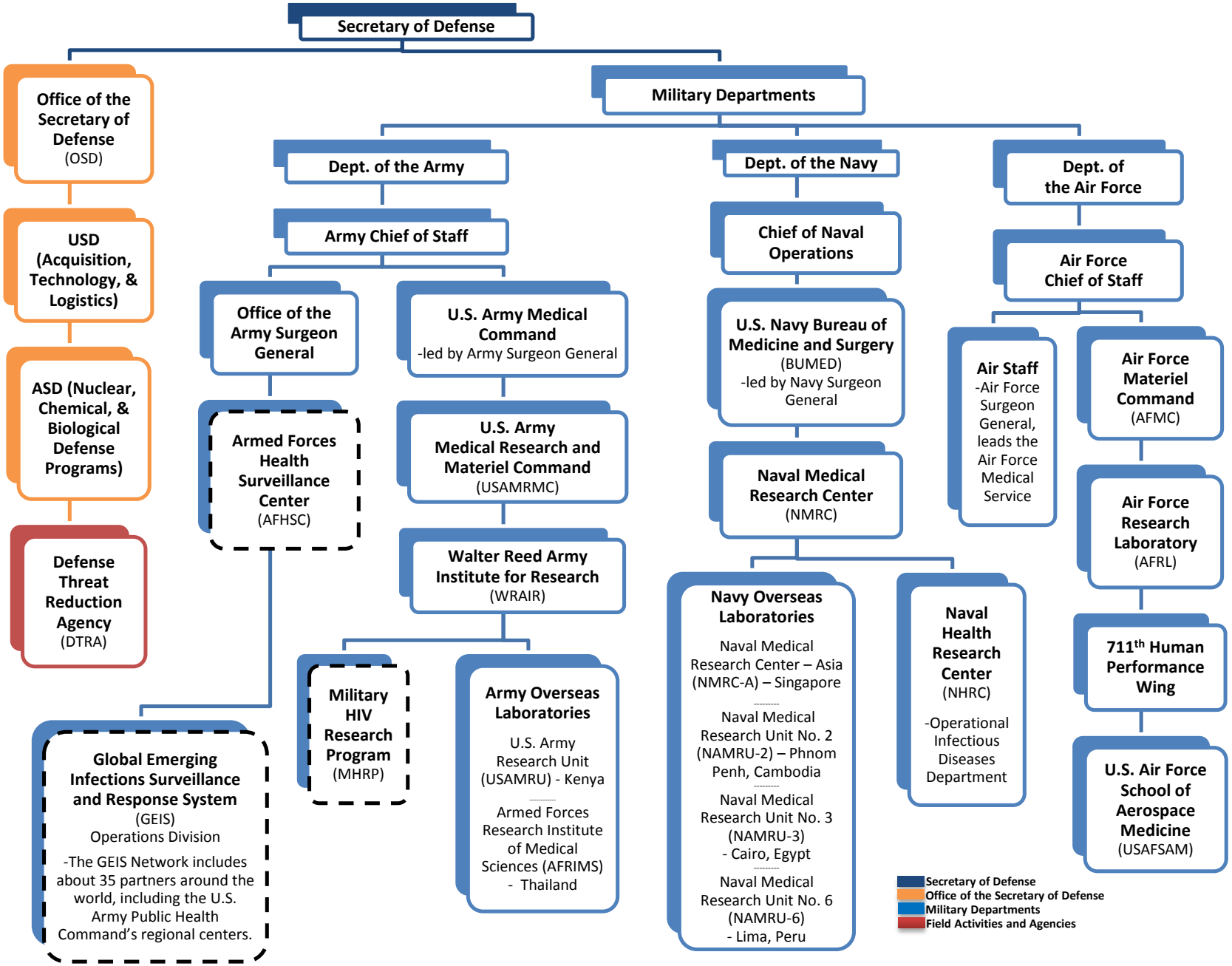
Although DoD's health surveillance efforts monitor for a range of infectious diseases, certain diseases are considered to be of particular importance to the department due to their capability "to cause serious outbreaks in military populations."[33] Among these are respiratory infections, especially influenza; gastrointestinal infections; febrile and vector-borne infections, such as malaria, Japanese encephalitis, and dengue fever; antimicrobial resistant organisms; and sexually-transmitted infections.[34]

Organization

Responsibilities for infectious disease surveillance are spread across DoD; the activities of the military health surveillance systems of each armed service[35] are complemented by global infectious disease surveillance activities carried out by DoD organizations, including DoD overseas laboratories. Most of DoD's efforts that are particularly related to international surveillance (see Figure 2) are pulled together under the Global Emerging Infections Surveillance and Response System (GEIS), which was established in 1997 to "provide a mechanism within the DoD to centralize coordination of surveillance efforts conducted through DoD overseas medical research and development laboratories" and became part of the Armed Forces Health Surveillance Center (AFHSC) in 2008.[36] GEIS plays a key role in global infectious disease surveillance and the "assessment of public health threats affecting U.S. service members and host country partners."[37] Through its network of about 35 partners (including Army and Navy overseas laboratories, the Naval Health Research Center (NHRC), U.S. Air Force School of Aerospace Medicine (USAFSAM), and U.S. Army Public Health Command regional centers), GEIS identifies and supports response efforts to outbreaks of diseases like influenza, cholera, dengue fever, and hepatitis in many countries.[38]

Additionally, DTRA's investments in research on disease surveillance technologies and other health surveillance efforts (as part of its threat reduction efforts to prevent, prepare for, detect, and respond to chemical and biological threats) also support DoD's broader infectious disease health surveillance efforts. As stated in the 2010 *Quadrennial Defense Review*, "Detecting, diagnosing, and determining the origin of a pathogen will enable U.S. authorities to better respond to future disease outbreaks and identify whether they are natural or man-made," and the expanded DoD biological threat reduction program's efforts are a key component in DoD's efforts "to create a global network for surveillance and response."[39]

FIGURE 2. ORGANIZATION OF DOD HEALTH SURVEILLANCE ACTIVITIES FOCUSED ON INFECTIOUS DISEASES*



NOTES: -- line around a box indicates a joint activity across military departments.

Coordination

DoD works closely with a number of USG and other partners in collecting and analyzing this information, in addition to sharing infectious disease data collected by these systems with a range of partners. For example, the worldwide network of GEIS partners allow the disease surveillance system to have a global reach; several CDC Global Disease Detection Centers are co-located at DoD overseas laboratory sites, including NAMRU-3 in Egypt;[40] and DoD influenza surveillance activities contribute to WHO's Global Influenza Surveillance System.[41]

FHP EDUCATION AND TRAINING FOR U.S. PERSONNEL

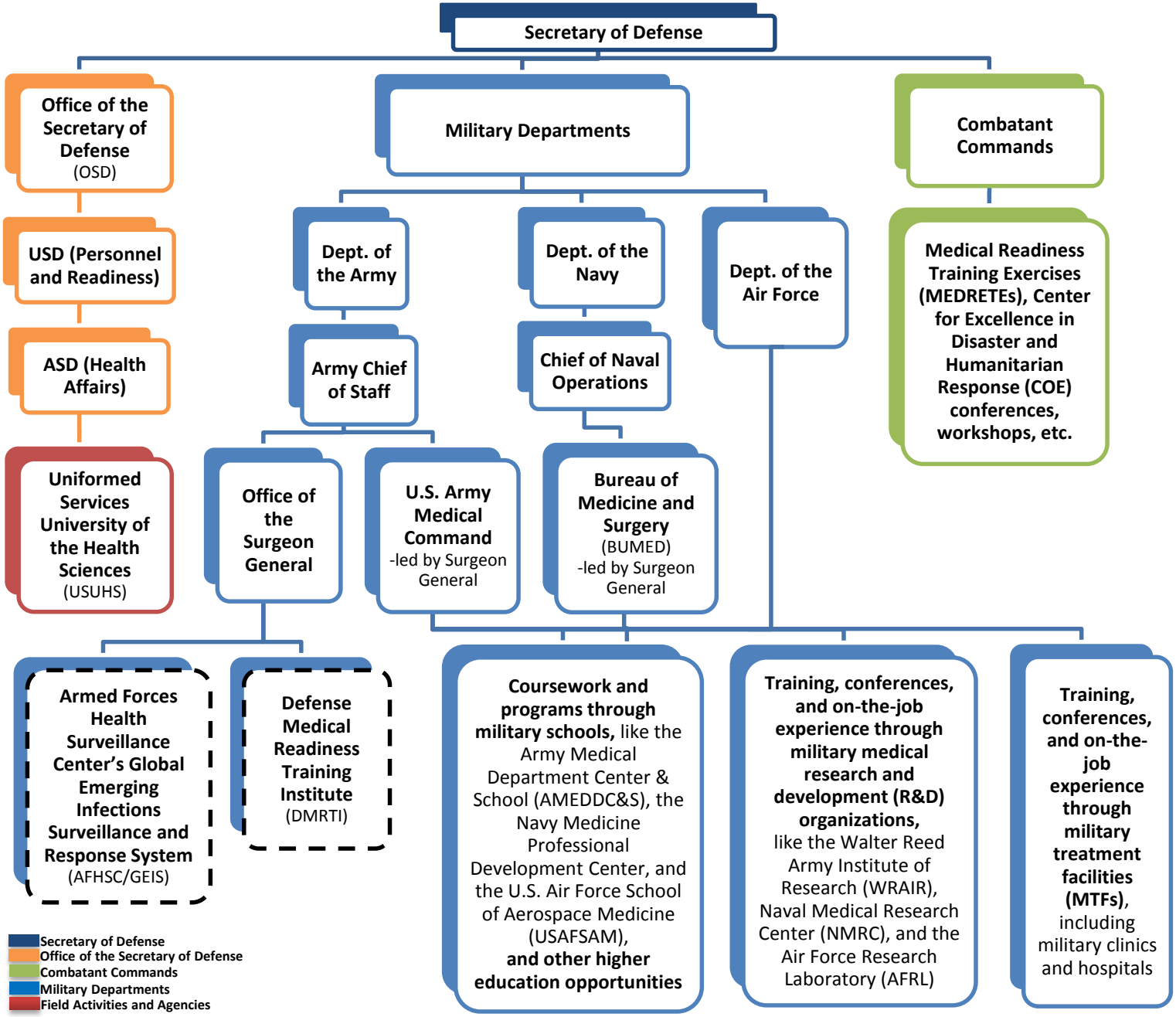
DoD supports education and training programs in infectious diseases for U.S. military personnel, including formal academic training (like short courses, certification programs, or full graduate degree programs) and experiential, on-the-job training and professional development activities (field experiences or conferences).

Organization

Key DoD organizations and institutions involved in these activities include (see Figure 3):

- DoD academic institutions, including the military departments' medical education institutions, which offer courses of study in emerging infectious diseases as well as tropical medicine and hygiene and provide opportunities for military medical personnel to learn about and experience tropical medicine and/or research in an overseas setting.[42] Additionally, DoD sometimes provides support for military personnel to study infectious diseases through further education at civilian institutions.
- the Medical Commands of the U.S. military branches (the umbrella organizations for military medicine within the Air Force, Army, and Navy) and the regional Combatant Commands, which command the military operations across the military departments in their geographic areas of responsibility). Through these DoD organizations, military medical personnel may have opportunities to attend conferences or be given on-the-job training on infectious disease topics related to their jobs.[43] Another avenue for on-the-job training is through DoD hospitals and research facilities that offer experience in infectious diseases through fellowships.[44]

FIGURE 3. ORGANIZATION OF DOD FHP EDUCATION AND TRAINING FOR U.S. PERSONNEL FOCUSED ON INFECTIOUS DISEASES*



NOTES: -- line around a box indicates a joint activity across military departments.

PARTNERSHIP ENGAGEMENT

DoD supports a variety of partnership engagement activities related to infectious diseases that are "aimed at building partnerships and trust, preventing conflict, fostering stability, and/or increasing capacities of partner governments, militaries, or other organizations."[45] These include infectious disease-focused programs and technical assistance that train and educate foreign military and civilian partners on topics ranging from epidemiology and laboratory skills to HIV prevention, build infectious disease surveillance capacity in partner countries, and facilitate cooperative research related to infectious diseases with foreign partners.

Organization

Key DoD organizations involved in these activities include (see Figure 4):

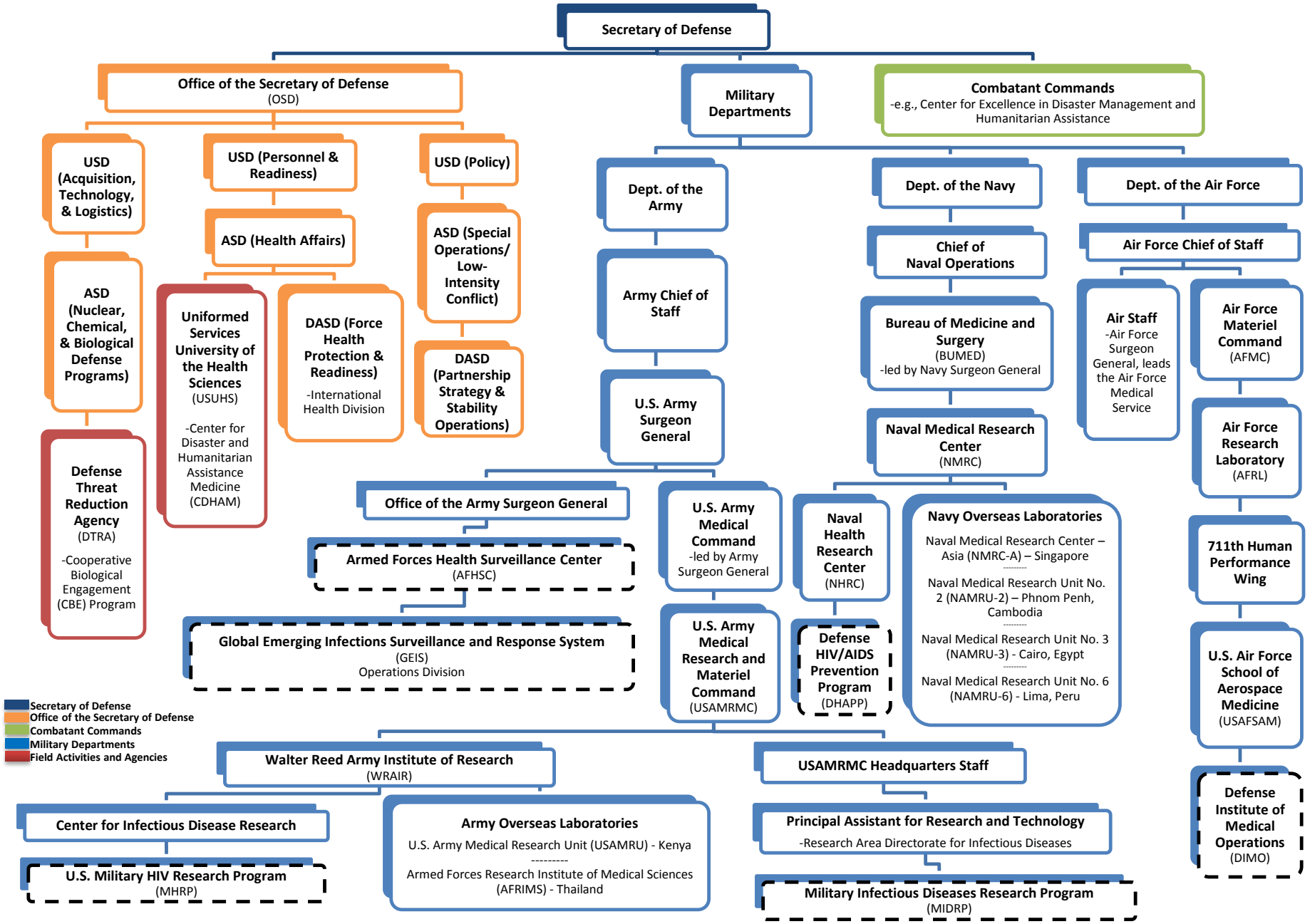
- the Defense HIV/AIDS Prevention Program (DHAPP), which assists African militaries in their prevention response to HIV among their military forces and surrounding communities (further discussed under "Spotlight on HIV/AIDS and Malaria Efforts").
- GEIS, which engages with local partners to build the core public health capacities of host nations (as laid out in the International Health Regulations (2005)) in the course of GEIS activities.[46] Through its Capacity Building Program and activities implemented by its network of partners, GEIS builds local military and civilian capacity for detecting and responding to infectious diseases by developing laboratory infrastructure and by training partners' military personnel in improved surveillance efforts, epidemiology, and emerging infectious diseases laboratory techniques.[47]
- WRAIR and other DoD medical R&D organizations like the Army and Navy overseas laboratories, which facilitate information sharing and support collaborative research on infectious diseases with military and civilian partners of other nations.
- DoD academic institutions that offer infectious diseases courses and training to foreign military personnel. Among these are the Academy of Health Sciences (AHS) of the U.S. Army Medical Department Center and School (AMEDDC&S), the Defense Institute of Medical Operations (DIMO), and USUHS, including its Center for Disaster and Humanitarian Assistance Medicine (CDHAM).[48]

Additionally, the DTRA-supported Cooperative Biological Engagement Program (CBEP) provides "education and training to enhance clinical, laboratory and epidemiological safety and security with regard to especially dangerous pathogens" to partner governments. It supports cooperative research as well as partner countries' efforts to build disease surveillance capacity in order to assist them to meet their obligations under the International Health Regulations (2005).

Coordination

DoD carries out some partnership engagement efforts in conjunction with other USG partners, including CDC and the U.S. Agency for International Development (USAID). DoD, for example, collaborates with CDC on field epidemiology and laboratory training programs,[49] and DoD, with partial funding from the USAID-supported Pandemic Response Program, helps implement training activities for African military leaders on planning for and responding to a pandemic emergency.[50]

FIGURE 4. ORGANIZATION OF DOD PARTNERSHIP ENGAGEMENT ACTIVITIES FOCUSED ON INFECTIOUS DISEASES*



NOTES: -- line around a box indicates a joint activity across military departments.

SPOTLIGHT ON HIV/AIDS AND MALARIA EFFORTS

DoD focuses a significant amount of support and funding on efforts to address HIV/AIDS and malaria, two of the most important infectious disease challenges in global health. This section spotlights DoD activities related to these two diseases and describes their relationship to the broader USG global health enterprise.

HIV/AIDS EFFORTS

DoD has long invested in efforts to prevent and treat HIV/AIDS as a matter of force health protection as well as national security. From the late 1980s to the early 2000s, the growing HIV/AIDS epidemic came to be seen as a threat to "stability and security" overseas by both the U.S. government (as in the 1987 National Intelligence Council report *Sub-Saharan Africa: Implications of the AIDS Pandemic*[52]) and international bodies (like the UN Security Council in Resolution 1308 from 2000, which drew attention to the potential impact of the disease on the health of uniformed services personnel as well as the broader community).[53] Due to the recognition of the threat posed by HIV/AIDS to U.S. military personnel, the military forces of partner countries, and peacekeeping efforts, DoD has been involved in HIV prevention, treatment, care, and research activities for decades (see Figure 5).

FIGURE 5. DOD'S GLOBAL HIV/AIDS EFFORTS: SELECTED MILESTONES[51]

1980s

- **1985:** Routine HIV testing of enlistees began
- **1986:** U.S. Army developed the initial HIV disease staging system, a clinical tool used to evaluate the progression of the disease
- **1986:** U.S. Military HIV Research Program (MHRP) authorized by Congress
- **1987:** NAMRU-3 (Egypt) became WHO Collaborating Center for HIV/AIDS

1990s

- **1990s:** U.S. military began HIV prevention training specifically targeted toward those already living with HIV
- **1997:** MHRP launched first HIV-1 vaccine trial with non-B protein
- **1999:** U.S. government's Leadership and Investment in Fighting an Epidemic (LIFE) Initiative launched, with DoD focusing its efforts on HIV prevention programming in sub-Saharan Africa

2000s – Present

- **2001:** DoD's LIFE Initiative effort renamed the Defense HIV/AIDS Prevention Program (DHAPP), a Navy-led effort to help African militaries to prevent HIV within their armed forces
- **2003:** MHRP-led study of RV144 – the largest Phase III study of an HIV vaccine regimen- began in Thailand
- **2004:** PEPFAR began providing funding support for some DoD global HIV/AIDS activities
- **2006:** MHRP characterized new circulating recombinant forms of HIV in East Asia
- **2009:** RV144 study results showed it to be the first HIV vaccine that is modestly effective in preventing HIV infection
- **2013:** MHRP initiated large, long-term cohort study – the African Cohort Study (AFRICOS), the first of its kind in sub-Saharan Africa – evaluating its PEPFAR-funded HIV prevention, treatment, and care services

Key Activities and Programs

DoD supports a wide array of global HIV/AIDS activities across the force health protection and partnership engagement focus areas. With regard to FHP activities, DoD's HIV efforts include: developing "countermeasures," such as prevention interventions, drug treatments (therapeutics), and vaccines; tracking the epidemic through surveillance; and FHP education and training on HIV to its personnel through both its academic institutions (which provide specialized courses on HIV prevention, treatment, and care) and its public health organizations (which educate DoD personnel about HIV prevention). With regard to partnership engagement activities, DoD helps partner countries plan HIV prevention strategies to address the threat of HIV/AIDS among their armed forces and, in certain overseas areas, provides prevention, treatment, and care services to foreign uniformed personnel and civilians living with HIV/AIDS and others affected by HIV/AIDS.

Many of these activities are carried out by the two major DoD programs focused on global HIV/AIDS; they are broadly coordinated with other USG efforts through the U.S global HIV program, the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) and, in some countries, carry out PEPFAR-supported activities.

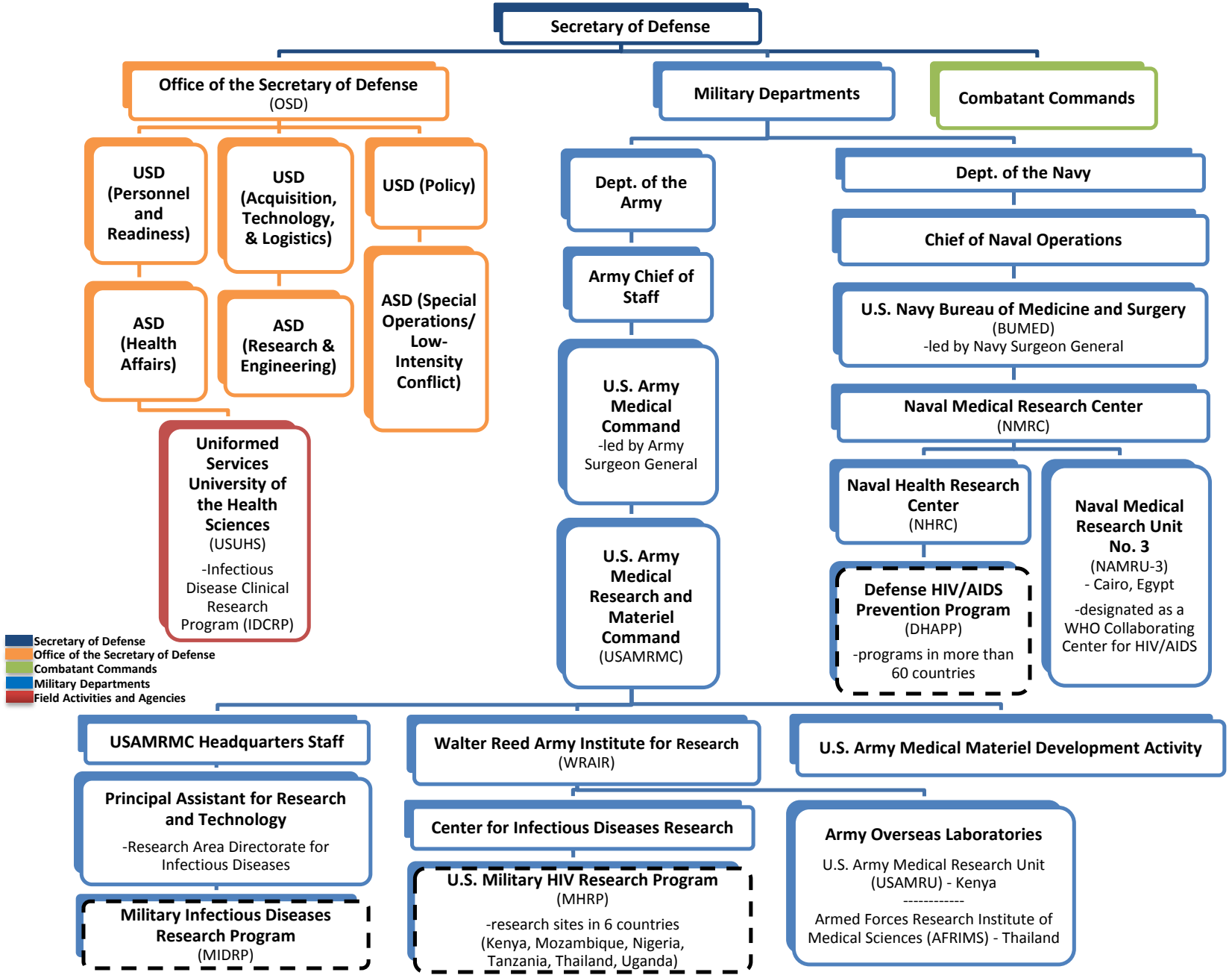
- the Defense HIV/AIDS Prevention Program (DHAPP),[54] which helps partner militaries in more than 60 countries worldwide by assisting them in developing and executing an effective HIV prevention strategy. Launched in 2001, DHAPP builds on U.S. military expertise in HIV prevention, including its experience with the "prevention with positives" approach to HIV prevention in the 1990s,[55] which recognized the importance of teaching prevention strategies to those living with HIV as well as to others. Additionally, DHAPP also refers foreign uniformed personnel who are identified as HIV positive to existing U.S. global HIV/AIDS efforts (i.e., PEPFAR programs) offering treatment and care, where possible.
- the U.S. Military HIV Research Program (MHRP),[56] which brings together DoD HIV research and development across the services (as coordinated under the Military Infectious Diseases Research Program (MIDRP)). MHRP has contributed to advances in HIV research since its inception in 1986 and today remains a key actor in USG efforts to develop a vaccine for HIV, playing a key role in designing, evaluating, and testing candidate HIV vaccine products through laboratory and clinical research. Importantly, in 2009, the program reported the results from an MHRP-led clinical trial for an HIV vaccine candidate (RV144), showing an HIV vaccine to have modest protective efficacy for the first time. The program has also had a role in inventing, co-developing, or participating in the evaluation of some antiretroviral drugs (therapeutics research[57]) as well as in HIV diagnostics. Additionally, it supports epidemiological studies to improve understanding of HIV's spread and to estimate its impact among certain populations, particularly in countries where it may ultimately establish a research site. MHRP activities also aim to track the HIV epidemic among U.S. active duty military forces around the world and to assess the risk of HIV and related infections to U.S. and allied forces overseas.[58] As part of its ethical obligations in executing HIV vaccine trials at overseas research sites, MHRP provides PEPFAR-supported HIV prevention, treatment, and care services to military and civilian populations in communities where it conducts clinical research in several countries in sub-Saharan Africa.[59]

Organization

Key DoD organizations involved in DHAPP, MHRP, and other global HIV/AIDS activities include (see Figure 6):

- the Naval Health Research Center (NHRC), which is home to DHAPP and oversees its military-to-military efforts (as the Navy is the DoD lead on HIV prevention activities with foreign militaries). While DHAPP efforts are planned and executed in coordination with the regional Combatant Commands and in-country teams, DHAPP carries out activities overseas through direct military-to-military support as well as through funding universities and non-governmental organizations.
- the U.S. Army Medical Research and Material Command's MIDRP, which includes HIV in its portfolio and supports and coordinates DoD HIV/AIDS R&D at various DoD organizations, including WRAIR (as the Army is the DoD lead on HIV research and development activities).
- WRAIR's Center for Infectious Disease Research, which is home to MHRP. In addition to HIV research conducted at its main facility in Maryland, WRAIR supports HIV research through the Army overseas laboratories and additional research sites; MHRP currently conducts studies in six countries: Kenya,

FIGURE 6. ORGANIZATION OF DOD GLOBAL HIV/AIDS EFFORTS*



NOTES: -- line around a box indicates a joint activity across military departments.

Mozambique, Nigeria, Tanzania, Thailand, and Uganda. Additionally, WRAIR – through MHRP – carries out PEPFAR-supported programs in Kenya, Nigeria, Tanzania, and Uganda, where MHRP has a field presence through its HIV clinical research and vaccine trials.

- the Navy overseas laboratory in Egypt, NAMRU-3, which supports HIV research and other HIV-related efforts.
- the Uniformed Services University for Health Sciences (USUHS), which supports USUHS faculty research on HIV/AIDS and hosts the Infectious Disease Clinical Research Program (IDCRP) that helps facilitate interagency collaboration on HIV research.

Additionally, the Henry M. Jackson Foundation for the Advancement of Military Medicine provides program support to the military's HIV research efforts.[60]

Coordination

DoD global HIV/AIDS efforts are coordinated with a range of USG and external partners; some examples are below.

USG Interagency Partners. DoD's HIV/AIDS efforts are coordinated with other USG agencies; these interactions may take place through formal mechanisms (like joint scientific projects and formal interagency working groups and initiatives) and informal means (like professional relationships). Some key examples include:

- DoD participation in PEPFAR. As the USG umbrella program that brings together global HIV/AIDS activities and funding across the USG, PEPFAR supports a process through which DoD coordinates planning and implementation of its international HIV/AIDS prevention, treatment, and care activities in several countries (as overseen by DHAPP and implemented by DHAPP and MHRP) with other USG agencies. PEPFAR-participating agencies include the Department of State, USAID, NIH, and CDC. The PEPFAR coordination process, which is managed by the State Department's Office of the Global AIDS Coordinator (OGAC), requires the submission of annual country operational plans that include DoD's global HIV/AIDS activities (when funded by PEPFAR in-country) and allows DoD representatives to be involved in PEPFAR leadership or technical working groups.
- interagency working groups and agreements. Key among these are an interagency agreement on HIV vaccine research that supports MHRP collaborations with NIH/NIAID;[61] the MHRP Research Coordinating Team and Research Oversight Team, which brings together DoD and NIH personnel to ensure the coordination of military HIV research with civilian-funded HIV research;[62] and IDCRP, which aims to support DoD clinical research on HIV (among other infectious diseases) through stronger collaborative relationships among DoD and NIH/NIAID investigators as well as other partners.[63]

Other Countries and Organizations. Globally, DoD coordinates and collaborates on HIV with other developed and developing countries as well as other organizations, including international and multilateral organizations, non-governmental organizations (NGOs), the private sector, and academia. Some partnership engagement examples include military-to-military activities (like DHAPP) that aim to strengthen the DoD relationship with foreign militaries and governments; engagement in international organizations' working groups, such the United Nations Joint Programme on AIDS' (UNAIDS) Global Uniformed Services Task Force on HIV and the United Nations Children's Fund's (UNICEF) child soldiers group; and DoD-supported HIV prevention projects

with other militaries and their surrounding communities that are sometimes carried out by or in conjunction with NGOs. Some medical R&D examples include the NAMRU-3 laboratory's status as a WHO Collaborating Centre for HIV/AIDS and DoD collaborations with research institutions both within and outside the U.S. (such as the Kenya Medical Research Institute (KEMRI)) and with private sector companies (such as pharmaceutical companies) to research and develop new HIV products.[64] A key example of the latter is a relatively new public-private partnership known as the Pox-Protein Public-Private Partnership (P5), which was formed in 2010 to build on the promising results of the RV144 HIV vaccine candidate clinical trial by seeking to "accelerate progress towards an effective and durable HIV vaccine."[65] The P5 members include MHRP, NIH/NIAID, the HIV Vaccines Trials Network, the Gates Foundation, Sanofi Pasteur, and Novartis Vaccines and Diagnostics.

MALARIA EFFORTS

As a long-time health threat and operational challenge to military forces, malaria has been a high priority for the U.S. military for more than a century (see Figure 7). Today, malaria continues to pose a significant threat to U.S. troops' health and readiness and to U.S. military operations in many regions: It is currently identified by DoD as the number one infectious disease threat to its global activities. This section provides an overview of the activities, organization, and coordination efforts of DoD global malaria efforts.

Key Activities and Programs

DoD supports malaria activities for both FHP and partnership engagement. As "the largest single program of medical research in the history of the Army,"[67] malaria R&D efforts supported by DoD are extensive, focusing on "countermeasure" development (including prevention tools such as vaccines and vector control products such as insecticides and mosquito bed nets) and drug treatment for the disease. In fact, the malaria vaccine candidate currently at the most advanced stage of development - known as RTS,S - was co-developed by the U.S. military. Additionally, the department conducts worldwide malaria disease surveillance, FHP education related to malaria, and partnership engagement efforts that range from technical assistance to capacity building efforts with local partners.

FIGURE 7. DOD'S GLOBAL MALARIA EFFORTS: SELECTED MILESTONES[66]

1900s – 1970s

- **1903:** Army instituted first successful large-scale malaria prevention program in support of Panama Canal Construction
- **1940s:** Atabrine used effectively as a prophylactic drug against malaria in the Pacific Theater of WWII
- **1944:** DDT used by Army malaria control teams for mosquito control in the Pacific Theater of WWII
- **1950s:** DoD and USDA co-developed DEET, a repellent widely used for vector control
- **1964–1973:** Military discovered asymptomatic malaria during Vietnam conflict

1980s – Present

- **1982:** WRAIR began research toward first efficacious malaria vaccine in a large scale trial (RTS,S)
- **1989:** New malaria drug mefloquine, co-developed by military researchers, licensed in the U.S.
- **1992:** The drug doxycycline, co-developed by military researchers, approved for use as antimalarial
- **2002:** NMRC and partners completed genetic sequencing of *P. falciparum* malaria parasite, part of Malaria Genome Project
- **2009:** WRAIR participated in the first Phase III trial of a malaria vaccine (RTS,S) in Africa
- **2011:** RTS,S malaria vaccine trial's initial results showed it reduced the risk of malaria infection by half in African children

Many of these activities are implemented through DoD's two malaria programs and vector control program, which are:

- the Army's Military Malaria Research Program, which conducts research into malaria drug treatments and prophylaxis[68] and malaria vaccines (including RTS,S).[69]

- the Navy Malaria Program, which is focused on malaria vaccine research, including discovery research (i.e., "understanding the nature of protective immunity") and clinical trials.[70]
- the MIDRP Vector Control Program, which supports research into vector control products with application to the U.S. military, such as insecticide use, cots with built-in insecticide-treated nets and face paint integrated with repellant.[71]

The malaria vaccine research aspects of these two programs are coordinated under the umbrella of the U.S. Military Malaria Vaccine Program (USMMVP), which is a joint activity[72] that brings together resources and personnel at NMRC and WRAIR to develop an effective malaria vaccine.[73] DoD organizations involved in USMMVP work with a number of partners within and outside the USG to fund and undertake the development of an efficacious malaria vaccine. Additionally, DoD overseas laboratories often serve as hubs of clinical trial research for malaria vaccine candidates.[74]

Organization

Most DoD global malaria efforts are carried out by the Army and Navy, though a number of other DoD organizations also implement these activities. Key organizations involved in these activities include (see Figure 8):

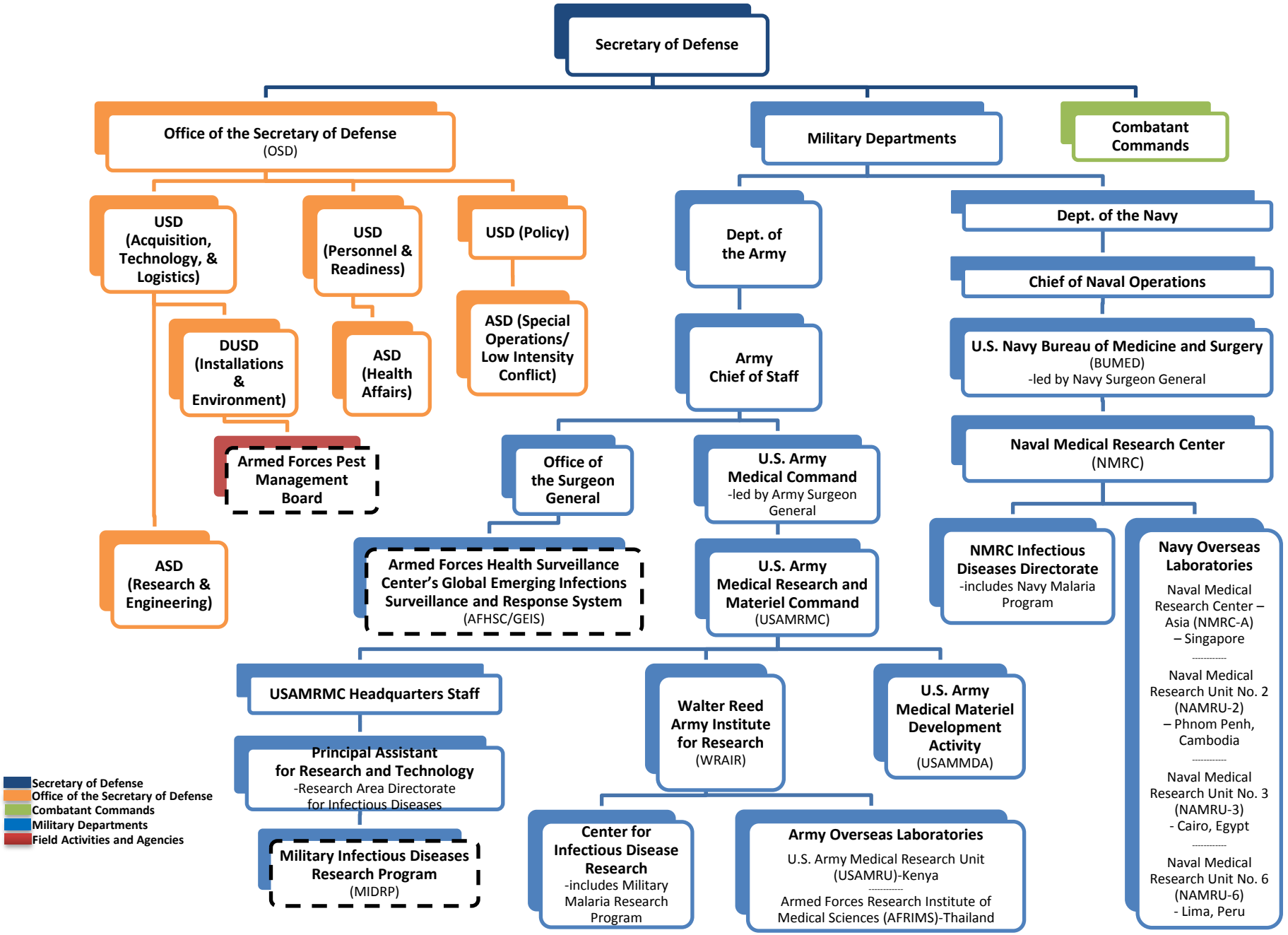
- MIDRP, which includes malaria in its portfolio and supports and coordinates DoD malaria R&D at various DoD organizations, including WRAIR (as the Army is the DoD lead on military malaria research and development activities) and the Armed Forces Pest Management Board (which is part of the MIDRP Vector Control Program, along with WRAIR's Entomology Branch).[75]
- WRAIR, which houses the Army's Military Malaria Research Program and the WRAIR Entomology Branch under the WRAIR Center for Infectious Disease Research.[76] In addition to malaria research conducted at WRAIR's main facility in Maryland, the Army overseas laboratories and field sites also are involved in conducting malaria research and field trials (including malaria vaccine trials), training local partners in malaria microscopy and diagnostics, and malaria surveillance activities.[77]
- NMRC, which houses the Navy Malaria Program under its Infectious Diseases Directorate's Malaria Research Department. Navy overseas laboratories and their field sites also are involved in conducting malaria research and field trials.[78]
- GEIS, which supports worldwide disease surveillance efforts focused on malaria through its network of partners. This malaria surveillance system provides critical data (such as that resulting from its ongoing monitoring of the spread of drug-resistant malaria in Southeast Asia and to other regions) that informs the work of scientists as well as public health practitioners, among others.[79] GEIS network partners also help build local capacity by training local staff in, for example, malaria microscopy and by providing technical assistance to partner countries.

Coordination

DoD malaria efforts are coordinated with resources and personnel from USG interagency partners and other countries and organizations. Some examples are below.

USG Interagency Partners. Across the USG interagency, DoD coordinates its malaria activities with those of other USG agencies, including CDC, NIH/NIAID (including the Malaria Vaccine Development Branch), USAID

FIGURE 8. ORGANIZATION OF DOD GLOBAL MALARIA EFFORTS*



NOTES: -- line around a box indicates a joint activity across military departments.

(through the President's Malaria Initiative (PMI) as well as the USAID Malaria Vaccine Development Program (MVDP)), and the U.S. Department of Agriculture (USDA). The nature of this coordination and collaboration varies, depending on the project and the partners: Interagency coordination may be formal (e.g., through DoD's involvement in interagency working groups or with other USG agencies in DoD's scientific and advisory committees related to malaria) or may be informal (e.g., through professional relationships among military and civilian researchers or through interactions on joint projects). Some key examples of such coordination include DoD participation in the Federal Malaria Vaccine Coordinating Committee[80] as well as two interagency agreements – one between WRAIR and USAID and the other between NMRC and USAID – that facilitate DoD's efforts to train foreign health care personnel in selected countries with PMI support (as outlined in their PMI Malaria Operational Plans (MOPs) each year)[81] and to advance malaria vaccine research with USAID/MVDP support.[82] (This funding support is described under "Spotlight on HIV/AIDS and Malaria Funding.")

Other Countries and Organizations. DoD also collaborates on global malaria efforts with other countries and organizations, including other developed countries (such as Australia, whose Australian Army Malaria Institute has played an important role in tracking the spread of drug-resistant malaria to the Pacific region as the only part of the GEIS network in this region), developing countries (whose research institutions are often critical to carrying out field trials), international organizations (such as WHO), non-governmental organizations (such as PATH, which hosts the Malaria Vaccine Initiative), the private sector (such as GlaxoSmithKline, the co-developer of the RTS,S malaria vaccine candidate), and collaborating academic institutions (in Africa, Asia, and South America).

Often, DoD malaria efforts coordinate and collaborate with a combination of these partners. For example, the malaria vaccine development efforts of the U.S. Military Malaria Vaccine Program (USMMVP) have involved both USG partners (such as USAID/MVDP and NIAID) and other partners (such as PATH, GlaxoSmithKline, and research institutions in host nations).[83]

FUNDING

This section summarizes publicly available information on DoD funding streams that support infectious disease activities in general and then describes DoD and other USG funding streams for DoD's HIV/AIDS and malaria activities specifically. It is important to note that identifying and tracking DoD funding for DoD's infectious disease efforts is often difficult for several reasons. For one, the DoD budget is marked by complexity and a long time-horizon; funding streams are also difficult to identify, since these activities are often supported by broader program elements/funding lines but not specifically mentioned in accompanying public descriptions of these funding streams. Additionally, the lack of availability of detailed public information and the partial support of the department's efforts in this area by external, non-DoD funding streams also contribute to this challenge. (For background information on the DoD budget process and global health-related funding streams, see the KFF report *The Department of Defense and Global Health*).

DOD INFECTIOUS DISEASE FUNDING

Congress appropriated funding to support DoD infectious disease efforts through most, if not all, of DoD's four main component budgets – the Air Force, Army, Navy, and "Defense-Wide" budgets — during FY 2012, the

most recent year for which data are available. Based on publicly available information as well as personal communication with DoD officials, Table 1 identifies at least 21 funding streams that support infectious disease efforts at DoD (see Appendix C for more detailed information). Additionally, it is important to note that non-DoD funding streams provide additional support for DoD infectious disease efforts; these include funds from other USG agencies (including the State Department, USAID, and NIH) and external partners (including foundations and the private sector). Given the difficulty of obtaining such data, this funding is not reflected in the table.

As Table 1 shows, most DoD infectious disease funding is provided to the Army, with smaller amounts provided

TABLE 1. DOD FUNDING STREAMS SUPPORTING GLOBAL HEALTH-RELATED ACTIVITIES FOCUSED ON INFECTIOUS DISEASES: BY BUDGET COMPONENT AND TITLE, FY 2012[84]
(in U.S. $ millions)

Project	Implementing Organization	FY 2012+
DEFENSE-WIDE/DEFENSE HEALTH PROGRAM RDT&E		
Infectious Disease Research (USUHS)	USUHS	0.396
Infectious Disease Research	the appropriate Joint Program Committee on DHP RDT&E funds	33.589^
Lab Support (Navy)	Navy Bureau of Medicine and Surgery	33.555^
Peer-Reviewed Medical Research	CDMRP	50.000^
Global HIV/AIDS Prevention (Navy)	NHRC/DHAPP	8.000
Warfighter Protection from Disease-Carrying Insects (Army)	Army Medical Command/ AFPMB	5.077
OCONUS Laboratory Infrastructure Support (Army)	Army Medical Command	2.966^
ARMY RDT&E		
Medical Research and Development Command	WRAIR, USAMRIID, and TATRC	3.575
Basic Research—Medical Research in Infectious Diseases	WRAIR, NMRC	10.693
System Biology and Network Science	USAMRMC	2.128
DoD Medical Defense Against Infectious Diseases	WRAIR, Army overseas labs, USAMRIID, NMRC, Navy overseas labs	16.842
HIV Exploratory Research	WRAIR, Army overseas labs, NMRC, Navy overseas labs	9.117
Infectious Disease Vaccines and Drugs	WRAIR, USAMRIID, NMRC	18.234
Medical Protection Against HIV	WRAIR, Army overseas labs	6.577
Military HIV Research	WRAIR, Army overseas labs, NMRC, Navy overseas labs	15.975
DoD Drug & Vaccine Advanced Development	Military labs, civilian pharmaceutical firms	11.970
Military HIV Vaccine & Drug Development	USAMMDA, USAMRMC	2.273
Military HIV Vaccine and Drug Development	USAMMDA, USAMRMC	3.742
Infectious Disease Drug and Vaccine Engineering Development	USAMMDA, USAMRMC	8.238
NAVY RDT&E		
Infectious Organisms of Military Relevance	Office of Naval Research	0.150
P. Falciparum Malaria Vaccine for Military Personnel	NMRC	3.774

NOTES: +Funding levels reflect amounts attributed to infectious disease activities within this program element or project except where ^ indicates this is the overall funding level for a project, of which only a portion is directed to infectious diseases specifically. Many of these funding streams are subject to the Office of the Secretary of Defense and Joint Chiefs' guidance and oversight. RDT&E means Research, Development, Test, and Evaluation.

through the Defense-wide Defense Health Program (DHP) budget and to the Navy. However, DHP infectious disease funding is usually transferred to the Army and Navy, which carry out most infectious disease efforts. Not included in Table 1 are funding streams that support GEIS efforts as well as threat reduction activities that may relate to infectious diseases. GEIS reports a FY 2012 funding level of $47.149 million, but since the specific funding streams that provide this funding could not be identified, this funding is not included in the table. Due to the parameters of this report, threat reduction funding that supports infectious disease efforts (e.g., Cooperative Biological Engagement Program (CBEP) funding, which was about $260 million in FY 2012) was not included in this analysis.

HIV/AIDS AND MALARIA FUNDING

Illustrative of the complexity of identifying and tracking these many funding streams for DoD infectious disease efforts, the mixed sources of support for DoD's global HIV/AIDS and malaria efforts are described below.

HIV/AIDS FUNDING

DoD HIV/AIDS activities are supported by funding from both within and outside DoD, with sources and levels of funding support for DoD global HIV/AIDS efforts under DHAPP and MHRP varying over the years (see Table 2). In FY 2012, overall support for DoD global HIV/AIDS activities from DoD and other USG sources was at least $183 million, of which about two-thirds supported MHRP activities and one-third supported DHAPP

TABLE 2. DHAPP AND MHRP FUNDING: DOD AND OTHER USG FUNDING STREAMS, FY 2007 – FY 2012[85]
(in U.S. $ millions)

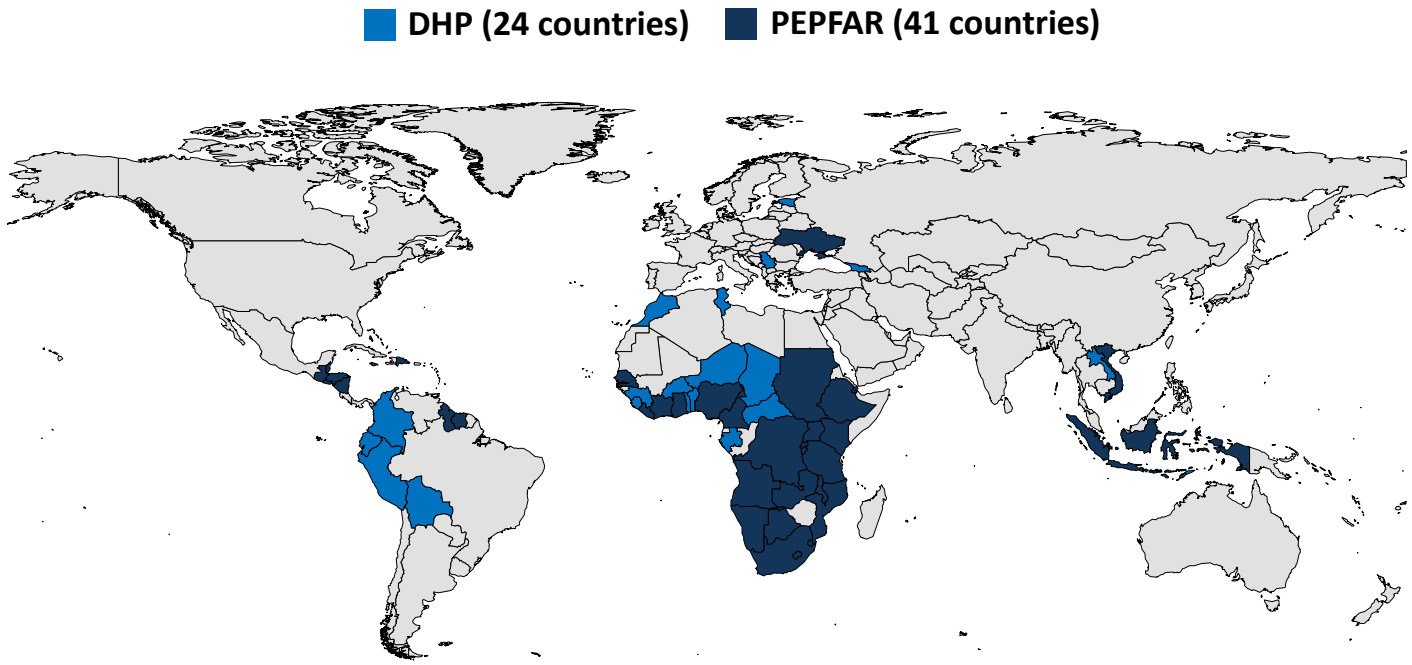
Funding Stream	FY07	FY08	FY09	FY10	FY11	FY12
MILITARY HIV RESEARCH PROGRAM						
Army CSI+	6.0	5.0	7.0	23.0	20.0	16.0
Army RDT&E S&T+	18.5	18.3	18.5	15.9	15.9	16.2
Army RDT&E Adv. Dev.+	4.7	4.5	4.8	5.9	7.4	6.3
Other USG Funding Streams	65.1	83.6	105.0	125.7	106.0	89.9
PEPFAR	40.6	59.7	64.5	72.2	86.7	47.2
NIH/NIAID Div. of AIDS	24.5	23.9	40.5	53.5	19.3	42.7
subtotal	*94.2*	*111.4*	*135.4*	*170.6*	*149.3*	*128.4*
DEFENSE HIV/AIDS PREVENTION PROGRAM (DHAPP)						
Defense-wide/DHP RDT&E CSI+	0.0	8.2	8.0	10.0	10.0	8.0
Other USG Funding Streams	33.3	41.0	62.5	49.5	61.4	47.1
FMF	1.3	1.2	1.2	0.2	0.0	0.0
PEPFAR	32.0	39.8	61.3	49.3	61.4	47.1
subtotal	*33.3*	*49.2*	*70.5*	*59.5*	*71.4*	*55.1*
TOTAL	**127.5**	**160.6**	**205.9**	**230.2**	**220.6**	**183.5**

NOTES: Includes funds directly appropriated to DoD for DHAPP and MHRP activities as well as other USG funding transferred from the Department of State (through Foreign Military Financing, FMF, and the President's Emergency Plan for AIDS Relief, PEPFAR) and the National Institutes of Health (NIH) to DoD that supports DHAPP and MHRP activities. RDT&E means Research, Development, Test, and Evaluation. CSI means congressional special interest. S&T means science and technology. Adv. Dev. means advanced development. DHP means Defense Health Program. + Funding streams included are drawn from the following: Army CSI – PE 0603807A, Project T16; Army RDT&E S&T – PE 0602787A, Project 873 and PE 0603105A, Project H29; Army RDT&E Adv. Dev. – PE 0603807A, Project 811 and PE 0604807A, Project 812; DHP RDT&E CSI – PE 0603115HP, Project 300A. Beginning in FY 2014, the military HIV research program funding is transferred from Army to DHP (PE 0602115HP, Project 447A and PE 0603115HP, Project 448A). Data may differ from data in Appendix B due to source date differences.

efforts. Most (75%) of this funding came from non-DoD funding sources (namely PEPFAR and NIH), with the remainder drawn from DoD funding streams. Additionally, non-USG funding supporting these efforts was provided by private and non-profit entities, such as foundations and collaborative research efforts, which may also receive USG funding support for HIV efforts; however, given the difficulty of obtaining such data, this funding is not reflected in the table.

DoD HIV/AIDS country activities are often subject to different requirements and processes depending on their source of funding, and different funding mechanisms vary in which partners weigh in on how funds are spent. For example, each DHAPP country program is supported by one of two funding streams (see Figure 9), and the particular funding source for a DHAPP country program determines what process is used to determine the activities carried out in that country.[86] In other words, DHAPP activities in Angola are funded by PEPFAR (and

FIGURE 9. DHAPP COUNTRY PROGRAMS BY SOURCE OF FUNDING, FY 2012*



NOTES: DHAPP programs in 65 countries were supported by FY 2012 Department of State/President's Emergency Plan for AIDS Relief (PEPFAR) funds (41 countries) and Defense Health Program (DHP) funds (24 countries).

implemented by either DHAPP or MHRP in the field), so these activities are programmed as part of the PEPFAR country operational plan (COP) for Angola. The COP brings together the global HIV/AIDS activities supported by USG agencies in a specific country in order to ensure coordination, and each COP must be approved by the U.S. Global AIDS Coordinator in the State Department. In contrast, DHAPP programs in Benin are funded with only DoD support (through the Defense Health Program (DHP)), so program planning is internal to the DHAPP program, with annual plans approved by a DHAPP Board and perhaps developed with some PEPFAR input.

MALARIA FUNDING

Similarly to HIV, DoD malaria activities are supported by funding from both within and outside DoD, with

sources and levels of funding support for DoD global malaria activities through the Army and Navy varying over the years (see Table 3). In FY 2012, DoD and other USG funding for DoD malaria research and development activities was at least $30.98 million, of which about three-quarters supported the Army program and the remaining quarter supported the Navy program. The vast majority (82%) of USG funding for DoD malaria projects came from DoD funding streams, with the remainder (18%) from USAID. Additionally, non-USG funding supporting these efforts was provided by private and non-profit entities, such as foundations and collaborative research initiatives, which may also receive USG funding support for malaria efforts[87] however, given the difficulty of obtaining such data, this funding is not reflected in the table.

TABLE 3. DOD MALARIA FUNDING: DOD AND OTHER USG FUNDING STREAMS, FY 2007 – FY 2013[88]
(in U.S. $ millions)

Funding Stream	FY07	FY08	FY09	FY10	FY11	FY12	FY13
MILITARY MALARIA PROGRAM (ARMY)							
Army RDT&E+	20.390	20.893	21.649	20.975	21.142	21.512	23.123
Other USG Funding Streams	1.373	2.607	1.972	3.135	2.803	2.904	2.000^
USAID GHP	1.373	2.607	1.972	3.135	2.803	2.904	2.000^
NAVY MALARIA PROGRAM							
Navy RDT&E+	*	*	*	*	*	3.774	2.002
Other USG Funding Streams	1.068	1.663	1.499	0.970	2.015	2.794	0.000
USAID GHP	1.068	1.663	1.499	0.970	2.015	2.794	0.000

NOTES: Includes funds directly appropriated to DoD for malaria activities as well as other USG funding transferred USAID's Global Health Programs (GHP) account to DoD that supports DoD malaria activities. USAID GHP for the Army includes USAID/MVDP and USAID/PMI funds. USAID GHP for the Navy includes USAID/MVDP funds. RDT&E means Research, Development, Test, and Evaluation. + Army RDT&E funding is drawn from PE 0603002A, Project 810; PE 0602787A, Project 870; PE 0601102A, Project S13. Navy RDT&E funding is drawn from PE 0604771N, Project 0933. ^ Does not include FY 2013 PMI funding allocations to countries, as FY 2013 MOPs are not yet publicly available. * indicates that Navy malaria funding levels for this fiscal year were not publicly available at the time of publication. Data may differ from data in Appendix B due to source date differences.

Like DoD global HIV/AIDS efforts, DoD global malaria efforts in some countries may be subject to different requirements and processes depending on their source of funding. For example, WRAIR receives some USAID funding through the President's Malaria Initiative (PMI) to conduct various malaria activities in selected countries; as a result, these activities are programmed under USAID's Malaria Operational Plans (MOPs) and approved by the U.S. Global Malaria Coordinator at USAID. In FY2012 this meant the $1.6 million planned for WRAIR malaria activities in Kenya, Nigeria, and Tanzania under PMI were described in these country MOPs and approved by USAID, whereas other DoD overseas malaria activities funded by DoD were subject to other requirements and funding and oversight processes.

CONCLUSION

Given the breadth and depth of DoD's engagement in infectious disease efforts as well as the intersection of these activities with other USG global health efforts, understanding the extent and nature of DoD engagement is important when examining the U.S. government's contributions to fighting infectious diseases overall. This report provided an overview of the range of DoD's infectious disease activities, outlined the organization of these efforts and the ways in which they are coordinated with other actors; and identified the DoD funding streams that support them. It also described DoD's global HIV/AIDS and malaria activities in-depth, including elucidating DoD and other USG funding streams for each. As it shows:

- DoD's engagement with various activities related to infectious diseases is long-standing and driven primarily by force health protection and readiness, though partnership engagement is an area of significant and growing activity.
- DoD investments in this area play an important role in many areas, such as: advancing medical research and development related to these diseases, developing innovative strategies and tools for prevention and control, and protecting the health of U.S. military personnel[89] and civilians at home and abroad.
- DoD's work in this area has a global reach, working to improve local health capabilities and capacity in many developing countries.
- DoD infectious disease programs are coordinated across services to some degree.[90]
- Many of these efforts are carried out in collaboration with other USG agencies, including CDC, NIH, the State Department, and USAID; non-governmental organizations; and a range of other bilateral, multilateral, private sector, and academic partners. Indeed, today DoD's infectious disease efforts are part of broader U.S. global health efforts that address infectious diseases like HIV, malaria, neglected tropical diseases, and influenza.
- As with other DoD global health engagement efforts, identifying and tracking funding streams remains challenging, though some efforts have been made to centralize some infectious disease funding flows, as through MIDRP.
- Addressing infectious diseases is likely to continue to be a key part of DoD's portfolio of global health-related activities, given the continuing threat that infectious diseases pose to the health of DoD personnel as well as national security and their potential impact on force readiness.

APPENDIX A. ACRONYMS

TABLE A. ACRONYMS	
AFHSC:	Armed Forces Health Surveillance Center
AFPMB:	Armed Forces Pest Management Board
AFRICOM:	Africa Command
AFRIMS:	Armed Forces Research Institute of Medical Sciences
AFRL:	Air Force Research Laboratory
AHS:	Academy of Health Sciences
AMEDDC&S:	Army Medical Department Center and School
BUMED:	Bureau of Medicine and Surgery
CBEP:	Cooperative Biological Engagement Program
CDC:	U.S. Centers for Disease Control and Prevention
CDHAM:	Center for Disaster and Humanitarian Assistance Medicine
CDMRP:	Congressionally-Directed Medical Research Program
CONUS:	Continental United States
COE:	Center for Excellence in Disaster and Humanitarian Response
COP:	Country Operational Plan
CRADA:	Cooperative Research and Development Agreement
CSI:	Congressional Special Interest
DEET:	Diethyl-meta-toluamide
DHAPP:	Defense HIV/AIDS Prevention Program
DHP:	Defense Health Program
DIMO:	Defense Institute for Medical Operations
DMRTI:	Defense Medical Readiness Training Institute
DoD:	U.S. Department of Defense
DTRA:	Defense Threat Reduction Agency
FDA:	U.S. Food and Drug Administration
FHP:	Force Health Protection
GEIS:	Global Emerging Infections Surveillance and Response System
HIV/AIDS:	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
IDCRP:	Infectious Disease Clinical Research Program
ILIR:	Investigator-Led In-House Research
KEMRI:	Kenya Medical Research Institute
KFF:	Kaiser Family Foundation
LIFE:	Leadership and Investment in Fighting an Epidemic initiative
MEDCAP:	Medical Civic Action Program
MEDRETE:	Medical Readiness Training Exercise
MHRP:	Military HIV Research Program
MHS:	Military Health System
MIDRP:	Military Infectious Disease Research Program
MOP:	Malaria Operational Plan
MTF:	Military Treatment Facility
MVDP:	Malaria Vaccine Development Program
NAMRU:	Naval Medical Research Unit
NGO:	Non-Governmental Organization
NHRC:	Naval Health Research Center
NIAID:	National Institute for Allergy and Infectious Disease
NIH:	National Institutes of Health
NMRC:	Naval Medical Research Center
NSTC:	National Science and Technology Council
OCONUS:	Outside the Continental United States
OGAC:	Office of the Global AIDS Coordinator
OSD:	Office of the Secretary of Defense
P5:	Pox-Protein Public-Private Partnership
PATH:	Formerly the Partnership for Advancing Technologies for Health
PDD:	Presidential Decision Directive
PE:	Program Element
PEPFAR:	U.S. President's Emergency Plan for AIDS Relief
PMI:	President's Malaria Initiative

TABLE A. ACRONYMS	
R&D:	Research and Development
RAD:	Research Area Directorate
RDT&E:	Research, Development, Test, and Evaluation
TATRC:	Technology and Research Centre
U.S.:	United States
UN:	United Nations
UNAIDS:	United Nations Joint Programme on AIDS
UNICEF:	United Nations Childrens Fund
USAFSAM:	U.S. Air Force School of Aerospace Medicine
USAID:	U.S. Agency for International Development
USAMMDA:	U.S. Army Material Development Agency
USAMRIID:	U.S. Army Research Institute for Infectious Disease
USAMRMC:	U.S. Army Medical Research and Materiel Command
USAMRU:	U.S. Army Medical Research Unit
USDA:	U.S. Department of Agriculture
USG:	U.S. Government
USMMVP:	U.S. Military Malaria Vaccine Program
USUHS:	Uniformed Services University for Health Sciences
WHO:	World Health Organization
WRAIR:	Walter Reed Army Institute for Research
WWII:	World War II

APPENDIX B. DOD INFECTIOUS DISEASE FUNDING STREAMS, FY 2012

TABLE B. DOD FUNDING STREAMS SUPPORTING GLOBAL HEALTH-RELATED ACTIVITIES FOCUSED ON INFECTIOUS DISEASES: BY BUDGET COMPONENT AND TITLE, FY 2012[91]
(in U.S. $ millions)

Project Information and Implementing Organization	Description	FY 2012 Funding+
DEFENSE-WIDE/DEFENSE HEALTH PROGRAM (DHP) RDT&E		
Infectious Disease Research (USUHS) Budget Activity 2: RDT&E PE 00601101HP: In-House Laboratory Independent Research (ILIR), Project 240A: Infectious Disease (USUHS) Uniformed Services of the Health Sciences (USUHS)	"The ILIR program at USUHS is designed to answer fundamental questions of importance to the military medical mission of the Department of Defense in the areas of Combat Casualty Care, Infectious Diseases, Military Operational Medicine, and Chemical, Biological, and Radiologic Defense." The project supported infectious disease research focused on the "immunology and molecular biology of bacterial, viral and parasitic disease threats to military operations. These threats include Bartonella bacillliformis, Clostridium difficile, E. coli and their Shiga toxins, Henipaviruses (Hendra & Nipah), Hepatitis A, Helicobacter pylori, HIV, HTLV-1, Leishmaniasis, Malaria, Neisseriae gonorrhea, Shigella spp., Streptococcus, Staphylococcus, and Typhoid fever."	0.396
Infectious Disease Research Budget Activity 2: RDT&E PE 0602115HP: Applied Biomedical Technology, Project 372A: GDF Applied Biomedical Technology Overseen by the appropriate Joint Program Committee on DHP RDT&E funds	This supported "refining concepts and ideas into potential solutions to military problems and conducting analyses of alternatives to select the best potential solution for further advanced technology development. …Military infectious diseases research saw significant progress [in FY 2012] in two platforms for rapid screening of pre-transfused whole blood for pathogens. …Supported multi-year studies initiated in FY10 and FY11 to transition the most appropriate efforts in development of antibacterial agents for biofilms (a thin layer of microorganisms adhering to the surface of a structure) and multidrug-resistant organisms (MDROs), detection of MDROs, and biomarker and diagnostic assay development to Medical Technology Development."	33.589^
Lab Support (Navy) Budget Activity 2: RDT&E PE 0603115HP: Medical Technology Development, Project 243A: Medical Development (Lab Support) (Navy) Navy Bureau of Medicine and Surgery	This "includes funds for research management support costs. The Outside Continental US (OCONUS) laboratories conduct focused medical research on vaccine development for Malaria, Diarrhea Diseases, and Dengue Fever. In addition to entomology, HIV studies, surveillance and outbreak response under the Global Emerging Infectious Surveillance (GEIS) program and risk assessment studies on a number of other infectious diseases that are present in the geographical regions where the laboratories are located. The CONUS laboratories conduct research on Military Operational Medicine, Combat Casualty Care, Diving and Submarine Medicine, Infectious Diseases, Environmental and Occupational Health, Directed Energy, and Aviation Medicine and Human Performance."	33.555^
Peer-Reviewed Medical Research Budget Activity 2: RDT&E PE 0603115HP: Medical Technology Development, Project 300A: CSI – Congressional Special Interests, Congressional Add – 400A: Peer-Reviewed Medical Research CDMRP	This supported "peer reviewed medical research. The vision of the program is to identify and fund the best medical research to protect and support warfighters, veterans, and other beneficiaries and to eradicate diseases that impact these populations. Research proposals submitted to the Fiscal Year 2012 (FY12) program must focus on at least one of the 22 Congressionally-directed topics. These topic areas are: …Listeria vaccines for infectious diseases; malaria; …. and tuberculosis."	50.000^

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(in U.S. $ millions)

Project Information and Implementing Organization	Description	FY 2012 Funding+
DEFENSE-WIDE/DEFENSE HEALTH PROGRAM (DHP) RDT&E		
Global HIV/AIDS Prevention (Navy) Budget Activity 2: RDT&E PE 0603115HP: Medical Technology Development, Project 300A: CSI – Congressional Special Interests, Congressional Add – 540A: Global HIV/AIDS Prevention (Navy) Naval Health Research Center's Defense HIV/AIDS Prevention Program (NHRC/DHAPP)	This provided support for DHAPP, which "conducts on-site visits to determine eligible areas for technical assistance and resource support." It "provides support to defense forces in … (1) HIV prevention, which includes training of medical personnel and peer educators, education of military members, provision of condoms and other prevention materials, provision of educational materials such as brochures, posters, and booklets (2) care for HIV-infected individuals and their families to include provision of electronic medical record programs, medications to treat HIV-related issues, physician education, and clinic infrastructure support, (3) treatment services including provision of laboratory services such as HIV test kits, and other laboratory equipment, and (4) Strategic Information including systems to collect information on the effectiveness of HIV treatment and prevention programs and generate databases of such information to guide treatment and prevention programs."	8.000
Warfighter Protection from Disease-Carrying Insects (Army) Budget Activity 2: RDT&E Component of PE 0603115HP: Medical Technology Development, Project 830A: Deployed Warfighter Protection (Army) Army Medical Command/Armed Forces Pest Management Board (AFPMB)	For the Army Medical Command, this supported the AFPMB "Deployed Warfighter Protection project for the development of new or improved protection of ground forces from disease carrying insects."	5.077
OCONUS Laboratory Infrastructure Support (Army) Budget Activity 2: RDT&E Component of PE 0606105HP: Medical Program-Wide Activities, Project 432A: OCONUS Laboratory Infrastructure Support (Army) Army Medical Command	This provided "for Army medical overseas research laboratory support of existing OCONUS laboratories and the new laboratory in the Republic of Georgia." For FY 2012, "infrastructure sustainment costs consist of the administrative and facility functions at the three laboratory sites, which support medical research and development of products such as biologics, drugs, and devices to treat/prevent polytrauma injuries and infectious diseases."	2.966^
ARMY RDT&E		
Medical Research and Development Command Budget Activity 1: Basic Research PE 0601101A: In-House Laboratory Independent Research, Project 91-C: ILIR-Med R&D Cmd WRAIR, USAMRIID, and TATRC	This project's "research areas address countermeasures against infectious diseases, defense against environmental extremes and operational hazards to health, mechanisms of combat trauma and innovative treatment and surgical procedures, and medical chemical/biological warfare threats." FY12 research included "studied the evolution of RNA genome viruses under immune system selective pressure to improve vaccine design: Theory, modeling, and validation; Investigated the use of recombinant reovirus particles as environmentally stable oral vaccine vectors against bioweapon threat agents; Enhanced understanding the role of the Sap proteins (particular type of proteinase protein) in	3.575

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(in U.S. $ millions)

Project Information and Implementing Organization	Description	FY 2012 Funding+
ARMY RDT&E		
Medical Research and Development Command *continued*	disease causing capability of microorganisms (pathogenesis); Investigated genetic determinants which contribute to the intracellular survival and replication of Burkholderia pseudomallei (a gram negative bacterium often associated with infections); Evaluated the basic science of filovirus (includes Ebola and Marburg viruses which cause serious often fatal hemorrhagic disease) neutralization and peptide entry inhibitors (proteins which inhibit infection)."	
Basic Research—Medical Research in Infectious Diseases Budget Activity 1: Basic Research PE 0601102A: Defense Research Sciences, Project S13: Sci BS/Med Rsh Inf Dis WRAIR and NMRC	"Infectious disease threats from malaria, diarrhea, and dengue are the highest priorities for basic research. Research conducted in this project focuses on the following four areas: (1) Prevention/Treatment of Parasitic (symbiotic relationship between two organisms) Diseases; (2) Bacterial Threats; (3) Viral Threats; and (4) Diagnostics and Disease Transmission Control."	10.693
System Biology and Network Science Budget Activity 1: Basic Research PE 0601102A: Defense Research Sciences, Project T64: Sci BS/System Biology And Network Science USAMRMC	This supported "research investigations through a modernized systematic approach that uses iterative computer simulation with mathematical modeling and biological information to analyze and refine biological studies. The information gained from these studies provides a better understanding of the overall biological system and its molecular network of interactions, which leads to improved early strategic decision-making in the development of preventive and treatment solutions to diseases. This approach establishes a model for application of systems biology processes and knowledge of biological networks to discover medical products that prevent and/or treat diseases or medical conditions. This more complex, yet integrated approach, to studying biological systems could potentially reduce both the time and expense of medical product development for the Army."	2.128
DoD Medical Defense Against Infectious Diseases Budget Activity 2: Applied Research PE 0602787A: Medical Technology, Project 870: Dod Med Def Ag Inf Dis WRAIR and Army overseas labs, USAMRIID, and NMRC and Navy overseas labs	This supported "applied research for medical countermeasures to naturally occurring infectious diseases that pose a significant threat to the operational effectiveness of forces deployed outside the United States. Effective preventive countermeasures (protective/therapeutic drugs and vaccines and insect repellents and traps) protect the Force from disease and sustain operations by avoiding the need for evacuations from the theater of operations. Diseases of military importance are malaria, bacterial diarrhea, and viral diseases (e.g., dengue fever and hantavirus). In addition to countermeasures, this project funds refinement of improved diagnostic tools to facilitate early identification of infectious disease threats in an operational environment, informing Commanders of the need to institute preventive actions and improve medical care. …Research conducted in this project focuses on the following five areas: (1) Drugs to Prevent/Treat Parasitic (living in or on another organism) Diseases; (2) Vaccines for Prevention of Malaria; (3) Diagnostics and Disease Transmission Control; (4) Bacterial Disease Threats (diseases caused by bacteria); (5) Viral Disease Threats (diseases caused by viruses)."	16.842

TABLE B. DOD FUNDING STREAMS SUPPORTING GLOBAL HEALTH-RELATED ACTIVITIES FOCUSED ON INFECTIOUS DISEASES: BY BUDGET COMPONENT AND TITLE, FY 2012[91]
(in U.S. $ millions)

Project Information and Implementing Organization	Description	FY 2012 Funding+
ARMY RDT&E		
HIV Exploratory Research Budget Activity 2: Applied Research PE 0602787A: Medical Technology, Project 873: HIV Exploratory Rsch WRAIR and Army overseas labs, and NMRC and Navy overseas labs	This supported "research on HIV, which causes AIDS. Work in this area includes refining improved identification methods to determine genetic diversity of the virus and evaluating and preparing overseas sites for future vaccine trials. Additional activities include refining candidate vaccines for preventing HIV and undertaking preclinical studies (studies required before testing in humans) to assess vaccine for potential to protect and/or manage the disease in infected individuals. This program is jointly managed through an Interagency Agreement between USAMRMC and [NIH/NIAID]. …The Henry M. Jackson Foundation (HMJF), located in Rockville, MD provides support for FDA testing and other research under a cooperative agreement."	9.117
Infectious Disease Vaccines and Drugs BA 3: Advanced Technology Development PE 0603002A: Medical Advanced Technology, Project 810: Ind Base Id Vacc&Drug WRAIR, USAMRIID, and NMRC	"This project maturates and demonstrates FDA-regulated medical countermeasures such as drugs, vaccines, and diagnostic systems to naturally occurring infectious diseases that are threats to U.S. military deployed forces. The focus of the program is on prevention, diagnosis, and treatment of diseases that can adversely impact military mobilization, deployment, and operational effectiveness. …The project also supports testing of personal protective measures that can reduce disease transmission from biting insects and other vectors to include products such as repellents and insecticides…. Research conducted in this project focuses on the following five areas: (1) Drugs to Prevent/Treat Parasitic (living in or on another organism) Diseases; (2) Vaccines for Prevention of Malaria; (3) Bacterial Disease Threats (diseases caused by bacteria); (4) Viral Disease Threats (diseases caused by viruses); (5) Diagnostics and Disease Transmission Control."	18.234
Medical Protection Against HIV Budget Activity 3: Advanced Technology Development PE 0603105A: Military HIV Research, Project H29: Med Protect Agnst Hiv WRAIR and Army overseas labs	This supported "research to develop candidate HIV vaccines, to assess their safety and effectiveness in human subjects, and to protect the military personnel from risks associated with HIV infection. In addition, it is designed to find ways to protect the blood supply from contamination with HIV virus. …This program is jointly managed through an Interagency Agreement by USAMRMC and NIAID. …Significant work is conducted under a cooperative agreement with the Henry M. Jackson Foundation, Bethesda, MD."	6.577
Military HIV Research Budget Activity 3: Advanced Technology Development PE 0603105A: Military HIV Research, Project T16: MILITARY HIV INITIATIVES CA WRAIR and Army overseas labs, NMRC and Navy overseas labs	"This is a Congressional Interest Item." Activity supported by this funding "matures and demonstrates advanced technology of candidate human immunodeficiency virus (HIV) vaccines, prepares and conducts human clinical studies to assess safety and efficacy of candidate HIV vaccines, conducts research to control HIV infection in military environments, protects the military blood supply from HIV, and protects military personnel from risks associated with the HIV infection. …This program is jointly managed through an Interagency Agreement by [USAMRMC], [NIH], and [NIAID]. …The Henry M. Jackson Foundation, located in Bethesda, MD, provides support for FDA testing and other research under cooperative agreement."	15.975
DoD Drug & Vaccine Advanced Development	This "funds development of candidate medical countermeasures for infectious diseases of military relevance. Efforts include vaccines, drugs, diagnostic kits/devices, and insect control	11.970

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(in U.S. $ millions)

Project Information and Implementing Organization	Description	FY 2012 Funding+
ARMY RDT&E		
DoD Drug & Vaccine Advanced Development *continued* Budget Activity 4: Advanced Component Development & Prototypes PE 0603807A: Medical Systems – Advanced Development, Project 808: DoD Drug & Vacc Ad Military labs, civilian pharmaceutical firms	measures. These funds support human clinical efficacy trials of the drug/vaccine in a larger group that are designed to assess performance and to continue safety assessments in a larger group of volunteers." Further, "product development priorities are determined based upon four major factors: (1) the extent and threat of the disease within the Combatant Commands theater of operations, (2) the clinical severity of the disease, (3) the technical maturity of the proposed solution, and (4) the affordability of the solution (development and production)."	
Military HIV Vaccine & Drug Development Budget Activity 4: Advanced Component Development & Prototypes PE 0603807A: Medical Systems – Advanced Development, Project 811: Mil HIV Vacc&Drug Dev USAMMDA, USAMRMC	This "funds the development of military relevant human immunodeficiency virus (HIV) medical countermeasures. It provides funding for planning and conducting of human clinical trials in a group of healthy volunteers to assess the drug/vaccine for safety, tolerability, how the drug/vaccine is distributed, metabolized, and excreted from the body, and investigate the appropriate dose for therapeutic use." Additionally, "the major contractor is Henry M. Jackson Foundation for the Advancement of Military Medicine, Rockville, MD. Research efforts are coordinated with [NIH]."	2.273
Military HIV Vaccine and Drug Development Budget Activity 5: System Development & Demonstration PE 0604807A: Medical Materiel/Medical Biological Defense Equipment – Eng Dev, Project 812: Mil HIV Vac&Drug Dev USAMMDA, USAMRMC	This "funds military relevant human immunodeficiency virus (HIV) medical countermeasures. These funds provide for engineering and manufacturing development of candidate vaccines and drugs to permit large-scale field testing. Development focused on military unique needs effecting manning, mobilization, and deployment." Additionally, "the major contractor is The Henry M. Jackson Foundation for the Advancement of Military Medicine, Rockville, MD. Research efforts are coordinated with [NIH]."	3.742
Infectious Disease Drug and Vaccine Engineering Development Budget Activity 5: System Development & Demonstration PE 0604807A: Medical Materiel/Medical Biological Defense Equipment – Eng Dev, Project 849: Infec Dis Drug/Vacc Ed USAMMDA, USAMRMC	This "funds development of candidate medical countermeasures for military relevant infectious diseases. These products fall between four major areas: vaccines, drugs, diagnostic kits/devices, and insect control measures to limit exposure and disease transmission." Further, " Development priority is based upon four major factors: (1) the extent of the disease within the Combatant Commands' theater of operations, (2) the clinical severity of the disease, (3) the technical maturity of the proposed solution, and (4) the affordability of the solution (development, production, and sustainment). Malaria, dysentery, hepatitis , and Dengue diseases (a severe debilitating disease transmitted by mosquitoes), which are found in Africa Command, Central Command, European Command, Southern Command, and Pacific Command areas are at the top of the infectious diseases requirements list."	8.238

TABLE B. DOD FUNDING STREAMS SUPPORTING GLOBAL HEALTH-RELATED ACTIVITIES FOCUSED ON INFECTIOUS DISEASES: BY BUDGET COMPONENT AND TITLE, FY 2012[91]
(in U.S. $ millions)

Project Information and Implementing Organization	Description	FY 2012 Funding+
NAVY RDT&E		
Infectious Organisms of Military Relevance PE Budget Activity 1: Basic Research PE 0601153N: Defense Research Sciences, Project 0000: Defense Research Sciences Office of Naval Research	Efforts include: Bioinspired autonomous and surveillance systems, and bio-inspired processes, materials and sensors;synthetic biology for Naval applications; casualty care and management; casualty prevention; undersea medicine/hyperbaric physiology; biorobotics; expeditionary operations training; and stress physiology. These efforts are coordinated with the Army and Air Force through joint program reviews and are complementary, not duplicative. This activity also includes Secretary of Defense directed peer-review basic research to develop innovative solutions and enhance the science and engineering base. It also includes efforts initiated under the Basic Research Challenge Program. More specifically, it includes continued work on genomics/genetics of infectious organisms of military relevance and signal of transduction.	0.150
P. Falciparum Malaria Vaccine for Military Personnel Budget Activity 5: System Development & Demonstration PE 0604771N: Medical Development, Project 0933: Medical/Dental Equipment Development NMRC	The purpose of this budget item is to develop biomedical equipment and related techniques to reduce morbidity; to enhance the logistic feasibility of modern medical care for combat casualties; to sustain casualties for evacuation to fixed medical facilities for definitive care; and to ensure that personnel are medically qualified for military duty. There is a strong potential for dual use, technology transfer, and biotechnology firms/industry participation in the projects. More specifically: Attenuated Sporozoite Malaria Vaccine for Military Personnel - Complete augmented efforts with the ongoing clinical trial effort to test, for safety and efficacy, a militarily relevant malaria vaccine regimen utilizing a promising novel vaccine candidate. Malaria vaccine research executed as partial funding of a consortium with the National Institute of Allergy and Infectious Diseases and the Malaria Vaccine Initiative. The product is the collaborative work between MVPP and a Gates Foundation researcher to develop a vaccine against Plasmodium falciparum. The approach is based on a prime/boost adenovaccine	3.774

NOTES: * Funding levels reflect amounts attributed to infectious disease activities within this program element or project except where ^ indicates this is the overall funding level for a project. Many of these funding streams are subject to OSD and Joint Chiefs' guidance and oversight in order to ensure resources are used in appropriate ways that meet major personnel, material, and logistics requirements. RDT&E means Research, Development, Test, and Evaluation. BA means Budget Activity. PE means Program Element.

ENDNOTES

** Figure Sources*

Figures 1-4, 6, 8: KFF analysis of DoD websites, policy guidance, and other official documents, and interviews with selected experts.

Figure 9: KFF map based on information provided on request by DHAPP ("DHAPP Country Programs, FY 2012 Funding (as of 5/1/13)). See endnote 86 for complete list of countries by funding source.

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[1] DoD Defense Manpower Data Center, *Total Military Personnel and Dependent End Strength Report: By Service, Regional Area, and Country*, as of Dec. 2012, SIAD 309 Report, https://www.dmdc.osd.mil/appj/dwp/reports.do?category=reports&subCat=milActDutReg.

[2] KFF, *The U.S. Department of Defense and Global Health*, Sept. 2012, #8358, http://www.kff.org/global-health-policy/report/the-u-s-department-of-defense-global/.

[3] MIDRP, "History & Achievements," webpage, https://midrp.amedd.army.mil/info/HAchieve.jsp; Andrew W. Artenstein, "History of U.S. Military Contributions to the Study of Vaccines Against Infectious Diseases," *Military Medicine*, 2005: Vol. 170, Supp. 4 (3); Jean-Paul Chretien, "Protecting Service Members in War – Non-Battle Morbidity and Command Responsibility," *New England Journal of* Medicine, Feb. 23, 2012: Vol. 366, Issue 8 (677-9).

[4] For example, one of every 67 U.S. soldiers died during the influenza pandemic that emerged at the end of World War I, while 2 of every 3 hospital admissions among U.S. soldiers during the Vietnam War were due to infections such as malaria, viral hepatitis, and diarrheal disease. MIDRP, "Influenza Vaccine," webpage, https://midrp.amedd.army.mil/info/influenza.jsp; Major General Spurgeon Neel, *Medical Support of the U.S. Army in Vietnam, 1965-1970*, 1991, Vietnam Studies, Department of the Army, http://www.history.army.mil/books/Vietnam/MedSpt/MedSpt-FM.htm.

[5] MIDRP, "History & Achievements," webpage, https://midrp.amedd.army.mil/info/HAchieve.jsp; Andrew W. Artenstein, "History of U.S. Military Contributions to the Study of Vaccines Against Infectious Diseases," *Military Medicine*, 2005: Vol. 170, Supp. 4 (3); WRAIR, "Walter Reed Army Institute of Research – Publications," webpage, http://wrair-www.army.mil/OtherServices_Library_Publication.aspx, WRAIR, *WRAIR Index of Publications 2009 Revised,* 2009, http://wrair-www.army.mil/Documents/Library/Publications/WRAIR_2009_index.pdf.

[6] Julian J. Ewell and Ira A. Hunt, Jr., *Sharpening the Combat Edge: The Use of Analysis to Reinforce Military Judgment*, Department of the Army, 1995.

[7] The White House, "Emerging Infectious Diseases," Presidential Decision Directive NTSC-7, June 12, 1996; DoD, Quaddrennial Defense Review (QDR), 2010; The White House, National Security Strategy, May 2010.

[8] For example, the 2000 National Intelligence Council (NIC) publication *The Global Infectious Disease Threat and Its Implications for the United States* observed the emergence or re-emergence of at least 50 infectious diseases since 1973, and multiple reports from the Institute of Medicine (IOM) (e.g., *The Impact of Globalization on Infectious Disease Emergence and Control*) have warned of the consequences of infectious diseases for the U.S. and the world as a whole. NIC, *The Global Infectious Disease Threat and Its Implications for the United States*, NIE 99-17D, Jan. 2000; IOM, *The Impact of Globalization on Infectious Disease Emergence and Control: Exploring the Consequences and Opportunities*, workshop summary – Forum on Microbial Threats, 2006.

[9] The White House, "Emerging Infectious Diseases," Presidential Decision Directive NTSC-7, June 12, 1996.

[10] KFF analysis of DoD websites, policy guidance, and other official documents, and interviews with selected experts.

[11] Reflecting information available at the time of study, these descriptions and charts show the lines of primary administrative oversight for the key DoD global health infectious disease offices and programs; not all relevant policy development and oversight relationships in DoD are reflected herein though. For example, the Armed Forces Health Surveillance Center (AFHSC) is organizationally placed under the oversight of the Army, but the AFHSC also receives policy guidance from the Assistant Secretary of Defense for Health Affairs (ASD-HA) through the Deputy Assistant Secretary for Defense for Force Health Protection and Readiness (DASD-FHP&R). Additionally, it is important to note that although this section captures the key organizations and activities of DoD in these areas, it is not intended to be exhaustive and may not capture every effort and all supporting units.

[12] The third focus area is threat reduction, which is not included in this report except as described under "Methodology." Some activities that fall chiefly under threat reduction are mentioned as they relate to the former two focus areas; these include those activities that address naturally-occurring infectious diseases to some extent and that improve health surveillance, preparedness, and response capacities overseas.

[13] NMRC, "Infectious Diseases Research Directorate," webpage, http://www.med.navy.mil/sites/nmrc/Pages/id_main.htm.

[14] NMRC, "Infectious Diseases Research Directorate," webpage, http://www.med.navy.mil/sites/nmrc/Pages/id_main.htm.

[15] NMRC, "Malaria Roundtable: Navy Medicine Efforts in Malaria Research," presentation slides, Sept. 12, 2013.

[16] For an example of how merit review is applied within the context of medical R&D, see DoDI 3210.01, "Administration and Support of Basic Research by the Department of Defense," September 16, 2005, http://www.dtic.mil/whs/directives/corres/pdf/321001p.pdf.

[17] In FY 2012 Congress appropriated $50 million to the Peer-Reviewed Medical Research Program (PRMRP) and directed that some of this funding should support research on malaria and tuberculosis. USAMRMC's Office of Congressionally Directed Medical Research

Programs administers this program. Congressionally Directed Medical Research Programs, "Defense Health Program – Department of Defense Peer Reviewed Medical Research Program Funding Opportunities for Fiscal Year 2012," news release, Feb. 10, 2012, http://cdmrp.army.mil/pubs/press/2012/12prmrppreann.shtml.

[18] DoD budget materials.

[19] USAMRMC HQ Strategic Partnerships Office (MCMR-ZCA), *Guide to Working With The U.S. Army Medical Research and Materiel Command – USAMRMC,* Nov. 23, 2011.

[20] As a result of MIDRP and other DoD investments, DoD has co-developed "more than half of the routine vaccinations given to service members."MIDRP History and Achievements, webpage. MIDRP, "History & Achievements," webpage, https://midrp.amedd.army.mil/info/HAchieve.jsp.

[21] NMRC, "Infectious Diseases Research Directorate," webpage, http://www.med.navy.mil/sites/nmrc/Pages/id_main.htm.

[22] Naval Medical Research Center-Asia, website, http://www.med.navy.mil/sites/nmrca/SitePages/Home.aspx.

[23] A private, non-profit organization dedicated to advancing military medical research, the Henry M. Jackson Foundation was established by Congress in 1983 to support research at USUHS and other military medical entities. Henry M. Jackson Foundation for the Advancement of Military Medicine, "About HJF," webpage, http://www.hjf.org/about/.

[24] IDCRP, "About IDCRP," webpage, http://www.idcrp.org/about/idcrp.

[25] CDMRP, "Peer Reviewed Medical," webpage, last updated July 17, 2013, http://cdmrp.army.mil/prmrp/default.shtml; TATRC, "Infectious Disease," webpage, http://www.tatrc.org/ports_infectDisease_index.html; USAMMDA, "About USAMMDA," webpage, last updated March 27, 2013, http://www.usammda.army.mil/about.html; USAMMDA, "Force Health Protection Division," webpage, last updated Feb. 17, 2012, http://www.usammda.army.mil/fhp.html.

[26] USAMRIID, *USAMRIID's Medical Management of Biological Casualties Handbook*, Seventh Edition, Sept. 2011, http://www.usamriid.army.mil/education/bluebookpdf/USAMRIID%20BlueBook%207th%20Edition%20-%20Sep%202011.pdf.

[27] For example, DoD's policy guidance on basic research states that "coordination with other Federal agencies is important," so DoD organizations "are to consider other Federal agencies' basic research investments when making investment decisions, both to avoid unintended overlapping of support and to leverage those agencies' investments as appropriate." DoDI 3210.01, "Administration and Support of Basic Research by the Department of Defense," September 16, 2005, http://www.dtic.mil/whs/directives/corres/pdf/321001p.pdf.

[28] These facilitate research and other types of collaboration among DoD and other USG personnel and investigators.

[29] Negotiated and signed on to by DoD organizations and external partners, with the aim of leveraging the capabilities of each while sharing risks and costs. USAMRMC, "Military Infectious Diseases Research Program (MIDRP)," webpage, https://mrmc.amedd.army.mil/index.cfm?pageid=medical_r_and_d.midrp.overview.

[30] For example, NAMRU-6 supports collaborative grants with both U.S. and Peruvian universities. NAMRU-6, "Current Scientific Efforts," webpage, http://www.med.navy.mil/sites/NAMRU6/Pages/efforts.htm.

[31] Vassil St. Georgiev, Karl A. Western, and John J. McGowan, *National Institute of Allergy and Infectious Diseases, NIH: Volume 2: Impact on Global Health*, 2009.

[32] These are defined as "institutions such as research institutes, parts of universities or academies, which are designated by the Director-General to carry out activities in support of the Organization's programme." One example of an overseas lab that is a collaborating center is NAMRU-3, which serves as a World Health Organization (WHO) Collaborating Center for HIV/AIDS and for Emerging and Re-Emerging Infectious Diseases. WHO, "WHO collaborating centres," webpage, http://www.who.int/collaboratingcentres/en/.

[33] AFHSC, *GEIS Annual Report,* 2005, http://www.afhsc.mil/geisReports.

[34] AFHSC, "Global Emerging Infections Surveillance (GEIS) Operations," webpage, http://afhsc.army.mil/geis.

[35] All of the U.S. military branches monitor the health and readiness of U.S. military personnel (as well as the health of their dependents) in the U.S. and abroad through the military health system's (MHS) military hospitals, treatment facilities, and other reporting mechanisms; the branches also monitor the broader health environment of overseas areas to which U.S. servicemen are deployed.

[36] The White House, "Emerging Infectious Diseases," Presidential Decision Directive NTSC-7, June 12, 1996, http://www.afhsc.mil/viewDocument?file=pdd-nstc-7.pdf; AFHSC, "Global Emerging Infections Surveillance & Response System," webpage, http://afhsc.army.mil/geis.

[37] Matthew C. Johns and David L. Blazes, "International Health Regulations (2005) and the U.S. Department of Defense: building core capacities on a foundation of partnership and trust," BMC Public Health, 2010: Vol. 10, Supp. 1 (54).

[38] The global network identified 76 outbreaks in 53 countries between 2008 and 2009; among the outbreaks detected were influenza, cholera, and dengue fever, with the response activities ranging from epidemiological consultative services to laboratory diagnostic support, including deployment of personnel to assist in field efforts. Matthew C. Johns and David L. Blazes, "International Health

Regulations (2005) and the U.S. Department of Defense: building core capacities on a foundation of partnership and trust," BMC Public Health, 2010: Vol. 10, Supp. 1 (54).

[39] DoD, *Quaddrennial Defense Review (QDR),* 2010.

[40] CDC, "Global Disease Detection: Egypt," webpage, updated June 24, 2011, http://www.cdc.gov/globalhealth/gdder/gdd/egypt.htm.

[41] Ronald L. Burke, et al., "Department of Defense influenza and other respiratory disease surveillance during the 2009 pandemic," *BMC Public Health*, 2009: Vol. 11, Supp. 1.

[42] For example, USUHS offers a graduate program in emerging infectious diseases as well as tropical medicine and hygiene; USUHS and GEIS provide an opportunity for military medical personnel to learn about and experience tropical medicine and/or research in an overseas setting through the Tropical Infectious Disease Training Programs; and the Navy Medicine Professional Development Center (NMPDC) offers an annual course in Military Tropical Medicine for which Air Force, Army, and Navy physicians are eligible. USUHS, "Graduate Programs in Biomedical Sciences & Public Health," webpage, updated Jan. 28, 2013, http://www.usuhs.mil/graded/masters.html; USUHS, "Emerging Infectious Diseases Graduate Program," webpage, updated Aug. 6, 2013, http://www.usuhs.mil/eid/; USUHS/AFHSC, "USU & AFHSC Tropical Infectious Disease Training Programs," fact sheet, http://www.usuhs.mil/pmb/pdf/USU-AFHSC.pdf; Navy Medicine Professional Development Center, "Military Tropical Medicine Course," webpage, http://www.med.navy.mil/SITES/NAVMEDMPTE/COURSES/Pages/MilitaryTropicalMedicineCourse.aspx.

[43] For example, DoD scientists and researchers often present their latest work to their peers at conferences like the International Military HIV/AIDS Conference, and U.S. military medical personnel learn about and treat a range of infectious diseases when taking part in medical readiness training exercises (MEDRETEs) in another country, such as those carried out in Honduras by Southern Command's Joint Task Force-Bravo (SOUTHCOM JTF-Bravo) in Honduras since 1993. USMHRP, "2010 International Military HIV/AIDS Conference," news release, April 14, 2010, http://www.hivresearch.org/news.php?NewsID=178&GlobalID=11; Joint Task Force-Bravo, Soto Cano Air Base, Honduras, "Medical Readinesss Training Exercises (MEDRETE)," fact sheet, Feb. 27, 2013, http://www.jtfb.southcom.mil/library/factsheets/factsheet.asp?id=10291.

[44] For example, the Infectious Disease Fellowship Program at Brooke Army Medical Center in Texas and the Infectious Diseases Fellowship Training Program at the Walter Reed National Military Medical Center in the Washington, DC, area provide opportunities for specialized infectious disease medical training. Brooke Army Medical Center, "Infectious Disease Fellowship Program," webpage, last modified Oct. 30, 2012, http://www.bamc.amedd.army.mil/saushec/gme/fellowship/infectious-disease/; Walter Reed National Medical Center, "Graduate Medical Education: Infectious Diseases Fellowship Training Program," webpage, http://www.wrnmmc.capmed.mil/ResearchEducation/GME/SitePages/InternalMedicine/InfectiousDiseases/Fellowship.aspx.

[45] KFF, *The U.S. Department of Defense and Global Health*, Sept. 2012, #8358, http://www.kff.org/global-health-policy/report/the-u-s-department-of-defense-global/.

[46] The International Health Regulations provide United Nations Member States "with a mechanism and legally-binding framework to help them build public health capacities required to identify, respond and report public health emergencies of international concern." AFHSC, "Capacity Building and Other Efforts," webpage, http://afhsc.army.mil/geisCapBuild.

[47] Matthew C. Johns and David L. Blazes, "International Health Regulations (2005) and the U.S. Department of Defense: building core capacities on a foundation of partnership and trust," BMC Public Health, 2010: Vol. 11, Supp. 2 (S6).

[48] For example, the USUHS Center for Disaster and Humanitarian Assistance (CDHAM), which provides training to international military medical and laboratory staff involved with infectious diseases through partnerships with Combatant Commands, GEIS, and CBEP. It has provided training and education on topics related to emerging infectious diseases ranging from basic disease surveillance and reporting to avian and pandemic influenza planning and response. CDHAM, " Programs," webpage, http://www.cdham.org/programs; CDHAM, "Cooperative Biological Engagement Program (CBEP),"webpage, http://www.cdham.org/cooperative-biological-engagement-program-pakistan; CDHAM, "Pandemic Response Program," webpage, http://www.cdham.org/pandemic-response-program-prp; CDHAM, "Pandemic Response Program: A Progress Report," webpage, May 30, 2012, http://www.cdham.org/prp-a-progress-report.

[49] These are "applied epidemiology programs offered by CDC to help foreign countries develop, set up, and implement dynamic public health strategies to improve and strengthen their public health system and infrastructure." CDC, "Field Epidemiology Training Program (FETP)," webpage, last updated April 18, 2013, http://www.cdc.gov/globalhealth/fetp/.

[50] CDHAM, "Pandemic Response Program," webpage, http://www.cdham.org/pandemic-response-program-prp; CDHAM, "Pandemic Response Program: A Progress Report," webpage, May 30, 2012, http://www.cdham.org/prp-a-progress-report.

[51] MHRP, "About MHRP," webpages, http://www.hivresearch.org/about.php; NMRC, "Naval Medical Research Unit 3 (NAMRU-3) Cairo, Egypt," webpage, http://www.med.navy.mil/sites/nmrc/Pages/namru3.htm; USAMRMC, "Command History," webpage, http://mrmc.amedd.army.mil/index.cfm?pageid=about.history; USAMRMC, *USAMRMC: 50 Years of Dedication to the Warfighter, 1958-2008*, undated, http://mrmc.amedd.army.mil/assets/docs/about/USAMRMC_history.pdf; Richard Shaffer, "Military Medicine's Contribution to an AIDS-free Generation," AIDS.gov blog, Nov. 27, 2012, http://blog.aids.gov/2012/11/military-medicines-contribution-to-an-aids-free-generation.html.

[52] National Intelligence Council, *Sub-Saharan Africa: Implications of the AIDS Pandemic*, June 1, 1987.

[53] For further discussion of USG treatment of HIV as a security threat, see KFF, *Raising the Profile of Diplomacy in the U.S. Global Health Response: A Backgrounder on Global Health Diplomacy*, September 2012, #8360, http://www.kff.org/global-health-policy/issue-brief/raising-the-profile-of-diplomacy-in-the/.

[54] DHAPP website, http://www.med.navy.mil/sites/nhrc/dhapp/Pages/default.aspx.

[55] Richard Shaffer, "Military Medicine's Contribution to an AIDS-free Generation," AIDS.gov blog, Nov. 27, 2012, http://blog.aids.gov/2012/11/military-medicines-contribution-to-an-aids-free-generation.html.

[56] MHRP website, http://www.hivresearch.org/home.php.

[57] Through therapeutics research, it conducts studies to examine the effects some drugs (or drug combinations) have on, for example, people living with HIV or AIDS who are just initiating antiretroviral therapy or who have particular HIV-related infections.

[58] Paraphrased from MHRP, "Threat Assessment and Global Epidemiology," webpage, http://www.hivresearch.org/research.php?ServiceID=9.

[59] MHRP, "MHRP & PEPFAR," webpage, http://www.hivresearch.org/prevention.php.

[60] Henry M. Jackson Foundation for the Advancement of Military Medicine, http://www.hjf.org/.

[61] NIH, "Interagency Agreement Transfers DoD HIV Research to NIAID," news release, July 1, 2002, http://aidsinfo.nih.gov/news/616/interagency-agreement-transfers-dod-hiv-research-to-niaid.

[62] NIH, "Interagency Agreement Transfers DoD HIV Research to NIAID," news release, July 1, 2002, http://aidsinfo.nih.gov/news/616/interagency-agreement-transfers-dod-hiv-research-to-niaid.

[63] IDCRP, "About IDCRP," webpage, http://www.idcrp.org/about/idcrp.

[64] NMRC, "Naval Medical Research Unit 3 (NAMRU03) Cairo, Egypt," webpage, http://www.med.navy.mil/sites/nmrc/Pages/namru3.htm; USAMRU Kenya website, http://www.usamrukenya.org/; MHRP, "About MHRP: Partners," http://www.hivresearch.org/about.php?AboutusID=4.

[65] MHRP, "HIV Vaccines: Building on Success," fact sheet, undated, http://www.hivresearch.org/media/pnc/9/media.749.pdf.

[66] MHRP, "Military Medicine: Building on a Tradition of Success in Infectious Diseases," fact sheet, undated, http://www.hivresearch.org/media/pnc/5/media.755.pdf; USAMRMC, *USAMRMC: 50 Years of Dedication to the Warfighter, 1958-2008*, undated, http://mrmc.amedd.army.mil/assets/docs/about/USAMRMC_history.pdf; USAMRMC, "Doxycycline Information Paper," June 2, 2005, https://midrp.amedd.army.mil/pdf_files/INFO_PDF/Doxycycline.pdf; Malaria Vaccine Initiative/PATH, "Phase III safety and efficacy trial of the RTS,S malaria vaccine candidate," fact sheet, May 2013, http://www.malariavaccine.org/files/MVI-GSK-PhaseIIIfactsheetFINAL-web.pdf; The RTS,S Clinical Trials Partnership, "First Results of Phase 3 Trial of RTS,S/AS01 Malaria Vaccine in African Children," *New England Journal of Medicine*, 2011: Vol. 365, pp. 1863-1875; Robert A. Seder, et al., "Protection Against Malaria by Intravenous Immunization with a Nonreplicating Sporozoite Vaccine," *Science*, Sept. 20, 2013: Vol. 341, No. 6152, pp. 1359-1365.

[67] USAMRMC, *USAMRMC: 50 Years of Dedication to the Warfighter, 1958-2008*, undated, http://mrmc.amedd.army.mil/assets/docs/about/USAMRMC_history.pdf.

[68] The U.S. Army has had a role in inventing, co-developing, or participating in clinical trials for almost every important new antimalarial drug to be licensed since 1950, including mefloquine (Lariam) and halofantrine (Halfan). IOM, *Saving Lives, Buying Time: The Economics of Malaria Drugs in an Age of Resistance*, July 27, 2004, p. 306.

[69] WRAIR, "Military Malaria Research Program: Malaria and Leishmaniasis Drug Development and Malaria Vaccine Program," fact sheet, http://wrair-www.army.mil/Documents/PDF%20ONE%20PAGERS/MMRP.pdf.

[70] NMRC, "Infectious Diseases Research Directorate," webpage, http://www.med.navy.mil/sites/nmrc/Pages/id_main.htm; NMRC, "Malaria Research Department," webpage, http://www.med.navy.mil/sites/nmrc/Pages/id_m.htm.

[71] Lynn W. Kitchen, Kendra L. Lawrence, and Russell E. Coleman, "The Role of the United States Military in the Development of Vector Control Products, Including Insect Repellents, Insecticides, and Bed Nets," *Journal of Vector Ecology*, June 2009: Vol. 34, Issue 1, pp. 50-61.

[72] A joint activity involves personnel or other resources drawn from two or more U.S. military services.

[73] "Statement by Colonel Peter Weina, The Walter Reed Army Instituite [sic] of Research, United States Army, on the U.S. Contribution to the Fight Against Malaria," Before the House Committee on Foreign Affairs, Subcommittee on Africa, Global Health, Global Human Rights, and International Organizations, First Session, 113th Congress, May 17, 2013, http://docs.house.gov/meetings/FA/FA16/20130517/100858/HHRG-113-FA16-Wstate-WeinaC-20130517.pdf.

[74] NMRC, "Malaria Research Department," webpage, http://www.med.navy.mil/sites/nmrc/Pages/id_m.htm.

[75] For example, MIDRP provided the primary funding used to support WRAIR's research into vector control products with application to the U.S. military, such as insecticide use, cots with built-in insecticide treated nets, and face paint incorporating bug repellant. Lynn

W. Kitchen, Kendra L. Lawrence, and Russell E. Coleman, "The Role of the United States Military in the Development of Vector Control Products, Including Insect Repellents, Insecticides, and Bed Nets," *Journal of Vector Ecology*, June 2009: Vol. 34, Issue 1, pp. 50-61.

[76] WRAIR, "Military Malaria Research Program (MMRP)," webpage, http://wrair-www.army.mil/ReAndDevelop_InfectDisRe_MalariaResearch.aspx; WRAIR, "Entomology Branch," webpage, http://wrair-www.army.mil/ReAndDevelop_InfectDisRe_Entomology.aspx. WRAIR, "Center for Infectious Disease Research," webpage, http://wrair-www.army.mil/ReAndDevelop_InfectiousDiseaseResearch.aspx.

[77] WRAIR, "Subordinate Commands: USAMRU-K," webpage, http://wrair-www.army.mil/Subordinate_UsamruK.aspx; WRAIR, "Subordinate Commands: USAMC-AFRIMS," webpage, http://wrair-www.army.mil/Subordinate_Afrims.aspx; WRAIR, "Armed Forces Research Institute of Medical Sciences – AFRIMS," fact sheet, http://wrair-www.army.mil/documents/AFRIMS.pdf.

[78] NMRC, "Infectious Diseases Research Directorate," webpage, http://www.med.navy.mil/sites/nmrc/Pages/id_main.htm; NMRC, "Malaria Research Department," webpage, http://www.med.navy.mil/sites/nmrc/Pages/id_m.htm.

[79] AFHSC, "GEIS: Febrile and Vector-borne Infections," webpage, http://afhsc.army.mil/geisFebrile.

[80] "The Federal Malaria Vaccine Coordinating Committee (FMVCC) is an informal, self-appointed committee of U.S. federal scientists and physicians involved in the development of malaria vaccines. ...[Its] mission is to contribute to the global effort to control malaria and to prevent malaria in U.S. citizens traveling in endemic areas through malaria vaccine development." WRAIR and NMRC may have two representatives each to the FMVCC. FMVCC website, http://www.fmvcc.org/index.html.

[81] For example, DoD and PMI have jointly supported a program in Tanzania developing the malaria diagnostic skills of laboratory technicians. USAID, *President's Malaria Initiative FY2011 Malaria Operational Plan (MOP): Tanzania*, undated.

[82] USAID, "Malaria Vaccine Development," webpage, latest update Jan. 23, 2013, http://transition.usaid.gov/our_work/global_health/id/malaria/techareas/vaccine.html; USAID, *Health-Related Research and Development Activities at USAID: An Update on the Five-Year Strategy, 2006-2010*, Report to Congress, Oct. 2010.

[83] USAID, *Health-Related Research and Development Activities at USAID: An Update on the Five-Year Strategy, 2006-2010*, Report to Congress, Oct. 2010.

[84] KFF analysis of DoD FY 2014 budget materials for the Defense Health Program – Operation and Maintenance, Procurement, Research, Development, Test and Evaluation; Operation and Maintenance, Defense-Wide — Cooperative Threat Reduction Program; Army Research, Development, Test & Evaluation; Navy Research, Development, Test & Evaluation; and communication with DoD, May-June 2013.

[85] KFF communication with MHRP and DHAPP, May 2013.

[86] *PEPFAR-funded countries* included: Angola, Antigua and Barbuda, the Bahamas, Barbados, Belize, Botswana, Burundi, Cameron, Côte d'Ivoire, the Democratic Republic of the Congo, Djibouti, the Dominican Republic, El Salvador, Ethiopia, Ghana, Guatemala, Guyana, Honduras, Indonesia, Jamaica, Kenya, Lesotho, Liberia, Malawi, Mozambique, Namibia, Nicaragua, Nigeria, Rwanda, Saint Kitts and Nevis, Senegal, South Africa, South Sudan, Suriname, Swaziland, Tanzania, Trinidad and Tobago, Uganda, Ukraine, Vietnam, and Zambia. *DHP-funded countries* included: Benin, Bolivia, Burkina Faso, the Central African Republic, Chad, Colombia, Ecuador, Estonia, Gabon, the Gambia, Georgia, Guinea, Laos, Morocco, Nepal, Niger, Peru, Sao Tome and Principe, Serbia, Sierra Leone, Timor-Leste, Togo, Tunisia, and Union of Comoros.

[87] For example, the Medicines for Malaria Venture (MMV) receives funding support from USAID. Geoff Lamb, "The Other Department of Defense Budget?," Gates Foundation blog Impatient Optimists, Oct. 20, 2011, http://www.impatientoptimists.org/Posts/2011/10/The-Other-Department-of-Defense-Budget. Medicines for Malaria Venture, "About Us," webpages, http://www.mmv.org/about-us.

[88] KFF communication with DoD MIDRP, May 2013; DoD budget materials; and KFF communication with USAID, June 2013.

[89] For example, as a result of MIDRP and other DoD investments, DoD has co-developed "more than half of the routine vaccinations given to service members." MIDRP, "History & Achievements," webpage, https://midrp.amedd.army.mil/info/HAchieve.jsp.

[90] Some examples of where greater DoD internal coordination is generally regarded as having reduced duplication while improving interagency coordination are: the Military HIV Research Program (MHRP) and the 2008 establishment of Uniformed Services University Infectious Disease Institutional Review Board created a "single review pathway for multicenter ID [infectious disease] research, eliminating the need for multiple and repetitive scientific, ethical and second level reviews" and the Military HIV Research Program (MHRP). IDCRP, "Regulatory Affairs," webpage, http://www.idcrp.org/about/regulatory-affairs.

[91] KFF analysis of DoD FY 2014 budget materials for the Defense Health Program – Operation and Maintenance, Procurement, Research, Development, Test and Evaluation; Operation and Maintenance, Defense-Wide — Cooperative Threat Reduction Program; Army Research, Development, Test & Evaluation; Navy Research, Development, Test & Evaluation; and KFF communication with DoD, May-June 2013.

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