
CDC SURVEILLANCE AND COLLECTION SYSTEMS

National Notifiable Disease Surveillance System (NNDSS) is a database maintained by the CDC's Epidemiology Program Office. NNDSS is a mechanism for the collection and publication of surveillance data gathered by state health departments on specific diseases and conditions. The system is based on a list of notifiable diseases compiled annually by the Council of State and Territorial Epidemiologists (CSTE) in collaboration with the CDC.¹

National Electronic Disease Surveillance System (NEDSS) is a planned CDC disease surveillance network that will be developed from existing technology and data. It will be based on existing technology and will link critical healthcare facilities and components of the local emergency medical systems to public health agencies for ongoing pathogenic monitoring and reporting.²

Epidemiology and Laboratory Capacity (ELC) is a program that assists state and local health departments in developing capabilities to

¹The CDC's list of "notifiable" diseases is published annually in *Morbidity and Mortality Weekly Report* (MMWR) as "Summary of Notifiable Diseases, United States." Each year the CSTE recommends additions to and deletions from this list. Roush et al., "Mandatory Reporting of Diseases and Conditions by Health Care Professionals and Laboratories," p. 164.

²U.S. Senate, statement by James Hughes made before the Subcommittee on Technology, Terrorism and Government Information Subcommittee on Youth Violence Committee on the Judiciary, April 20, 1999, and U.S. House of Representatives, statement made by Scott Lillibridge before the Subcommittee on National Security, Veterans Affairs and International Relations Committee on Government Reform, September 22, 1999.

- identify and monitor the occurrence of infectious diseases of public health importance in a community,
- characterize disease determinants,
- identify and respond to disease outbreaks and other infectious disease emergencies,
- use public health data for priority setting and policy development, and
- assess the effectiveness of their prevention-and-control activities.³

The **Emerging Infection Program (EIP)** aims to assess both the public health impact of emerging infections and the measures used to prevent and control them. Currently operating in nine states, the EIP network sponsors the Active Bacterial Core Surveillance Program and the Foodborne Disease Active Surveillance Network (FoodNet). EIP also provides funding to selected sites for electronic, laboratory-based surveillance and reporting of meningoen­cephalitis, chronic liver disease, and acute viral hepatitis and surveillance for the Unexplained Deaths and Critical Illnesses Due to Possibly Infectious Causes project, which seeks to identify and characterize emerging pathogens.

Enhanced Surveillance Project has been developed for syndromic surveillance at special events. Syndrome baseline data are established using emergency room visit data at sentinel hospitals. The CDC analyzes the data to detect aberrations and notifies the state and local health departments of problems requiring epidemiological investigation.⁴

³CDC, "Epidemiology and Laboratory Capacity (ELC) for Infectious Diseases Cooperative Agreement," available at <http://www.cdc.gov/ncidod/osr/ELC.htm>, accessed July 11, 2001.

⁴CDC, "Enhanced Surveillance Project (ESP)," available at <http://www.bt.cdc.gov/EpiSurv/ESP.asp>, accessed August 8, 2001. This system has been used at special events, including the Democratic and Republican national conventions, the World Trade Organization meeting in Seattle, and the Super Bowl in Tampa, Florida.

Four provider-based sentinel networks have been established to monitor conditions not covered by routine health department surveillance:

- *Emergency Department Sentinel Network for Emerging Infections* is a network of 11 university-affiliated, urban hospital emergency departments for responding to new diseases or epidemics. The network currently investigates *Shiga* toxin-producing *E. coli*, rabies postexposure prophylaxis practices, and nosocomial *M. tuberculosis* transmission in emergency departments. The network plans to add studies of antimicrobial use, meningitis, and encephalitis to its agenda.⁵
- *Infectious Diseases Society of America, Emerging Infections Network* (IDSA EIN), a sentinel network of more than 700 physicians specializing in infectious diseases, grew out of a 1995 CDC Cooperative Agreement Program award to the Infectious Diseases Society of America. EIN is designed to function as an “early warning system” for the CDC by supplying information about unusual cases encountered by the network’s members.⁶ Network physicians also agree to assist the public health community by supplying information on diagnostic and therapeutic approaches to specific syndromes and infections and preliminary estimates on morbidity and mortality.⁷
- *GeoSentinel* was first funded by the CDC’s Division of Quarantine in 1996 and consists of 25 travel/tropical medicine clinics around

⁵CDC, “Surveillance Systems Home Pages and Contacts,” available at <http://www.cdc.gov/ncidod/osr/survsyss.htm#EMERGE>, accessed July 3, 2001.

⁶Infectious Disease Society of America, “Emerging Infections Network,” available at <http://www.idsociety.org/EIN/TOC.htm>, accessed July 11, 2001.

⁷Every six to eight weeks EIN members receive two-page requests for information about specific clinical entities. Members may also submit spontaneous reports. In the event of a possible outbreak, EIN members may receive e-mail or facsimile requests for information, to which they are expected to respond within 24 hours. Summaries of information collected by periodic queries, urgent queries, and spontaneous reports are sent to all EIN members, the CDC, and state and territorial epidemiologists. Infectious Disease Society of America, “Emerging Infections Network: Background and Organization,” www.idsociety.org/EIN/AboutEIN.htm, accessed July 27, 2001.

the world that monitor geographic and temporal trends in morbidity among travelers and other globally mobile populations.⁸

- *Border Infectious Disease Surveillance (BIDS)* is a binational disease surveillance project that conducts active sentinel surveillance for hepatitis and febrile-rash illnesses, such as measles and dengue, at nine sites on the U.S.-Mexican border. The BIDS project represents collaboration among the CDC, U.S. and Mexican state health departments, the Mexican Secretariat of Health, and the Pan American Health Organization.⁹

Global Emerging Infections Surveillance and Response System (GEIS) is a network of domestic and overseas military research units charged with supporting global surveillance, training, research, and response to infectious disease.¹⁰ Five Army and Navy laboratories in Egypt, Kenya, Indonesia, Peru, and Thailand monitor infectious diseases of concern to the military and host countries, particularly influenza, drug-resistant malaria, and diarrheal and febrile diseases. Through close working relationships with host country counterparts, DoD-GEIS personnel have also served to improve local epidemiolog-

⁸CDC, "Surveillance Systems Home Pages and Contacts." The network's basic surveillance tool is a one-page faxable form submitted by participating clinics to a central data site. Diagnoses may be entered as specific etiologies or as syndromes. GeoSentinel also has the capability to request urgent surveys of all 25 sites; send inquiries to 350 medical providers via TravelMed, the international Society of Travel Medicine list service; and electronically disseminate alerts to 1,250 society's providers in 65 countries. International Society of Travel Medicine, "GeoSentinel: Objectives," available at <http://www.istm.org/geosweb/objectiv.html>, accessed August 7, 2001.

⁹Surveillance is conducted at San Diego, California/Tijuana; Baja California; Nogales, Arizona; Nogales, Sonora; Las Cruces, New Mexico/El Paso, Texas/Ciudad Juarez, Chihuahua; and McAllen, Texas/Reynosa, Tamaulipas. CDC, "Border Infectious Disease Surveillance Project Moves Forward," *NCID Focus*, Vol. 1, No. 2, March-April 2000, p. 4; CDC, "Surveillance Resources: Surveillance Systems," available at <http://www.cdc.ncidod/osr/survsyss.htm>, accessed July 3, 2001.

¹⁰Domestic components of DoD-GEIS are the U.S. Army Center for Health Promotion and Preventive Medicine, Aberdeen Proving Ground, Maryland; USAMRIID, Fort Detrick, Maryland; the Naval Health Research Center, San Diego, California; the Naval Environmental Health Center, Norfolk, Virginia; and the U.S. Air Force Global Surveillance Office, Brooks AFB, Texas. The GEIS overseas laboratories are the Armed Forces Research Institute of Medical Sciences, Bangkok, Thailand; the U.S. Army Medical Research Unit, Nairobi, Kenya; the U.S. Naval Medical Research Center, Lima, Peru; the U.S. Naval Medical Research Unit, No. 2, Jakarta, Indonesia; and the U.S. Naval Medical Research Unit No. 3 in Cairo, Egypt. See the DoD-GEIS home page at <http://www.geis.ha.osd.mil>.

ical capabilities. The DoD facilities in Egypt and Indonesia have been designated as WHO Collaborating Centers for infectious disease.¹¹

Electronic Surveillance System for Early Notification of Community-Based Epidemics (ESSENCE), a DoD-GEIS-administered, syndromic surveillance system that records outpatient diagnoses in eight syndrome categories from area military medical-treatment facilities.¹² Daily electronic dispatches of this information are compared to geographical and seasonal baselines.¹³

The Early Warning Outbreak Recognition System (EWORS), developed jointly by the U.S. Naval Medical Research Unit No. 2 in Jakarta, the Indonesian Ministry of Health, and the WHO, collects clinical data from five sentinel sites around Indonesia on a daily basis. The information is collected in Jakarta, where it is plotted geographically and analyzed.

Electronic Laboratory Reporting (ELR) is a means of reporting surveillance data and outbreak and other information from clinical laboratories to state health departments. In March 1997, the CDC, CSTE, and APHL met to determine recommended standards for ELR.¹⁴ In 1998, Hawaii became the first state to establish a prototype for a statewide ELR system based on these recommendations. With assistance from the CDC, the Hawaii Department of Health (HDOH) developed a laboratory-based, electronic, communicable-disease reporting system, incorporating the state's three largest commercial

¹¹Other WHO Collaborating Centers within DoD are USAMRIID, the Armed Forces Institute of Pathology's Department of Infectious and Parasitic Diseases Pathology, and the Division of Experimental Therapeutics at Walter Reed Army Institute of Research. GAO, "Global Health," July 20, 2000, p. 16.

¹²ESSENCE originally encompassed only the Washington, D.C., area (broadly defined) but it has now been expanded to cover the entire world. The population covered includes all those who go to military treatment facilities (active servicemembers, dependents, and retirees).

¹³Kelley, "Bioterrorism."

¹⁴Specifically, the CDC and CSTE recommended the adoption of Health Level 7 (HL7) as the standard format for electronic messages, Logical Observation Identifiers, Names and Codes as the standard for coding test names and the Systematized Nomenclature of Human and Veterinary Medicine as the standard for the test result codes. Greg Armstrong et al., "Electronic Reporting of Laboratory Information for Public Health, January 7-8, 1999, Summary of Proceedings," p. 1.

clinical laboratories. A study of this system published in the *Journal of the American Medical Association* (JAMA) compared the electronic system with conventional reporting by mail or fax and found that electronic reporting more than doubled the number of laboratory-based reports received by HDOH. Furthermore, the electronic reports were more complete and generally arrived several days before the conventional reports. The report concluded that if implemented nationwide, “ELR systems will likely have a positive impact on national morbidity figures and lead to a better understanding of communicable disease epidemiology.”¹⁵

The **Bio-Surveillance System**, although not a surveillance/data system per se, this \$24 million, five-year DARPA project seeks to link disparate sources of health information to detect abnormal health events in the interest of protecting DoD personnel. The December 2000 project announcement referred to an earlier DARPA project that had mined grocery store, pharmacy, and absentee databases as well as healthcare records to detect an abnormal health event.¹⁶

INVESTIGATION ASSETS

The **Epidemic Intelligence Service (EIS)** carries out this direct support, known as Epidemiologic Assistance, or EPI-AIDs. EIS offers a two-year program in epidemiological training for physicians and public health specialists, emphasizing practical experience in field epidemiology.¹⁷

¹⁵Paul Effler et al., “Statewide System of Electronic Notifiable Disease Reporting from Clinical Laboratories: Comparing Automated Reporting with Conventional Methods,” *JAMA*, Vol. 282, No. 19, November 17, 1999, pp. 1849–1850.

¹⁶Doug Brown, “Catching the Bug Before It Kills,” *Interactive Week*, January 7, 2001, available at <http://www.zdnet.com/intweek/stories/news/0,4164,2671596,00.html>, accessed August 25, 2001. See also Murray Burke, “Bio-Surveillance System” slide presentation, available at http://www.darpa.mil/ito/research/rkfbio/biosurveillance_ito_web.pdf.

¹⁷The current annual EIS class size is about 70 students, a quarter of whom are placed in state or local health departments around the country. Stephen M. Ostroff, “The Epidemic Intelligence Service in the United States,” *Eurosurveillance*, Vol. 6, No. 3, March 2001, pp. 34–36, available at <http://www.ceses.org/eurosurveillance/V6n3/En53-222.htm>, accessed August 13, 2001.

Laboratory Response Network (LRN) is a collaborative program between the CDC and the APHL that seeks to enhance laboratory capacity and diagnostic expertise for identifying and containing critical biological agents. Specifically, the LRN aims to develop screening and confirmation procedures for biological agents, expedite communication of test results, and facilitate transportation of specimens.

COMMUNICATION AND COORDINATION PROGRAMS

Information Network for Public Health Officials (INPHO) is a joint program between states and the CDC designed to help state health department officials to implement electronic information tools in support of public health objectives. Initiated in Georgia in 1993, INPHO has since awarded grants to 14 additional states. INPHO helps state public health departments to develop immunization registries, data warehousing, Internet access, and distance-based informatics training. INPHO also provided the groundwork for the information systems component of the Health Alert Network (see below).¹⁸

Health Alert Network (HAN) was launched by CDC's Public Health Practice Program Office in 1999. It aims to support local health agency efforts to track diseases, train public health professionals, and establish a standard, nationwide, information technology infrastructure to strengthen preparedness and response to bioterrorism and other public health emergencies.¹⁹ When completed, HAN will enable electronic communication; delivery of health alerts from local health departments to the community; sharing of surveillance data, laboratory reports, and CDC diagnostic and treatment guidelines; and access by local health departments to CDC distance-learning programs. In 2000, the CDC funded cooperative agreements with 37 states, three counties, three cities, and two university research centers to build public health information technology capacity.²⁰ HAN also provides Secure Data Network, an Internet pipeline for encrypt-

¹⁸CDC, 2001 Program Review, p. 61.

¹⁹CDC, "Public Health's Infrastructure: A Status Report," p. 9.

²⁰CDC, 2001 Program Review, p. 59.

ing and transferring files from health departments to the CDC. As of November 2000, 17 state surveillance systems were using Secure Data Network.²¹

Epidemic Information Exchange (Epi-X), which has been operational since November 2000, is a secure, Web-based communications network designed to expedite exchange of routine and emergency public health information between the CDC and state health departments.²² Epi-X runs as an application on the HAN infrastructure, utilizes Secure Data Network, and is integrated with NEDSS.²³

FOOD SAFETY INITIATIVES

The **Foodborne Disease Active Surveillance Network (FoodNet)** is a collaborative project involving the CDC, FDA, and USDA, is the food safety component of the EIP. FoodNet currently operates in nine states, monitoring 29 million people, or 11 percent of the U.S. population.²⁴ In addition to collecting information on all diarrheal illnesses in participating states, FoodNet has carried out surveys of laboratory and clinical practices with respect to foodborne illness diagnosis, as well as epidemiologic studies of *E. coli* 0157:H7, *Salmonella*, and *Campylobacter*.²⁵

The **National Molecular Subtyping Network for Foodborne Disease Surveillance (PulseNet)** is a network of laboratories that perform DNA “fingerprinting” of bacteria believed to be foodborne using a method called pulsed-field gel electrophoresis. These molecular fingerprints are entered into an electronic database of other DNA fin-

²¹CDC, “Secure Data Network,” available at <http://www.cdc.gov/programs/research22.htm>, accessed August 15, 2001.

²²CDC, “Epidemic Information Exchange (Epi-X),” available at <http://www.cdc.gov/programs/research5.htm>, accessed August 15, 2001.

²³CSTE, “Support Development and Implementation of the Epidemiology Information Exchange,” CSTE Position Statements 2000 EC-#4, available at <http://www.cste.org/ps/2000/2000-ec-04.htm>, accessed August 15, 2001.

²⁴CDC, “Programs in Brief: Food Safety,” available at <http://www.cdc.gov/programs/environ6.htm>, accessed August 15, 2001.

²⁵CDC, “What Is FoodNet?” available at http://www.cdc.gov/foodnet/what_is.htm, accessed July 26, 2001.

gerprints at a state or local health department and compared with patterns in a database at CDC. Matching patterns from disparate sources during a given period of time indicate a possible multistate outbreak. In such cases, PulseNet sends e-mail alerts to all participating sites.²⁶ Forty-eight public health laboratories in 46 states currently participate in PulseNet.²⁷

Hazard Analysis and Critical Control Point (HACCP) regulations, issued in 1996 by FSIS, require hazard analysis to identify critical points in the food production process and the application of preventive and corrective measures aimed at eliminating hazards at those points.²⁸ HACCP represents a shift in FSIS's regulatory approach to include the production process as well as the finished product.²⁹ Implementation of the HACCP system was completed in 2000.

The National Antimicrobial Monitoring System (NARMS) for Enteric Bacteria is a surveillance system for tracking changes in antimicrobial susceptibility in humans and food animals. It was initiated in 1996 by HHS and USDA and expanded under the auspices of the FoodNet system.³⁰ Human-origin isolates of *Salmonella*, *Shigella*, and *E. coli* 0157:H7 are sent by 17 state and local health departments to the CDC. Eight participating departments also submit *Campylobacter* isolates on a weekly basis.³¹ Animal-origin isolates are sent from FSIS, the USDA/APHIS National Animal Health Monitoring System, and National Veterinary Services laboratories and sentinel sites to the USDA's Agricultural Research Service laboratory in Athens,

²⁶CDC, "PulseNet: The National Molecular Subtyping Network for Foodborne Disease Surveillance," available at <http://www.cdc.gov/ncidod/dbmd/pulsenet/pulsenet.htm>, accessed July 11, 2001.

²⁷CDC, "Programs in Brief: Food Safety."

²⁸FDA, "HAACP."

²⁹USDA/FSIS, "Protecting the Public From Foodborne Illness."

³⁰Participating agencies include the following: FDA, Center for Veterinary Medicine; CDC; FSIS, Agricultural Research Service; and APHIS.

³¹Participating health departments are those in California, Colorado, Connecticut, Florida, Georgia, Kansas, Los Angeles County, Maryland, Minnesota, Massachusetts, New Jersey, New York City, New York, Oregon, Tennessee, Washington, and West Virginia. Connecticut, Georgia, Maryland, Minnesota, New York, Oregon, and Tennessee also submit *Campylobacter* isolates. Center for Veterinary Medicine, FDA, "National Antimicrobial Resistance Monitoring System-Enteric Bacteria," available at <http://www.fda.gov/cvm/index/narms/narmsbro.htm>, accessed August 15, 2001.

Georgia. Human- and animal-origin isolates are tested for susceptibility to 17 antimicrobial agents. *Campylobacter* isolates are tested for susceptibility to eight antimicrobial agents.

RESPONSE

The **Chemical and Biological Rapid Response Team (CB-RRT)** is a joint unit developed from DoD chemical and biological assets, including the U.S. Army Technical Escort Unit, the Army 52nd Ordnance Group, USAMRIID, U.S. Army Medical Research Institute for Chemical Defense, Edgewood CB Forensic Analytical Center, the Navy Medical Research Institute, Navy Environmental and Preventive Medicine Unit, and Navy Research Laboratory. The Technical Escort Unit is the lead element of the CB-RRT and can deploy a 12-person CB-RRT nationwide within four hours of notification.

The **Chemical and Biological Incident Response Force (CBIRF)**, activated in 1996, is a Marine Corps unit based at the Naval Surface Warfare Center (NSWC) with chemical and biological terrorism consequence-management capabilities.³² Although CBIRF's primary mission is to respond to attacks on U.S. Navy and State Department facilities worldwide, the unit may be deployed for a domestic incident in support of local authorities and the OEP.³³ CBIRF is composed of approximately 375 personnel organized into command and control, reconnaissance, decontamination, medical, security, and service support elements. This unit has capabilities to detect and identify chemical and biological agents, and evacuate, decontaminate, triage, and treat patients.³⁴

The **National Disaster Medical System (NDMS)** is an asset-sharing partnership among HHS, DoD, FEMA, the Department of Veterans Affairs, state and local governments, private businesses, and civilian

³²Smithson and Levy, *Ataxia*, p. 138.

³³Jonathan B. Tucker, "National Health and Medical Services Response to Incidents of Chemical and Biological Terrorism," *JAMA*, Vol. 278, No. 5, 1997, pp. 362-368, available at <http://www.lsic.ucla.edu/classes/mimg/spring01/micro12/Website/JAMA/articles/response.html>, accessed July 5, 2001.

³⁴Koblentz, p. 31.

volunteers.³⁵ The NDMS is designed to provide integrated national medical assistance during major peacetime disasters within 12 hours.³⁶ More than 7,000 NDMS volunteer health professionals are organized into 80 Disaster Medical Assistance Teams.³⁷ NDMS also includes Disaster Mortuary Operations Response Teams and Veterinary Medical Assistance Teams. The NDMS capability includes the provision of in-hospital care for up to 100,000 victims.³⁸

The **National Immunization Program (NIP)** of the CDC provides leadership for the planning, coordination, and institution of immunization activities nationwide. It is subdivided into four main divisions—Data Management, Epidemiology and Surveillance, Immunization Services, and Global Immunization—and currently oversees seven vaccine-related areas.³⁹ The NIP was preceded by the National Vaccine Program Office (NVPO), which was an attempt during the early part of the Clinton administration to coordinate HHS immunization programs.⁴⁰

³⁵HHS, Office of Emergency Preparedness home page, available at <http://www.oep.dhhs.gov/>, accessed July 6, 2001.

³⁶HHS, Office of Emergency Preparedness, "NDMS: Catastrophic Care for the Nation," available at <http://ndms.dhhs.gov/NDMS/ndms.html>, accessed July 2, 2001. NDMS has three components: direct medical care, patient evacuation, and non-federal hospital care. HHS, "Medical Response in Emergencies: HHS Role," fact sheet, January 25, 2001, available at http://www.os.dhhs.gov/news/press/2001pres/01fs_emergencyresponse.html, accessed July 6, 2001.

³⁷HHS, "Medical Response in Emergencies."

³⁸Tommy G. Thompson, Secretary, HHS, testimony before the Subcommittee on Commerce, Justice, State, and Judiciary, Committee on Appropriations, U.S. Senate, May 9, 2001, available at <http://www.os.dhhs.gov/progorg/asl/testify/t010509.html>, accessed September 3, 2001.

³⁹These include child vaccines, vaccine safety, tracking vaccine-preventable diseases, measles immunization, immunization grant programs, development of immunization registries, and adult/adolescent immunization. For further details, see <http://www.cdc.gov/nip/>.

⁴⁰CDC, "About NVPO," available at <http://www.cdc.gov/od/nvpo/who.htm>.