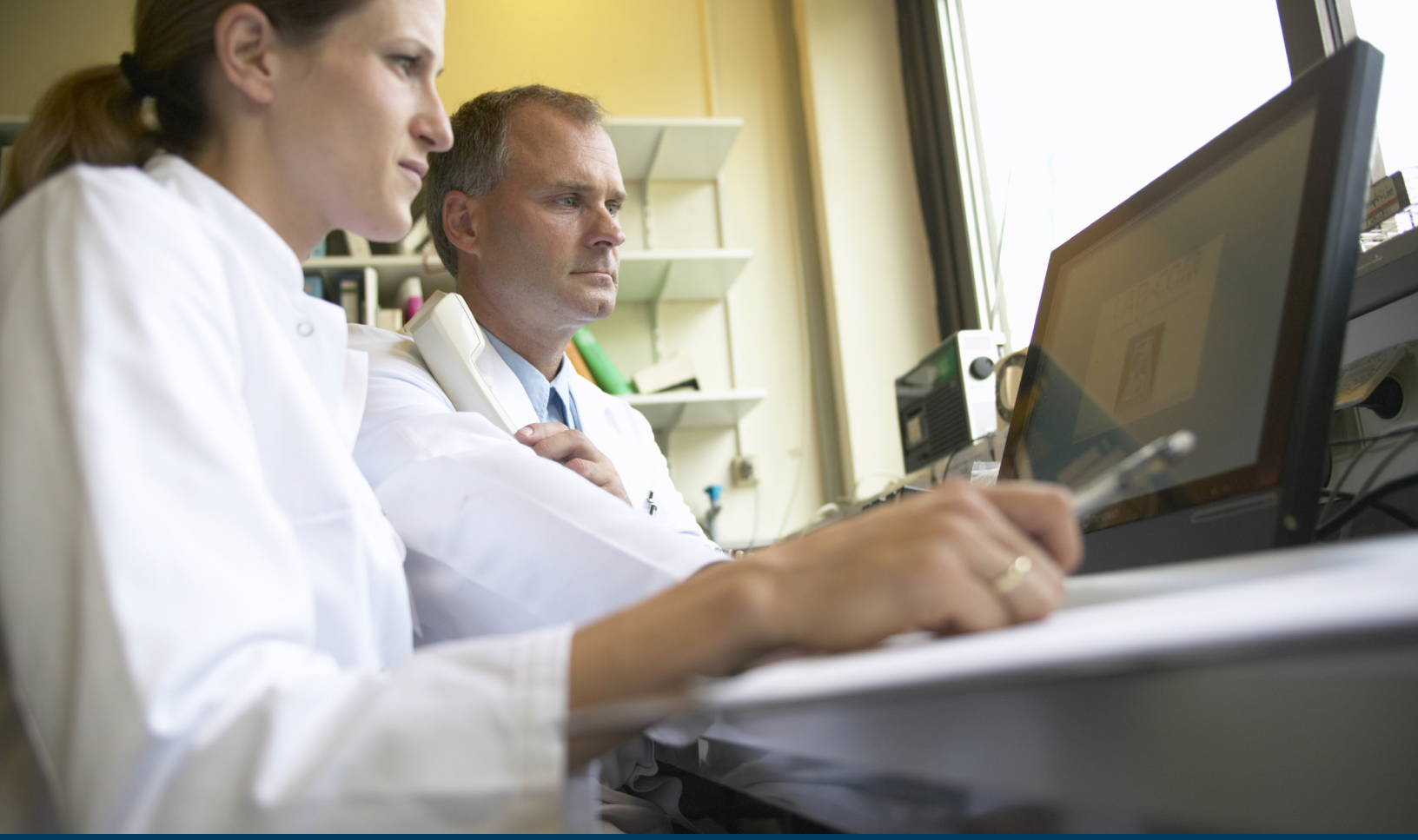


Health Informatics and Surveillance

Center for Surveillance, Epidemiology, and Laboratory Services (CSELS)
Division of Health Informatics and Surveillance (DHIS)

Overview

Our Mission: To provide leadership and crosscutting support in developing public health information systems, managing public health surveillance programs, and providing health-related data required to monitor, control, and prevent the occurrence and spread of diseases and other adverse health conditions

Our Services

- Provide technical assistance for and access to **multiple data sources** that can be used for research, decision making, priority setting, program evaluation, and resource allocation.
- Develop **information systems** used by state and local health departments and CDC programs for data collection, exchange, and processing.
- Collaborate with state and local health departments to provide technical support for collecting, managing, and submitting data on **notifiable diseases and conditions**.
- Collaborate with other federal agencies, state and local health departments, and other organizations to support the timely exchange of **syndromic data and information** for nationwide situational awareness and enhanced response to hazardous events and disease outbreaks.

data hub

NNDSS
National Notifiable Diseases Surveillance System

NSSP
National Syndromic Surveillance Program
BioSense Platform

Our Programs

Data Hub

- Coordinates agency-wide data purchases and acquisitions.
- Establishes and maintains secure databases on the CDC network.
- Facilitates and tracks CDC data use agreements.
- Provides technical and scientific assistance to CDC users.
- Supports user networks for shared learning.
- Maintains a suite of flexible SAS tools.

Information Systems

- Track supplies during health emergencies.
- Provide mobile tools for assessing health threats.
- Support public health and other laboratories that test for biological and chemical agents linked to terrorism.
- Help transfer disease-tracking data efficiently and securely.
- Enable public health organizations to communicate with each other.

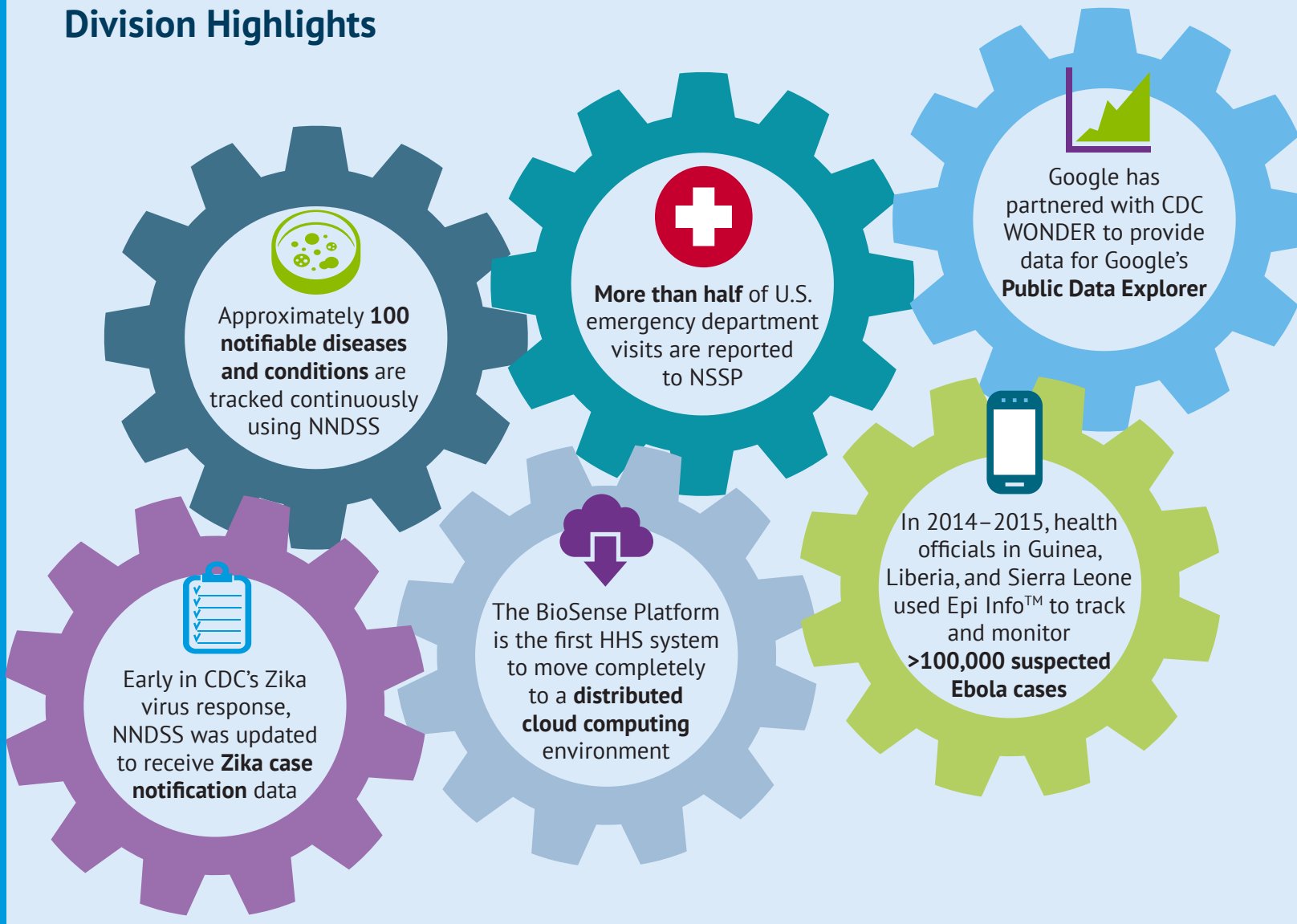
National Notifiable Diseases Surveillance System (NNDSS)

- Provides data on current disease patterns and outbreaks.
- Helps monitor regional and national trends in diseases and health conditions.

National Syndromic Surveillance Program (NSSP)

- Promotes and advances development of a system for the timely exchange of syndromic data, which come from healthcare settings such as emergency departments, hospitals, clinics, pharmacies, and laboratories.
- These data support situational awareness and emergency response.

Division Highlights



Moving Toward the Future

As part of the CDC Surveillance Strategy, we're leading efforts to modernize NNDSS and enhance NSSP so that

- The entire country will be using common national data exchange standards
- CDC programs will get more complete and timely data on notifiable diseases and conditions
- Syndromic data are timely and improve situational awareness and response to public health threats
- Federal, state, and local health agencies have access to powerful tools for analyzing and visualizing syndromic data.

Data Hub

We make **health-related data** available to CDC programs—as well as to the broader community of health professionals, researchers, and the public at large—to support **public health research and decision making.**

Our Services

Through centralized coordination and improved efficiencies, we provide access to a variety of resources, including

- **CDC WONDER (Wide-ranging Online Data for Epidemiologic Research),** a web application connecting users with data to help conduct research, make decisions, set priorities, assess programs, and focus resources. CDC WONDER is available to state and local health departments, researchers, healthcare providers, CDC disease-tracking programs, and the general public.
- **American Hospital Association (AHA) data,** which include information from two sources. The **AHA Annual Survey of Hospitals** profiles more than 6,500 U.S. hospitals with information on organization and staffing, communities served, services provided, and expenses. The **AHA Healthcare IT Database** has information on the depth and level of technology integration in more than 3,400 hospitals.
- **Centers for Medicare & Medicaid Services clinical claims data,** which are valuable for CDC research on topics such as access to care, healthcare utilization and practices, disease burden, and health outcomes.
- **MarketScan,** a suite of databases and tools licensed from Truven Health Analytics that has information on healthcare insurance claims. MarketScan data allow researchers to explore complex problems in public health across time, such as health economics and treatment outcomes.
- **Healthcare Cost and Utilization Project (HCUP), a national resource** on inpatient and outpatient care and emergency department visits. HCUP was developed through a partnership of federal and state agencies and commercial organizations and built from hospital administrative data. It's sponsored by the Agency for Healthcare Research and Quality (AHRQ).

Our Work

- Coordinate agency-wide data purchases and acquisitions.
- Establish and maintain databases that are housed securely on the CDC network.
- Facilitate and track data use agreements within CDC.
- Provide technical and scientific assistance to CDC users.
- Offer training to enhance users' skills.
- Support user networks to facilitate shared learning.
- Maintain a suite of flexible SAS tools.

Our Impact

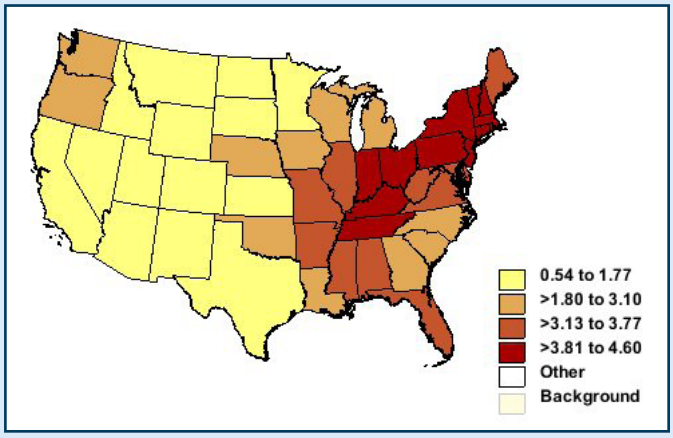
- **Access to timely information is crucial for public health research.** Data Hub's various databases have more than 470 total users. They are the primary sources for peer-reviewed publications, policy statements, and impact analysis studies by CDC programs, partners, and other researchers. For example, MarketScan data helped show that diabetes self-education programs—important for managing the disease and preventing complications—are underused even when health insurance pays for them. HCUP data helped researchers understand trends in hospital readmission for patients with heart or lung diseases.
- **Data Hub resources support data-driven decisions.** HCUP, for instance, enables researchers and policymakers to study how health care is practiced and how patients fare over time and at the national, regional, state, and community levels. AHA data are usually combined with information from the HCUP or CDC disease-tracking systems to see how certain hospital characteristics affect patients' health, like how often patients get hospital-acquired infections. Federal agencies and state and local health departments can use sound, evidence-based information like this to evaluate their own programs, set priorities, and determine how to focus their resources.
- **CDC WONDER makes finding and understanding data easier.** CDC WONDER's streamlined, menu-driven queries and reports connect users—both professional and the general public—with information on a wide variety of health topics including births, deaths, cancer diagnoses, HIV/AIDS, tuberculosis, sexually transmitted diseases, vaccinations, and environmental exposures. CDC WONDER can also create tables, maps, charts, data exports, and summary statistics; organize data results into categories; and compare data from different populations, locations, or groups of people.

Access CDC WONDER databases

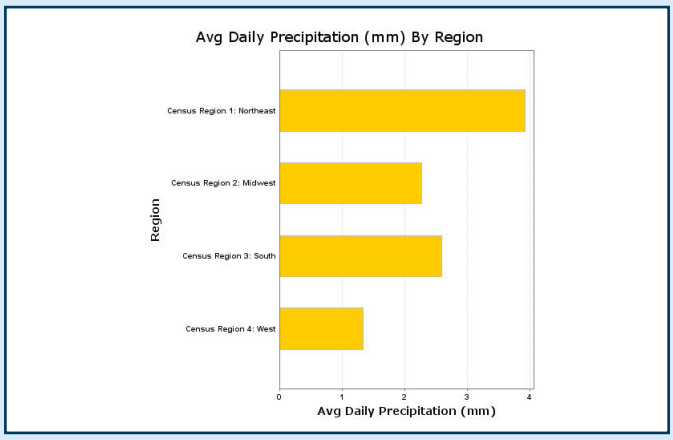
wonder.cdc.gov

Putting CDC WONDER to Use

Need to know how many heat wave days there were in your area last year? Or how much precipitation your community received on a particular day? Or how much particulate matter (a type of pollution) is in the air in your region? CDC WONDER's environmental exposure data can answer all these questions, compare the answers for different communities or years, and create maps and charts to make the information easy to understand.



An example of CDC WONDER's map-making tool, this image shows the average precipitation in the United States by state.



CDC WONDER also allows users to create tables and charts, like this one showing the average daily precipitation in the United States by region.

Information Systems

We operate crucial systems that give health officials access to information they need to protect against **disease outbreaks and other health threats**. Our systems reach CDC programs, state and local health departments, and state public health laboratories, as well as international public health officials.

Our Services

- Provide software to
  - ✓ Enhance the ability of federal, state, and local public health agencies to **track supplies**—such as drugs and vaccines—that are needed to respond to health emergencies
  - ✓ Enable public health practitioners around the world—even those who have limited network connectivity or only have access to mobile devices—to **assess health threats** during disease outbreaks, perform surveys, and generate maps that show clusters and trends in disease cases
  - ✓ Support a network of public health and other laboratories that **test for biological and chemical agents** linked to terrorism.
- Provide information systems that allow the efficient and **secure transfer of data**. Examples of these systems include the Message Validation, Processing, and Provisioning System; the Messaging System; and the National Electronic Disease Surveillance System (NEDSS) Base System.
- Operate a secure messaging platform to **enable public health organizations to communicate** with each other, regardless of the types of information systems they use.

At the beginning of 2016
Epi Info™ had more than
1 million users in
181 countries
with products translated into
13 different languages

Our Work

We build and operate five systems

- **Countermeasure Tracking Systems (CTS).** CTS consists of **three web-based computer applications** that give public health decision makers timely, accurate information about the supply, distribution, and use of countermeasures—medicines and other supplies used to help prevent or slow the spread of disease.
- **Epi Info™.** This publicly available suite of interoperable software tools—Epi Info for Windows, Epi Info for Mobile Devices, and Epi Info for Web & Cloud—provides the global community of public health practitioners and researchers with a **flexible, scalable, free toolkit** with multiple capabilities. Epi Info is used worldwide to rapidly assess disease outbreaks, or to develop small disease-tracking systems or ad hoc components for larger systems. Epi Info is also used for training public health professionals in epidemiology.
- **Laboratory Response Network Results Messenger (LRN RM) and Results Viewer (LRN RV).** This software provides LRN laboratories with the ability to **manage and share standard laboratory results data** securely with public health partners. Established in 1999, LRN is an integrated national and international network of more than 150 laboratories that can respond quickly to biological and chemical threats, including those related to terrorism. It includes federal, state, local, military, food-testing, environmental, and international laboratories.
- **NEDSS Base System.** This CDC-developed integrated information system helps state and local public health departments manage reportable disease data and send notifiable disease data to CDC. The system gives users a **tool to process, analyze, and share** the data they receive. It also helps them manage disease outbreaks and prepare data for geographic analysis.
- **Message Quality Framework (MQF), Messaging System (MS), and Vocabulary Access and Distribution System (VADS).** These tools help public health agencies **electronically exchange health data and information**. They make it possible for the many organizations that help protect the public's health to communicate with each other and exchange critical and sensitive data—despite their use of a wide variety of information systems. Organizations create messages composed of standard health information content and vocabulary and exchange them over a secure messaging platform.

Our Impact

- **We bring state-of-the-art information systems to hard-to-reach settings.** The Epi Info mobile application allows epidemiologists to collect and analyze data on smartphones or tablets to investigate disease outbreaks, respond to emergencies, or conduct research in settings with or without good IT infrastructure. In 2016, the Epi Info team provided technical support to CDC's Brazilian Field Epidemiology Training Program and the Brazil Ministry of Health. We helped develop and deploy the Epi Info 7 case-control study form used in the field for Zika virus investigation, and supported surveillance activities at Brazil's 2016 Olympic soccer venue.
- **Health information systems are critical for national security.** For example, after a Florida laboratory discovered that a specimen from a patient contained the bacterium that causes anthrax, LRN laboratories used the secure LRN RM and LRN RV software as they engaged in the subsequent investigation, conducting more than **1 million tests on 125,000 samples** before the investigation was completed.
- **Our tools help CDC and other public health agencies respond effectively to emergencies.** The CTS, for example, proved its value as an emergency response asset in 2009 during **CDC's H1N1 (swine flu) vaccination campaign** and again during the **2014–2015 Ebola response.** CDC used CTS components to assess vaccine availability, track vaccine dispensing, monitor supplies like respirators and surgical masks, and determine vaccination rates in at-risk populations—and to track travelers returning from Ebola-affected countries. In both instances, health officials were able to quickly evaluate the effectiveness of public health interventions.

National Notifiable Diseases Surveillance System (NNDSS)

NNDSS is a **nationwide collaboration** that enables all levels of public health—local, state, territorial, federal, and international—to **share information about notifiable diseases**. Information from NNDSS is used to monitor, control, and prevent the occurrence and spread of these infectious and noninfectious diseases and health conditions.

In January 2014, CDC began a multi-year **NNDSS Modernization Initiative**—part of the agency-wide Surveillance Strategy. CSELS is leading these efforts to update and strengthen the infrastructure supporting NNDSS. For example, the **Message Validation, Processing, and Provisioning System** software is being developed to improve how nationally notifiable disease case messages are sent to CDC and how they are processed and provided to CDC programs for analysis. The new software will enhance the system's ability to provide comprehensive, timely, and high-quality data for public health decision making.

Partners in the **NNDSS collaboration** include

- State and local jurisdictions
- CDC programs
- Council of State and Territorial Epidemiologists
- Association of State and Territorial Health Officials
- Association of Public Health Laboratories
- International health organizations.

Our Services

- Coordinate and provide data to **monitor diseases** and track how they spread.
- Provide data to CDC programs for tracking **regional and national trends** in diseases and health conditions.
- Lead the **NNDSS Modernization Initiative** by addressing data availability, system usability, and redundancies, and by incorporating new information technologies into the system.

Our Work

- **Support state and local health departments** in collecting, managing, and analyzing their data and in submitting case notification data to CDC for NNDSS. Support includes funding, health information exchange standards and frameworks, electronic health information systems, and technical support.
- **Receive, secure, and process** nationally notifiable disease data, and provide it to disease-specific CDC programs.
- **Work with other CDC programs** to prepare annual summaries of infectious and noninfectious diseases and conditions, which are published in the *Morbidity and Mortality Weekly Report (MMWR)*.

Our Impact

- **Surveillance is the foundation of public health practice.** To keep people safe, health professionals need to be aware of disease and other health threats facing the population. That's why systems like NNDSS are so important. It's a centralized way to collect, analyze, and use health data to see what's happening in our communities, our regions, and across the nation so we can identify and respond to disease trends and outbreaks as soon as possible.
- **NNDSS is vital to the national public health infrastructure.** It represents a partnership across the whole public health enterprise—including CDC, public health jurisdictions, and partner organizations. Disease surveillance begins at local, state, and territorial public health departments, where local laws and regulations require that cases of certain infectious and noninfectious diseases be reported. Health departments work with healthcare providers, laboratories, hospitals, and other partners to get the information needed to monitor, control, and prevent these conditions in their communities. Health departments also notify CDC about certain conditions so we can track them for the whole country.
- **Modernizing the system is critical to the nation's health.** The Modernization Initiative is making the technological infrastructure of NNDSS more robust. Based on standardized data and exchange mechanisms that work across all platforms, updates to NNDSS will improve notifiable disease data collection, sharing, and analysis across the entire public health community.

All 50 states, the District of Columbia, New York City, and 5 territories provide critical data on more than **100 conditions of public health concern** through NNDSS

The history of NNDSS traces back to 1879, when Congress funded the collection and publication of reports on notifiable diseases such as cholera and smallpox. In 1961, CDC assumed responsibility for collecting and publishing data on nationally notifiable diseases and began to publish these data in the *MMWR*.

This photo from 1966 shows (left to right) Dr. Donald A. Henderson, Dr. J. Donald Millar, Dr. John J. Witte, and Dr. Leo Morris standing in one of CDC's former offices. They are discussing what may have been epidemiologic findings on the eradication of smallpox, an effort in which CDC played a central role.

National Syndromic Surveillance Program (NSSP)

Syndromic surveillance is a type of disease tracking that uses near "real-time" data, mostly from emergency departments, to detect unusual activity for further investigation. It's used to spot disease outbreaks or threats and to **improve situation awareness** for mass gatherings and public health emergencies. NSSP promotes and advances development of a **surveillance system for the timely exchange of syndromic information** to protect America's health, safety, and security.

Our Services

- Promote a **community of practice (CoP)** in which participants collaborate to advance the methods and practice of syndromic surveillance.
- Support development, maintenance, and use of the cloud-based **BioSense Platform**—a secure integrated electronic health information system with standardized tools for quickly collecting, evaluating, storing, and sharing syndromic surveillance data.

Our Work

- **Fund ASTHO** to host the NSSP BioSense Platform.
- **Work with partners**, such as ASTHO, CSTE, NACCHO, and the International Society for Disease Surveillance, so NSSP BioSense Platform users can provide feedback on its use and development.
- **Support a CoP** that includes CDC-funded grantees, nonfunded states and jurisdictions that contribute data to BioSense, public health practitioners who use local syndromic surveillance systems, CDC programs, other federal agencies, partner organizations, hospitals, healthcare professionals, and universities.

NSSP works through collaboration with

- Other federal agencies, such as the Department of Defense and Department of Veterans Affairs
- State and local health departments
- Hospitals, healthcare organizations, and health professionals
- Public health partner organizations, such as the National Association of County and City Health Officials (NACCHO), Association of State and Territorial Health Officials (ASTHO), and Council of State and Territorial Epidemiologists (CSTE).

Our Impact

- **Syndromic surveillance is an early warning system for our nation's health and security.** Syndromic surveillance supports emergency response by monitoring outbreaks, injuries, unusual health conditions not found by other systems, and other health conditions associated with natural or manmade disasters such as hurricanes, wildfires, oil spills, or terrorist attacks. Ongoing monitoring during emergency response helps officials decide what resources are needed and how well the response is helping the community recover from the event. Ongoing tracking of an event can also provide reassurance that a large-scale outbreak is not occurring.

- **Real-time tracking can inform decision making during public health emergencies.** Through BioSense, NSSP connects CDC programs with state and local syndromic surveillance data to help track and respond to health threats. In 2014, for example, NSSP brokered relationships with Texas public health officials to give CDC's Office of Public Health Preparedness and Response access to local syndromic surveillance data to assess an Ebola surge in hospitals. In 2015, NSSP provided CDC with local surveillance data on opioid overdose, unintentional marijuana ingestion by children, and enterovirus D68 infection.

- **A shared infrastructure helps state and local health departments better recognize and respond to potential threats.** BioSense gives health departments a common electronic platform for collecting, storing, and sharing syndromic surveillance data. Cloud computing provides a shared pool of resources—networks, servers, software, and other electronic tools—that allows agencies to work more efficiently, reduce costs, and share information quickly across city, county, or state lines. This shared infrastructure also helps expand the use of electronic health records.

Syndromic surveillance isn't just for emergency response. It can also detect **unusual increases** in injuries, drownings, drug overdoses, and chronic conditions such as asthma. Syndromic surveillance has been used to monitor **healthcare use,** including medication refills. Public health officials routinely use syndromic surveillance for **situational awareness** to monitor **outbreaks or injuries** during mass gatherings like the Super Bowl or major conventions. These data help public health officials respond to **ongoing health threats** in their communities.

NSSP
National Syndromic Surveillance Program
BioSense Platform

A CDC laboratory worker enters information into an influenza database in the 1980s. Tracking data on the location and spread of diseases is critical for healthcare providers on the front lines of treatment and for epidemiologists who look for ways to stop the disease. Computerized disease tracking began in 1990. Today, CSELS leads CDC's efforts to modernize this tracking system.