Council of State and Territorial Epidemiologists

Leaders in Applied Public Health Epidemiology

National Electronic Disease Surveillance System: A Status Report on Implementation

The **National Electronic Disease Surveillance System (NEDSS)**[1] relies on industry-standard code sets used in health information technology (i.e., LOINC,[2] SNOMED,[3] and HL7[4]) to integrate surveillance systems that efficiently and securely transfer public health, laboratory, and clinical data from the health care system to public health departments. NEDSS comprises interoperable individual surveillance modules for which CDC, individual health departments, or private vendors can create software.

During late August 2007, the Council of State and Territorial Epidemiologists (CSTE) conducted the NEDSS Assessment. One reason for the assessment was to identify potential resources for NEDSS solutions for states whose systems are under development or who want to improve their existing systems. The assessment illustrates the progress of electronic disease surveillance systems nationwide.

All 50 states (population average: 5.6 million; range: 500,000–38 million) participated in the 2007 assessment. The survey asked respondents to indicate the operational status, integration levels, and software developers of their surveillance systems. Data on modules such as animal disease, communicable human diseases, HIV/AIDS, lead, sexually transmitted diseases, and tuberculosis (TB) surveillance systems were collected. IT enhancements (e.g., electronic laboratory reporting, Geographic Information Systems, Master Patient Index, [5] and Outbreak Management Systems [OMS] [6]) also were assessed for integration level and status of development. Data were analyzed using MS Excel 2007 and SAS version 9.1.3.

Results from the NEDSS assessment shows that twenty-eight (56%) of states use software systems from all three sources: CDC, public health departments, or private vendors. Other states have created electronic surveillance systems customized to their own public health needs. Sixteen states use the CDC NEDSS Base System (NBS) as their sole surveillance system.

The Move Toward Interoperable Systems

Results of the NEDSS Assessment show a shift toward integrated electronic disease surveillance systems and an increasing effort to achieve interoperability. Thirteen (27%) of 48 states reported achieving interoperability among two or more surveillance modules. Seven (14%) states reported current plans for interoperability. However, 27 states still are acquiring the new technology and the expensive software and hardware the system requires. As interoperability becomes the standard for electronic data sharing, more states will face customization costs and increasing demand for informaticians in the workforce.

[1] NEDSS: National Electronic Disease Surveillance System. CDC Solutions. Available at http://www.cdc.gov/phin/library/documents/pdf/111759_NEDSS.pdf.
[2] Logical Observation Identifiers Names and Codes Available at http://loinc.org/
[3] Standardized Nomenclature of Medicine. Available at http://snomed.org
[4] Health Level 7. Available at http://hl7.org.
[5] Master Patient Index technology, which references all patients relating to an area or organization, is a source of user demographic data for other linked services and systems.
[6] OMS software allows public health to respond to emergencies. OMS software can generate questionnaires, perform analyses, issue reports, manage case and contact investigations, and perform other epidemiologic functions.

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Current Capabilities of Electronic Disease Surveillance Systems

The eight state electronic surveillance systems illustrated in Table 1, were reported as fully operational and implemented in those states shown in the table. Thirty-nine (78%) reported at least one aspect of their surveillance system as under development or were planned for future development (data not shown). Most (70%) states reported their system could send a message about communicable disease in HL7 format to CDC. Fifty-eight percent of states with an operational system have an integrated communicable disease surveillance system.

HIV/AIDS surveillance systems were mostly stand-alone systems, with few states developing integrated modules. The nature of HIV/AIDS surveillance—historically supported through categorical funding—requires states to now focus on ways to electronically link surveillance systems.

Of the 21 states reporting a TB case management system, 16 were non-NBS; the five NBS states reported having stand-alone systems. Non-NBS states tended to have integrated TB surveillance, including modules for case management, case reporting, and tracking for latent TB Infection. Some states developed their TB surveillance modules in-house, but most TB surveillance systems were vendor-developed.

Similar to HIV surveillance, lead surveillance historically has been developed through separate funding, as reflected in the higher percentage of stand-alone operating systems. Although 21 states reported having an operational and implemented lead surveillance system, 14 states reported future development for this module.

The three most commonly integrated modules were the automated electronic laboratory reporting, manual electronic laboratory reporting (Web-based), and Master Patient Index modules. These relatively recent technologies were more integrated than the traditional HIV/AIDS and tuberculosis surveillance modules into the general communicable disease systems. Four states reported their Master Patient Index was under development, and six states reported plans for future

Table 1. Fully Operational and Implemented Surveillance Systems Reported by the 50 States, NEDSS Assessment, August 2007

Variable (No. States Responding)	No. (%)
Ability to send a communicable disease message in HL7 format to CDC (n=50)	35 (70%)
Ability to deploy surveillance system (all or parts) in other states (n=48)	35 (73%)
Achievement of interoperability among ≥2 surveillance modules (n=49)	13 (27%)
State Electronic Surveillance Systems	**No. (%)**
General communicable disease surveillance (n=40)	
Integrated	23 (58%)
Stand-alone	15 (38%)
HIV/AIDS surveillance (equivalent to HARS) (n=18)	
Integrated	1 (6%)
Stand-alone	15 (83%)
Tuberculosis case management (n=21)	
Integrated	9 (43%)
Stand-alone	12 (57%)
Lead surveillance (n=17)	
Integrated	5 (29%)
Stand-alone	11 (65%)
Automated electronic laboratory reporting (n=28)	
Integrated	20 (71%)
Stand-alone	4 (14%)
Manual electronic laboratory reporting (Web-based) (n=24)	
Integrated	15 (63%)
Stand-alone	5 (21%)
Master Patient Index (n=12)	
Integrated	9 (75%)
Stand-alone	2 (17%)
Outbreak Management System (n=8)	
Integrated	4 (50%)
Stand-alone	4 (50%)

Outbreak Management Systems (OMS) software is a host of applications that allows public health to respond to emergencies. Of the eight states that reported functional OMS, four were stand-alone systems and four were integrated systems. Twenty states reported their OMS was either under development or targeted for future development.

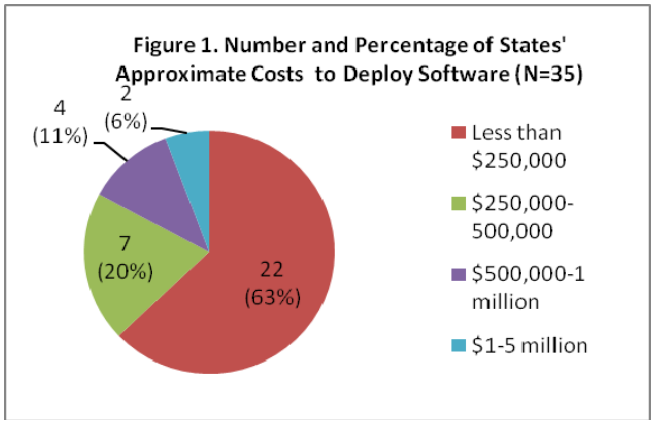
The Costs of Surveillance Systems

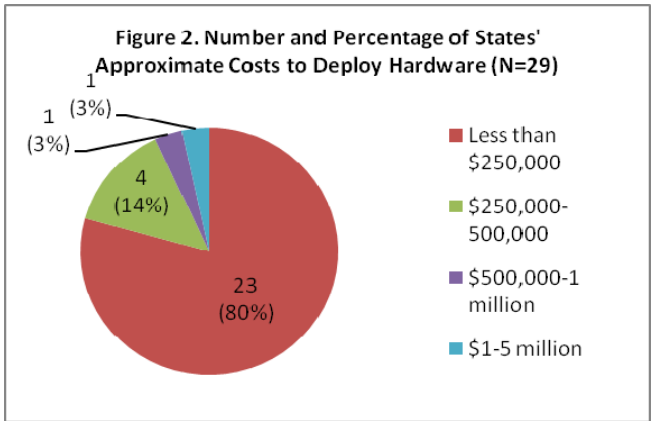
Costs of software and hardware are key factors in changing electronic surveillance systems or acquiring new modules. Thirty-five states reported the approximate cost of deploying their software for electronic surveillance in another state (excluding cost of customizations).[7]

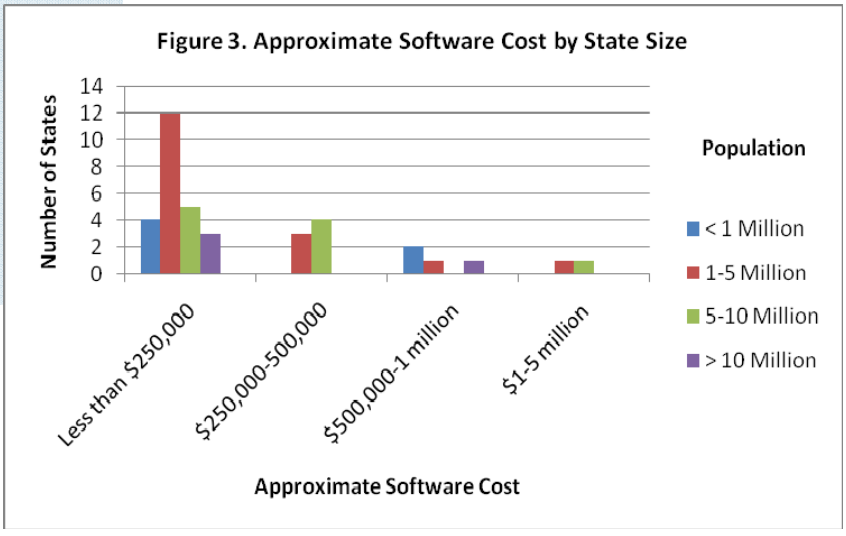
For most states, software costs were less than $250,000 (Figure 1).The 29 states reporting hardware costs indicated approximate costs of less than $250,000 to deploy in another state (Figure 2). Combined software and hardware costs ranged from $250,000 to $1 million for another state to deploy the electronic disease surveillance system without customization. Additional costs include annual licensing fees from the software developer/vendor, security customization fees, and costs associated with tailoring a surveillance system to state or local needs (ranging from $20,000 to $50,000).

States using the NBS reported much lower costs for software deployment; this reflects the investment by CDC that passes to states using the NBS. Four states reported having open-source code and being willing to share state written code with any interested party.

The assessment showed no clear association between software cost and state size (Figure 3). Mid-sized to large states reported most in the “less than $250,000” category and $250,000–500,000 range. Smaller states reported software costs ranging from less than $250,000 to $1 million.







[1]States reporting $0 for software used the CDC NBS—thus incurring no software cost.

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Number of Full-Time Equivalents in Information Technology

States averaged two to three (range 1:12) Full-time equivalents (FTEs) per IT role (Figure 4). Because states were not asked to indicate whether IT staff had multiple roles, the actual number of FTEs may be underreported if staff perform a variety of duties or overlap in the roles provided.

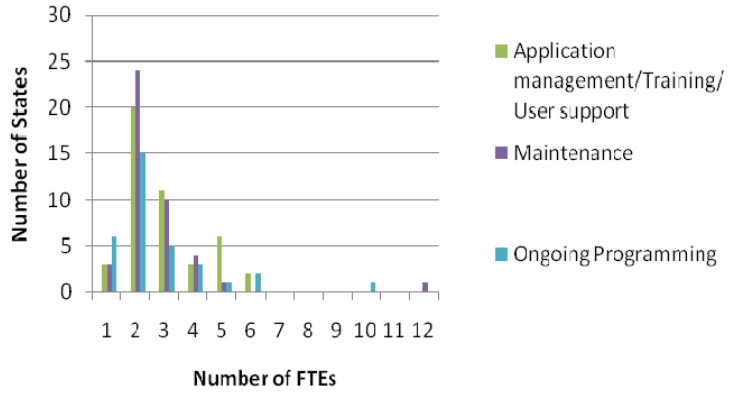
States with mid-sized to large populations reported more FTEs in each IT role than did smaller states, but most states generally had no more than four FTEs for each IT role (Table 2). Table 2 displays the number of states and the number of Full Time Equivalents in each IT role by increasing state population size.

Table 2. IT roles, by state size and by number of FTEs in each role, NEDSS Assessment, August 2007

IT Role	State Population			
	<1 million (n=7)	1–5 million (n=21)	5–10 million (n=13)	>10 million (n=8)
	No. States (No. FTEs)	No. States (No. FTEs)	No. States (No. FTEs)	No. States (No. FTEs)
Application management/ Training/User support	7 (1)	10 (1) 7 (2) 1 (4) 1 (5)	2 (1) 3 (2) 1 (3) 3 (4)	1 (1) 1 (2) 3 (3) 2 (4) 1 (5)
Maintenance	4 (1) 1 (2)	14 (1) 3 (2) 2 (3)	4 (1) 4 (2) 1 (3)	2 (1) 2 (2) 2 (3) 1 (4) 1 (11)
Ongoing pro-gramming	2 (1)	9 (1) 1 (2) 2 (3) 1 (5)	4 (1) 2 (2) 1 (4) 1 (5)	1 * 2 (2) 1 (3) 1 (9)

*Unknown.
IT = information technology; FTE = full-time equivalent;
NEDSS = National Electronic Disease Surveillance System.

Figure 4. Number of Full Time Equivalents per State for each Information Technology Category



Conclusion

The results of the CSTE NEDSS Assessment indicate substantial variation among states in how they have developed their electronic surveillance systems. States are strongly committed to making their surveillance systems interoperable, and interoperability is within reach of most states.

Funding to complete electronic disease surveillance systems is the largest obstacle for states. Aging electronic surveillance systems will need to be upgraded or replaced in the near future to continue to meet the needs of the public's health. Future efforts need to support the growing electronic infrastructure and constantly aim to improve the efficacy and quality of electronic disease surveillance systems.

For More Information Contact:

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