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Clinical Data Systems to Support Public Health Practice: A National Survey of Software and Storage Systems Among Local Health Departments

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Context: Numerous software and data storage systems are employed by local health departments (LHDs) to manage clinical and nonclinical data needs. Leveraging electronic systems may yield improvements in public health practice. However, information is lacking regarding current usage patterns among LHDs. **Objective:** To analyze clinical and nonclinical data storage and software types by LHDs. **Design:** Data came from the 2015 Informatics Capacity and Needs Assessment Survey, conducted by Georgia Southern University in collaboration with the National Association of County and City Health Officials. **Participants:** A total of 324 LHDs from all 50 states completed the survey (response rate: 50%). **Main Outcome Measures:** Outcome measures included LHD's primary clinical service data system, nonclinical data system(s) used, and plans to adopt electronic clinical data system (if not already in use). Predictors of interest included jurisdiction size and governance type, and other informatics capacities within the LHD. Bivariate analyses were performed using χ^2 and *t* tests. **Results:** Up to 38.4% of LHDs reported using an electronic health record (EHR). Usage was common especially among LHDs that provide primary care and/or dental services. LHDs serving smaller populations and those with state-level governance were both less likely to use an EHR. Paper records were a common data storage approach for both clinical data (28.9%) and nonclinical data (59.4%). Among LHDs without an EHR, 84.7% reported implementation plans. **Conclusions:** Our findings suggest that LHDs are increasingly using EHRs as a clinical data storage solution and that more LHDs are likely to adopt EHRs in the foreseeable future. Yet use of paper records remains common. Correlates of electronic system usage emerged across a range of factors. Program- or system-specific needs may be barriers or facilitators to EHR adoption. Policy makers can tailor resources to address barriers specific to LHD size, governance, service portfolio, existing informatics capabilities, and other pertinent characteristics.

KEY WORDS: clinical data, electronic health records, local health department, software

Modern public health practice relies on a wealth of data to fulfill core public health functions such as surveillance, disease control interventions, and delivery of clinical services.[1] Much of the data collected as part of conducting these essential public health functions are clinical (health and medical) in nature, and there are a multitude of systems for storing, retrieving, and utilizing these data. Regardless of the system used, the primary goal of a clinical data system should be to support the provision of those services. However, given the technology developments in the storage and access of data, these routinely collected data can also be used to develop population health or quality indicators.[2] A wide range of data systems can conceivably enhance a local health department's (LHD) capacity to perform these essential public health functions, yet little is

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understood nationally about the types and variety of systems currently in use.[3-7]

Outside of public health, parts of the health care sector have seen a rapid shift toward one specific clinical data storage system—the electronic health record (EHR).[8] These gains are due in no small part to recent federal investment through the Meaningful Use program,[9] although adoption has lagged in organizations not eligible for the Meaningful Use program.[10-12] LHDs and other public health agencies may have become familiar with the Meaningful Use program as a consumer of electronic data submitted to them by hospitals, laboratories, or providers required to do so under the program.[13] However, many LHDs are not themselves eligible to receive the incentive payments as clinical care providers because they do not meet the statutory requirements, including providing primary care and/or oral health services, accepting Medicare or Medicaid, or having the corresponding facility and/or provider types.[14]

As in other settings lacking Meaningful Use financial incentives, there has yet to be a rapid expansion of EHR use by LHDs. As of 2010, 19.3% of LHDs reported using an EHR; as of 2013, 22.0% of LHDs were using an EHR (not a statistically significant change).[15] LHDs with shared governance structures (eg, with other state entities) may be more likely to use EHRs,[16] as are LHDs that serve larger, urban jurisdictions.[17] Likewise, LHDs providing a greater scope of clinical services and those with higher per capita expenditures are more likely to be EHR users.[15]

However, very little data exist on the "non-EHR" LHDs. The most recent data available—from 2013—contain only high-level information about an LHD's clinical data storage solutions, namely the presence or absence of an EHR. Clearly, many public health agencies are electing to use other systems to meet clinical data storage needs, yet existing evidence has yet to shine light on the specific manners in which LHDs are electing to address their information management and data storage needs. Little is known about the practical differences between LHDs that rely on EHRs versus those that use paper records or basic computer systems to support clinical practice and other essential public health functions. An enhanced understanding of the software and data storage strategies currently employed by LHDs, including EHR usage, can help to elucidate current capacities to further leverage existing electronic data and, eventually, connect with external organizations to improve public health practice.[18,19] The purpose of this study was to examine and analyze current usage of clinical data storage and software types by LHDs and to identify characteristics of LHDs associated with these usage patterns.

Methods

Data and sampling design

Data were drawn from the 2015 Informatics Capacity and Needs Assessment Survey, conducted by the Jiann-Ping Hsu College of Public Health at Georgia Southern University in collaboration with National Association of County and City Health Officials (NACCHO). This web-based survey had a target population of all LHDs in the United States. A representative sample of 650 LHDs was drawn using a stratified random sampling design, on the basis of 7 population strata: less than 25 000, 25 000 to 49 999, 50 000 to 99 999, 100 000 to 249 999, 250 000 to 499 999, 500 000 to 999 999, and 1 000 000 and more. LHDs with larger population were systematically oversampled to ensure inclusion of sufficient number of large LHDs in the completed surveys. The targeted respondents were informatics staff designated by the LHDs through a minisurvey conducted before the main survey. A structured questionnaire was constructed and pretested with 20 informatics staff. The questionnaire included various measures to examine the current informatics capacity and needs of LHDs. The survey questionnaire was sent via the Qualtrics survey software to the sample of 650 LHDs. The survey remained open for 8 weeks in 2015. A total of 324 completed responses were received with a 50% response rate. Response rates varied by jurisdiction size from 42% (<25 000 persons) to 64% (≥1 000 000 persons). Given that only a sample of all LHDs participated in the study and the larger LHDs were oversampled and overrepresented, statistical weights were developed to account for 3 factors: (a) disproportionate response rate by population size (7 population strata, typically used in NACCHO surveys), (b) oversampling of LHDs with larger population sizes, and (c) sampling rather than the census approach.

Analyses

For this study, we employed the final, cleaned dataset produced by the 2015 NACCHO Informatics Assessment Survey. Using these data, we performed several univariate and bivariate analyses of LHD software and data storage patterns.

The outcome of interest included the LHD's primary system used for clinical service data ("What is your local health department's primary system to contain/organize patient health information (clinical service data) in-house?"). For this question, survey respondents selected 1 of the 8 categories: vendor-built EHR system, custom-built EHR system, open-source EHR system paper records, basic software, federally provided system, other, and N/A (no clinical services provided).

Independent variables of interest included LHD's size of jurisdiction served (population size), governance type (local, state, or shared), presence of high-speed internet, presence of health information exchange connection, and self-rated information technology (IT) infrastructure (poor, fair, average, good, excellent). In addition, we examined software selection control type (through each department/program, through central department, through city/county IT, through state health agency, or through someone else); whether the LHD reported a need for informatics staff development for "using clinical data to improve quality of care and interpreting clinical data from EHRs and other clinical sources;" the ways in which informatics is used in the LHD (clinical records management, accounting and finance, billing, human resources management, programmatic reporting, program improvement, quality improvement/assurance, surveillance, and none of the above); and whether the LHD reported that 1 of their 3 largest challenges related to electronic exchange of health information with outside organizations was "inability of our organization's EHR system to generate/receive electronic messages/transactions in standardized format."

Statistical analyses consisted of χ^2 and analysis of variance tests, adjusted for multiple comparisons, and weighted for survey design and nonresponse. Analyses were performed using Stata version 13.1.

Results

Data on clinical data storage systems were available for a total of 297 LHDs. As shown in Table 1, the most common method for storing clinical data was a vendor-built EHR system (30.5%). Paper records were the second most common (28.9%) whereas open-source EHRs were only used by 1.5% of respondents.

TABLE 1 Primary System for Clinical Data Storage at LHDs in 2015 (n = 297)

Clinical Data Storage System	Proportion of LHDs, %
Vendor-built EHR system	30.5
Paper records	28.9
Electronic record system other than those listed	12.7
Custom-built EHR system	6.4
Federally provided system	6.1
Basic software	5.3
Open-source EHR system	1.5
Not applicable (no clinical services)	8.5

Abbreviations: EHR, electronic health record; LHD, local health department.

Table 2 shows LHD software and storage methods for nonclinical data. The most common system for nonclinical data is paper records. As with clinical data storage systems, open-source information systems were used by approximately 2% of LHDs.

Among LHDs only reporting use of 1 of the above systems, 44% reported using paper, 24% reported using a vendor-built system, 14% reported using basic software, and 13% reported using a custom-built system (other response categories <2%).

Bivariate analyses

As shown in Table 3, LHD use of EHR varies significantly across several different LHD characteristics. LHD clinical data storage systems differed significantly by jurisdiction size, with LHDs serving larger populations (≥500 000 persons) more likely to use EHR and LHDs serving small jurisdictions (<50 000) less likely to use EHR ($P < .001$) (Table 4). More specifically, LHDs serving small jurisdictions (<50 000) were significantly more likely to use paper records than LHDs serving more than 50 000 to 499 999 or 500 000 and more persons (36.7% vs 18.5% and 12.7%, respectively) ($P = .003$). Larger jurisdictions more frequently used vendor-built systems (eg, 59.1% of LHDs serving 500 000 or more used vendor-built systems).

LHDs with state-level governance were significantly more likely to use paper records than LHDs with local or shared governance (41.1% vs 28.3% and 22.8%, respectively) ($P = .002$). No significant differences in clinical data storage systems were observed for LHDs with and without high-speed internet access.

LHDs that used paper records were significantly more likely to self-rate their IT infrastructure as fair or poor than those using an EHR. LHDs with a vendor-built system reported significantly different levels of IT infrastructure satisfaction—specifically, they were more likely to report "average" satisfaction and less likely to report "poor/fair" or "good/excellent" satisfaction ($P = .004$).

TABLE 2 System(s) for Nonclinical Data Storage at LHDs in 2015 (n = 297)[a]

Nonclinical Data Storage System	Proportion of LHDs, %
Paper records	59.4
Basic software	41.7
Vendor-built information system (ie, "out of the box" system)	29.6
Custom-built information system (ie, designed "in-house")	17.6
Federally provided system	9.9
Open-source information system	2.3

Abbreviation: LHD, local health department.
[a]LHDs could select more than 1 category, so column sums to greater than 100%.

TABLE 3 ● Type of Clinical Data Storage System Used, by LHD Characteristics (n = 297)

LHD Characteristic	LHD's Clinical Data System								*P* Value
	Paper Records, %	Basic Software, %	Federally Provided System, %	Custom-Built EHR, %	Vendor-Built EHR, %	Open-Source EHR, %	Other Electronic System, %	N/A, %	
All LHDs	28.9	5.3	6.1	6.4	30.5	1.5	12.7	8.5	
Jurisdiction size									.003
<50 000	36.7	6.1	7.6	4.3	20.3	1.8	13.9	9.3	
50 000-499 999	18.5	4.8	4.6	9.0	43.1	1.4	10.1	8.6	
≥500 000	12.7	0.0	0.0	12.7	59.1	0.0	15.6	0.0	
Governance type									.002
Local	28.3	5.5	7.5	3.6	31.2	1.6	11.5	10.1	
Shared	22.8	6.5	0.0	24.6	19.7	0.0	26.4	0.0	
State	42.1	2.4	0.0	12.9	28.8	2.2	8.3	3.4	
Use of high-speed internet									.741
Yes	25.7	4.0	8.4	10.3	22.6	1.3	19.3	8.4	
No/not sure	30.0	5.6	5.7	5.8	31.7	15.8	11.6	8.2	
Connected to health information exchange									.025
Yes	14.8	7.5	5.9	11.7	35.7	1.7	16.2	6.6	
No/not sure	36.4	4.5	5.9	4.3	26.4	1.5	11.2	9.7	
Self-rated IT infrastructure									.018
Poor	48.3	5.6	4.7	2.7	9.7	2.7	7.2	19.1	
Fair	40.7	1.8	4.2	9.3	20.6	0.0	14.1	9.3	
Average	21.3	4.6	8.6	28.4	45.9	24.7	6.9	7.4	
Good	27.6	6.3	4.9	9.1	27.7	0.0	15.9	8.4	
Excellent	17.0	15.0	7.1	5.9	18.3	9.1	27.7	0.0	
Software selection control									.645
Controlled within LHD	27.5	5.1	5.6	5.6	34.3	0.8	13.3	7.8	
Controlled outside LHD	31.5	5.7	7.0	8.0	23.4	2.9	11.6	9.9	
Self-reported staff development needs for using clinical data									.012
Yes	18.9	2.0	2.8	7.1	46.2	3.8	19.2	0.0	
No	30.8	6.5	6.0	6.5	26.7	10.7	11.6	10.8	

Abbreviations: EHR, electronic health record; IT, information technology; LHD, local health department; N/A, not applicable.

LHDs currently connected to an electronic health information exchange were significantly less likely to report using paper records than others (14.8% vs 35.1%, $P = .03$).

Use of EHR was significantly higher for LHDs that provide primary care and/or dentistry services than LHDs that provide neither of these services. Provision of either of these 2 services indicates potential eligibility for federal meaningful use payments. Specifically, 56.8% of LHDs that provide primary care and/or dentistry services reported use of vendor- or custom-built EHR whereas only 31.5% of LHDs that did not provide either service reported use of these EHR systems ($P = .01$).

No significant differences were seen in clinical data storage systems according to the LHD's level of internal control for software selection. Specifically, LHDs with decision-making authority for software selection

TABLE 4 ● Type of Clinical Data System Used Versus Ways in Which Informatics Is Used by LHD (n = 297)

	LHD's Clinical Data System								
Functional Area	Paper Records, %	Basic Software, %	Federally Provided System, %	Custom-Built EHR, %	Vendor-Built EHR, %	Open-Source EHR, %	Other Electronic System, %	N/A[a]	*P* Value
All LHDs	28.9	5.3	6.1	6.4	30.5	1.5	12.7	8.5	
Clinical records management									<.001
Yes	22.7	3.2	4.7	9.6	42.4	1.4	13.6	2.5	
No	38.0	8.3	8.2	2.1	14.4	1.7	11.6	15.8	
Accounting and finance									.031
Yes	25.9	4.0	6.3	8.4	35.3	1.4	13.0	5.7	
No	36.6	8.5	5.8	1.8	19.7	1.8	12.2	13.7	
Billing									.001
Yes	27.9	4.4	3.8	9.7	38.1	1.7	12.6	1.9	
No	31.0	6.8	9.8	1.4	19.1	1.3	13.0	17.7	
Human resources management									.001
Yes	19.7	2.1	3.6	19.1	37.2	0.0	16.5	1.8	
No	31.8	6.3	6.9	2.8	28.7	2.0	11.7	9.9	
Programmatic reporting									.002
Yes	26.0	4.3	4.1	7.9	34.3	1.3	17.4	4.7	
No	34.7	7.2	9.9	3.9	24.0	2.0	4.2	14.1	
Program improvement									.001
Yes	17.0	4.3	7.4	10.4	40.5	0.0	15.9	4.6	
No	37.7	6.1	5.3	3.7	23.7	2.6	10.5	10.5	
Quality improvement/assurance									.020
Yes	19.0	5.5	5.8	9.4	39.5	1.7	12.5	6.6	
No	38.1	5.2	6.4	3.8	22.7	1.4	13.0	9.3	
Surveillance									.026
Yes	28.8	3.6	5.1	9.4	31.8	2.4	13.8	5.1	
No	29.6	8.4	7.9	1.5	28.8	0.0	10.9	13.1	
None of the above									.116
Yes	13.6	21.0	0.0	0.0	28.1	0.0	0.0	37.3	
No	29.5	4.9	6.3	6.6	30.7	1.6	13.1	7.3	

Abbreviations: EHR, electronic health record; LHD, local health department; N/A, not applicable.
[a]No clinical services provided by LHD.

were no more or less likely to report using EHRs than LHDs for which decision-making authority rested with a city/county IT department or state health agency.

LHDs using vendor-built, custom-built, and open-source systems more frequently reported a need for informatics staff development ($P = .01$).

Significant differences were observed for ways in which informatics is used in an LHD according to the type of clinical data storage system employed. For all functional areas examined, paper records were associated with a significantly lower likelihood of informatics usage.

LHDs displayed a high level of consistency in terms of data storage systems for both clinical and nonclinical data (data not shown in tables). For example, 82.4% of LHDs using paper records for clinical data also use paper records for nonclinical data, 80.0% of LHDs using basic software for clinical data also use basic software for nonclinical data, 65.3% of LHDs using a custom-built system for clinical data also use a custom-built system for nonclinical data.

As shown in Table 4, the ways in which informatics was used by LHDs varied significantly according to clinical data system used. Specifically, for nearly all of the 8 functional areas examined, LHDs that reported using informatics for a given area had higher rates of EHR usage than LHDs reporting not using informatics for that area. LHDs not using informatics for a given area were frequently more likely to report relying on paper records or answering that they do not perform clinical services.

Finally, as shown in Table 5, of LHDs that do not use a formal EHR (ie, those reporting use of paper records, basic software such as Microsoft Word, or a federal system such as Epi Info), 75.6% reported that, within the past 2 years, they had reviewed their current systems to determine whether they need to be improved or replaced. In contrast, only 65.5% of LHDs that use a formal EHR reported such a review within the past 2 years. This difference was not statistically significant.

Discussion

Our analysis found that 38.4% of LHDs reported using a vendor-purchased, custom-built, or open-source EHR system. This estimate is higher than levels found previously. For example, the 2013 NACCHO profile reported that only 22% of LHDs used an EHR. Yet that same report found that another 22% of LHDs reported plans to implement an EHR. The data for that survey were collected in 2012, which was only the second year that (some) LHDs could have been eligible to receive federal incentive payments for Meaningful Use of an EHR system. Our data were collected in 2015, and the notably higher EHR usage estimate may reflect the LHDs that reported plans to adopt and/or the impact of an additional 3 years of Meaningful Use incentive payment opportunities.

Among LHDs that do not currently have an EHR, the clear majority (84.7%) reported already having selected an EHR system. Only 11.5% reported no current plans to implement an EHR. If true, this would portend sizable increases in EHR adoption and usage rates in coming years. Given the importance of review and planning in the IT life cycle,[7] it is notable that there was no difference in EHR adoption plans for LHDs that had recently performed a review of their information systems versus those that had not. Reviewing one's information needs does not automatically lead to a decision to implement an EHR. Indeed, the review may suggest just the opposite. Therefore, more analysis of what these reviews found and how and why they may motivate EHR adoption is needed.

Although EHR usage may be more common than in 2012, the majority of LHDs (nearly two thirds) do not report using any of the 3 EHR types surveyed. Indeed, a similar proportion of LHDs are still using paper as their primary system for clinical data storage (28.9%) as are using EHRs (30.5%). One possible explanation for this is that the limited services provided by LHDs in some jurisdictions do not justify the time

TABLE 5 Plans to Implement EHR Among Non-EHR Using LHDs, According to Whether LHD Has Conducted a System Review to Determine Needs[a]

		Within Past 2 y, Reviewed System to Determine Improvement/Replacement Needs?	
LHD's EHR Implementation Plans	Total for All Non-EHR Users, %	Yes, Have Reviewed, %	No, Have *Not* Reviewed, %
No plans to implement EHR system	11.5	15.0	9.6
Currently researching/selecting EHR system	3.9	0.0	6.0
Have selected a system but have not begun implementing	36.5	38.0	35.6
Have selected a system and have begun implementing	48.2	46.9	48.8
Total	100.0	100.0	100.0

Abbreviations: EHR, electronic health record; LHD, local health department.
[a]Differences between LHDs that have reviewed and those that have not reviewed (columns 3 and 4) are not statistically significant ($P = .45$).

and expense associated with transitioning to an EHR system. In previous analysis of LHD services, we identified that a small minority (less than 12%) of LHDs are providing primary care services whereas the majority provide specialty screening programs for human immunodeficiency virus (HIV), sexually transmitted diseases, and tuberculosis (62%, 66%, and 84%, respectively).[20] Information management needs for these more commonly delivered screening programs may be sufficiently met through non-EHR systems. For example, the Health Resources and Services Agency (HRSA) provides a software platform called CARE-Ware as a free option for Ryan White CARE Act-funded agencies to track HIV/AIDS testing, referral, and treatment services. This system also has the advantage of providing data reports and exports, which meet HRSA's detailed grantee reporting requirements.[21] In contrast, paper-based data systems may not adequately meet the rigorous medical history and patient management needs for primary care services. Therefore, an LHD may choose to leverage a data storage system with a smaller footprint in terms of IT resources, hardware, software licensing fees, maintenance, or required training.

We found evidence of a significant gap in EHR usage according to size of jurisdiction served. Specifically, only 12.7% of LHDs serving 500 000 or more persons are still using paper for clinical data storage compared with 36.7% of smaller (<50 000) jurisdictions. Simply because of economies of scale, larger jurisdictions may have more resources (financial, personnel, or both) at their disposal to facilitate transition to an electronic data storage system such as EHR. In the absence of direct federal or state support, the presence of these resources may moderate the effects of internal motivations to adopt and use information systems. After all, even the LHDs most motivated to adopt an EHR face sizable upfront financial investments. Shared decision making between state and local jurisdictions also appears to promote electronic data storage as 41.1% of jurisdictions with state-level governance were using paper records compared with 28.3% and 22.8% of jurisdictions with local or shared governance, respectively. This same relationship was not observed when LHDs were asked specifically about decision-making authority over IT projects.

LHDs provide a wide variety of services beyond clinical care, some of which are more amenable to electronic data storage than others. Beyond specialty screening programs, several nonclinical LHD service types were identified in the survey as examples including organizing permit, license, inspection, investigation, surveillance, and enforcement data. Although national standards for good practices related to implementation of the Food and Drug Administration's Food Code have been in place for many years, the requirement for provisioning food service licenses and permits as well as inspection of these facilities lies at the local level.[22] There is no corresponding national system for aggregating this information beyond the state or local jurisdiction. This may explain why this information is commonly managed locally with paper records or basic software (59.4% and 41.7%, respectively). In contrast, infectious disease investigation and surveillance data are typically reported on a weekly basis beyond the state or local jurisdiction to the Centers for Disease Control and Prevention (CDC) for dissemination through the Morbidity and Mortality Weekly Report.[23] The CDC has also dedicated time and resources to develop the National Electronic Disease Surveillance System (NEDSS) and its accompanying software application, NEDSS Base System (NBS), which is used in 19 states and Washington, DC.[24] Other states and jurisdictions must have NEDSS-compatible systems that allow for entry directly through an internet browser-based system by health investigators and public health care professionals. Notifiable disease surveillance system participation by LHDs could fall into vendor-built, custom-built, or federally provided information systems (57.1%).

Paper records remain a common approach for clinical and nonclinical data management for LHDs. Although other parts of the health care sector are moving away from paper toward electronic records, for some service areas within an LHD discontinuing use of paper records may not be feasible. The example of HIV/AIDS surveillance is instructive. The CDC-supported electronic HIV/AIDS Reporting System (eHARS) supports electronic data reporting to the CDC.[18] Although the system is electronic, it requires the maintenance of records in their original format (often meaning paper copies of records) and their subsequent scanning and attachment to case reports. Given these system requirements, LHDs that perform HIV/AIDS screening or disease control activities must commonly maintain paper records.

Our study's findings should be viewed in light of several limitations. One limitation of this analysis is that the original survey instrument did not ask the questions on nonclinical data storage for each type of service independently. As a result, we could not identify which specific data are being maintained on paper versus some other option. As described with the case of HIV/AIDS programs earlier, it is plausible that some aspects of many public health information systems still have a paper component. Second, our data are self-reported. Respondents may be unaware of all informatics systems in use or may report using systems perceived as better or more desirable (eg, socially desirable response bias). Yet, these same survey

administration methods and potential sources of bias are also present for other surveys (eg, NACCHO Profile survey) and our data reveal a notable increase in EHR usage from 2013 to 2015.

Conclusions

LHDs, like many health care organizations, are turning to electronic data systems to manage and store health data. There are a broad range of programmatic needs, reporting requirements, competing priorities, and financial realities that LHDs must juggle when determining the optimal data storage system(s) for a given service line. As it stands, 38.4% of LHDs report using an EHR to store clinical data. Although this is a substantial increase from previous estimates, it still means that more than 60% of LHDs are not currently using any EHRs systems to support their service lines. Of these nonusers, the vast majority report plans to implement an EHR in the foreseeable future, suggesting that we may be at an important inflection point where additional policy support may help to shape LHD use of EHR. Specifically, LHD governance type and jurisdiction size may be important differential factors for determining types of policy assistance or technical support required.

Guidelines such as how to assess readiness to adopt technology, how often to reassess software or technology solutions, and the return on investment seen from technology investments would likely be useful to jurisdictions not already heavily invested in technology infrastructure. Further use cases showing the benefits to health information exchange and how to leverage this technology investment from a public perspective would also likely be beneficial for discussing resource allocations with decision makers. Likewise, program- or system-specific needs (such as those for HIV/AIDS reporting) may pose as either barriers or facilitators to EHR adoption and should be addressed specifically. Health IT may offer a range of promising benefits for public health practice, but more work remains to realize a nation of fully wired LHDs.

REFERENCES

1. Scutchfield FD, Keck CW. *Principles of Public Health Practice*. Clifton Park, NY: Delmar, Cengage Learning; 2003.
2. Dixon BE, Pina J, Kharrazi H, Gharghabi F, Richards J. What's past is prologue: a scoping review of recent public health and global health informatics literature. *Online J Public Health Inform.* 2015;7(2):e216.
3. Friede A, Blum HL, McDonald M. Public health informatics: how information-age technology can strengthen public health. *Annu Rev Public Health.* 1995;16:239-252.
4. Yasnoff WA, O'Carroll PW, Koo D, Linkins RW, Kilbourne EM. Public health informatics: improving and transforming public health in the information age. *J Public Health Manage Pract.* 2000;6(6):67-75.
5. Baker EL Jr, Ross D. Information and surveillance systems and community health: building the public health information infrastructure. *J Public Health Manag Pract.* 1996;2(4):58-60.
6. Baker EL, Ross DA. Managing information—addressing a central challenge of the public health enterprise. *J Public Health Manage Pract.* 2013;19(4):383-385.
7. Yasnoff WA, Overhage JM, Humphreys BL, LaVenture M. A national agenda for public health informatics. *J Am Med Inform Assoc.* 2001;8(6):535-545.
8. DesRoches CM, Charles D, Furukawa MF, et al. Adoption of electronic health records grows rapidly, but fewer than half of US hospitals had at least a basic system in 2012. *Health Aff.* 2013;32(8):1478-1485.
9. Hsiao C-J, Jha AK, King J, Patel V, Furukawa MF, Mostashari F. Office-based physicians are responding to incentives and assistance by adopting and using electronic health records. *Health Aff.* 2013;32(8):1470-1477.
10. Wolf L, Harvell J, Jha AK. Hospitals ineligible for federal meaningful-use incentives have dismally low rates of adoption of electronic health records. *Health Aff.* 2012;31(3):505-513.
11. DesRoches CM, Worzala C, Joshi MS, Kralovec PD, Jha AK. Small, nonteaching, and rural hospitals continue to be slow in adopting electronic health record systems. *Health Aff.* 2012;31(5):1092-1099.
12. McCullough JM, Zimmerman FJ, Bell DS, Rodriguez HP. Electronic health information exchange in underserved settings: examining initiatives in small physician practices & community health centers. *BMC Health Serv Res.* 2014;14(1):415.
13. Heisey-Grove D, Chaput D, Daniel J. *Hospital Reporting on Meaningful Use Public Health Measures in 2014.* ONC Data Brief number 22. Office of the National Coordinator for Health Information Technology; 2015.
14. National Association of City and County Health Officials. Statement of Policy: Local Health Department Involvement in Meaningful Use Preparation. http://www.naccho.org/uploads/downloadable-resources/Policy-and-Advocacy/11-05-LHD-Involvement-in-Meaningful-Use.pdf. Published 2011. Accessed May 15, 2016.
15. McCullough JM, Zimmerman FJ, Bell DS, Rodriguez HP. Local public health department adoption and use of electronic health records. *J Public Health Manage Pract.* 2015;21(1):20-28.
16. Vest JR, Menachemi N, Ford EW. Governance's role in local health departments' information system and technology usage. *J Public Health Manage Pract.* 2012;18(2):160.
17. Shah GH, Leider JP, Castrucci BC, Williams KS, Luo H. Characteristics of local health departments associated with implementation of electronic health records and other informatics systems. *Public Health Rep.* 2016;131(2):272-282.
18. Shapiro JS, Mostashari F, Hripcsak G, Soulakis N, Kuperman G. Using health information exchange to improve public health. *Am J Public Health.* 2011;101(4):616-623.

19. Kierkegaard P, Kaushal R, Vest JR. Applications of health information exchange information to public health practice. Paper presented at: AMIA Annual Symposium Proceeding, 2014.
20. McCullough JM, Goodin K. Patterns and correlates of public health informatics capacity among local health departments: an empirical typology. *Online J Public Health Inform.* 2014;6(3):e199.
21. Health Resources and Services Administration. Ryan White CAREWare. http://hab.hrsa.gov/manageyourgrant/careware.html. Published 2015. Accessed February 29, 2016.
22. Cohen SM, Gray KM, Ocfemia M, Johnson AS, Hall HI. The status of the National HIV Surveillance System, United States, 2013. *Public Health Rep.* 2013;129(4):335-341.
23. Centers for Disease Control and Prevention. Notifiable diseases and mortality tables. *Morb Mortal Wkly Rep (MMWR).* 2016;65(8).
24. Centers for Disease Control and Prevention. National Notifiable Diseases Surveillance System (NNDSS). https://wwwn.cdc.gov/nndss/. Published 2015. Accessed February 23, 2016.