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Kate Drezner

National Association of County & City Health Officials

Lisa McKeown

National Association of County & City Health Officials

Gulzar H. Shah

Georgia Southern University, gshah@georgiasouthern.edu

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Assessing Skills and Capacity for Informatics: Activities Most Commonly Performed by or for Local Health Departments

Kate Drezner, MPH; Lisa McKeown, MPH; Gulzar H. Shah, PhD, MStat, MS

Objective: To describe the informatics activities performed by and for local health departments. **Design:** Analysis of data from the 2015 Informatics Capacity and Needs Assessment Survey of local health departments conducted by the Jiann-Ping Hsu College of Public Health at Georgia Southern University in collaboration with the National Association of County & City Health Officials. **Participants:** 324 local health departments.

Main Outcome Measure(s): Informatics activities performed at or for local health departments in use and analysis of data, system design, and routine use of information systems. **Results:** A majority of local health departments extract data from information systems (69.5%) and use and interpret quantitative (66.4%) and qualitative (55.1%) data. Almost half use geographic information systems (45.0%) or statistical or other analytical software (39.7%). Local health departments were less likely to perform project management (35.8%), business process analysis and redesign (24.0%), and developing requirements for informatics system development (19.7%). Local health departments were most likely to maintain or modify content of a Web site (72.1%). A third of local health departments (35.8%) reported acting as “super users” for their information systems. A significantly higher proportion of local health departments serving larger jurisdictions (500 000+) and those with shared governance reported conducting informatics activities.

Conclusion: Most local health department informatics activities are completed by local health department staff within each department or a central department, but many state health departments also contribute to informatics at the local level. Larger local health departments and those with shared governance were more likely to perform informatics activities.

Local health departments need effective leadership, a skilled workforce, strong partnerships, and policies that foster implementation of health information systems to successfully engage in informatics. Local health departments also face important training needs, including data analytics, project management, and geographical information systems, so they can adapt to the increasing availability of electronic data and changes in technology.

KEY WORDS: informatics, local health departments, public health

Local health departments (LHDs) adapt to the evolution of information technology to remain leaders in public health. Strategically capturing and using information effectively are essential to responding to the needs of communities and protecting local health.^{1,2} Several federal initiatives in recent years have accelerated the evolution of LHDs to focus on e-health and population health initiatives. The 2009 passing of the Health Information Technology for Economic and Clinical Health Act (HITECH) provided financial incentives to providers and hospitals for health information technology with the purpose of meaningful use

Author Affiliations: National Association of County & City Health Officials, Washington, District of Columbia (Mss Drezner and McKeown); and Jiann-Ping Hsu College of Public Health, Georgia Southern University, Statesboro (Dr Shah).

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Correspondence: Kate Drezner, MPH, National Association of County & City Health Officials, 1100 17th St NW, Washington, DC 20036 (kaltshaefl@gmail.com).

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of electronic health records (EHRs) and health system interoperability, including interoperability with public health entities.³ However, little funding was provided to public health agencies to support the requirements of meaningful use reporting to public health.⁴ As more providers adopt electronic medical records with a variety of health information systems, health departments must work with them to ensure continuance of timely public health reporting and compatibility with health department data collection systems.

Informatics at LHDs includes a variety of activities that are essential for improving public health programs.⁵ At the local level, informatics is used to detect, track, and manage illness outbreaks; coordinate access to information from inside and outside the formal delivery system; analyze population health trends and identify at-risk populations; and protect communities during public health emergencies.⁵⁻⁷ Interoperability is especially important to allow data to come from a variety of sources in a timely manner so that the data can then be used for program planning and evaluation.^{5,7,8} For example, syndromic surveillance captures recent data from various sentinel organizations such as hospitals and urgent care centers to identify trends in illness and notify LHDs of emerging issues, which is only possible with timely data.^{5,8} In addition, implementation of electronic laboratory reporting has been shown to increase the number of case reports and reduce the time between testing and reporting, which improves surveillance timeliness and accuracy in capturing all cases.^{9,10} In New York City, access to timely laboratory data allowed investigators to identify the addresses of patients to determine the source of a Legionnaires' disease outbreak by analyzing geographic clustering of cases.¹¹

To inform public health programs, LHDs need staff with technical skills and experience in informatics to successfully navigate the integration of various data sources, while also maintaining both high data quality and patient confidentiality.^{7,11} Despite facing barriers of costs and limited resources, LHD staff need to continue to prioritize professional development in informatics to meet the needs of their community and facilitate the sharing of data across local and state health care systems.¹² According to the 2013 National Association of County & City Health Officials, (NACCHO) profile of LHDs, the LHD information systems specialist workforce remained unchanged between 2008 and 2013. LHDs' staffing of information systems specialists varies by size, ranging from no staff in the smallest LHDs to approximately 4.5 staff members in the largest jurisdictions.¹³ With the lack of staff, LHDs are lagging behind in informatics activities, with only 22% of LHDs implementing EHRs and 13% conducting health information exchanges. However, nearly half of LHDs are planning on implementing these activities or

examining the possibility, and a capable informatics workforce is essential to completing this work.¹³

Previous studies of informatics capacity have focused on the use of information systems and workforce capacity.^{5,14-18} Existing research shows that LHDs differ in the use or implementation of information systems by infrastructural and other organizational characteristics.^{5,15,16} However, detailed analyses of the informatics-related activities indicating the workforce capacity and the extent to which LHDs vary in informatics activities by organizational characteristics have not been examined. Therefore, the 2015 Informatics Capacity and Needs Assessment Survey builds on previous informatics assessments and fills important evidence gaps. To this end, this article examines the skills and capacity section of the assessment, which explored the ability of LHDs to perform informatics activities.

● Methods

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 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, based on 7 population strata: less than 25 000; 25 000-49 999; 50 000-99 999; 100 000-249 999; 250 000-499 999; 500 000-999 999; and 1 000 000 and more. LHDs with larger populations were systematically oversampled to ensure inclusion of a sufficient number of large LHDs in the completed surveys. The targeted respondents were informatics staff designated by the LHDs through a mini-survey conducted prior to the main survey. A structured questionnaire was constructed and pretested with 20 informatics staff members. 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. 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. Surveys with incomplete responses in section 1 of the survey, featuring questions for all LHDs regardless of informatics activities, were excluded from the analysis.

Measures

For this study, our measure for the informatics-related activities came from the question, “Which of the following activities are performed at (or for) your health department (select all that apply)?” with a list of the activities included in Table 1 as the response categories. Respondents were further asked to, “Please indicate who does the following for your LHD (check all that apply).” Survey participants were asked to record their responses for each of the activities listed in Table 2 on the following response categories: (a) staff within your LHD (within each department), (b) staff in your LHD (through central department), (c) staff in another government department in your jurisdiction, (d) the state health department, (e) contractors or consultants, and (f) other. The list of activities was developed from a review of the literature and expanded with the help of the project advisory committee, consisting of more than 12 subject matter experts from the industry.

Respondents to the aforementioned listed questions were provided the following definitions:

- *Geographic information systems:* Software used to perform spatial analysis and produce geographic visualizations such as maps.
- *Business process analysis:* A systematic process by which an LHD maps out the tasks performed for specific public health operations.

- *Business process redesign:* Rethinking the way tasks are carried out to increase the efficiency and effectiveness of public health operations.
- *Requirements for information system development:* “Requirements” describe what an information system must be able to do. They can guide the selection or development of a system.
- *Super user:* A system user who is knowledgeable enough about the system to help other users understand how to make good use of the system and perhaps has the ability to modify/customize the system.

To examine the variation in informatics by some basic LHD characteristics, we included 2 measures, namely, population size of LHD jurisdiction (<50 000; 50 000-499 999; and 500 000 or more people) and the LHD governance relationship (state governed, locally governed, and shared governance).

Analysis

Descriptive statistics (proportion of LHDs) were computed to compare which informatics activities were performed more commonly and the activities least commonly performed (and thus needing capacity building). We used the χ^2 test for examining difference in the proportion of LHDs performing various

TABLE 1 ● Percentage of LHDs With Type of Informatics-Related Activities Performed, by Type of LHD Governance and Size of Population in LHD Jurisdiction^a

Activities Performed at (or for) LHD	Type of LHD Governance					Size of Population in LHD Jurisdiction			
	All	State	Local	Shared	P	<50 000	50,000-499,999	500,000+	P
Uses and analysis of data									
Extracts data from information systems	69.5%	67.2%	68.3%	81.7%	<.001	60.5%	80.6%	97.0%	<.001
Uses and interprets quantitative data	66.4%	66.7%	66.3%	66.4%	.99	59.4%	73.9%	94.0%	<.001
Uses and interprets qualitative data	55.1%	54.9%	55.1%	55.7%	.98	47.7%	63.5%	82.1%	<.001
Uses geographic information systems	45.0%	42.6%	45.0%	47.2%	.63	30.0%	63.1%	93.2%	<.001
Uses statistical or other analytical software	39.7%	43.1%	37.9%	51.5%	<.001	26.9%	54.1%	85.8%	<.001
System design									
Provides project management	35.8%	24.5%	37.5%	31.5%	<.001	26.3%	45.3%	78.9%	<.001
Conducts business process analysis and redesign	24.0%	26.5%	21.1%	45.5%	<.001	17.6%	27.8%	67.7%	<.001
Develops requirements for informatics system development	19.7%	17.2%	17.8%	37.0%	<.001	10.3%	28.6%	63.9%	<.001
Routine use of information systems									
Maintains (modifies content of) a Web site	72.1%	53.9%	72.5%	84.7%	<.001	63.8%	83.4%	90.3%	<.001
Acts as super users for your information systems	35.8%	42.6%	33.1%	52.3%	<.001	26.6%	44.1%	83.5%	<.001
None of the above	10.3%	12.7%	10.0%	10.2%	.48	15.5%	3.1%	0.0%	<.001

Abbreviations: IS, information system; LHD, local health department.

^aP values for the population categories are based on Somer’s D, and for governance category, based on the χ^2 test. Bolded values show significance of subgroup differences at $P \leq .05$. Number of observations (n) = 306.

TABLE 2 ● Percentage of LHDs With Type of Informatics-Related Activities by the Entity (LHD, SHD, etc) That Performs Those Activities (N = 281)^a

Type of Function ^b	Staff Within LHD (Each Department)	Staff Within LHD (Central Department)	Staff in Another Government Department	The State Health Department	Contractors or Consultants	Other
Uses and analysis of data						
Extracts data from information systems	60.30%	23.90%	6.70%	30.70%	11.10%	1.20%
Uses and interprets quantitative data	62.50%	22.70%	4.50%	28.00%	5.70%	1.00%
Uses and interprets qualitative data	51.60%	21.00%	4.70%	23.00%	4.00%	1.00%
Uses statistical or other analytical software	29.00%	14.50%	5.50%	17.40%	2.50%	1.00%
Uses geographic information systems	34.00%	14.10%	13.40%	12.50%	2.10%	0.80%
System design						
Conducts business process analysis and redesign	15.30%	11.70%	3.20%	7.60%	4.40%	1.00%
Develops requirements for informatics system development	10.70%	9.80%	5.50%	8.40%	4.80%	0.60%
Provides project management	20.40%	16.60%	6.00%	7.20%	4.80%	0.30%
Routine use of information systems						
Acts as “super users” for your information systems	23.70%	18.60%	5.80%	7.90%	3.50%	0.00%
Maintains (modifies content of) a web site	44.60%	35.80%	13.70%	10.10%	5.30%	1.40%

Abbreviations: LHD, local health department; SHD, state health department.

^aRow percentages do not add up to 100% because response choices were not mutually exclusive.

^bLHDs *not* performing a specific function (eg, extracting data from information systems) were coded as “no” for this table. LHDs that indicated performing none of these functions in the previous questions were programmed in the survey to skip this question and were treated as missing in this table.

activities by LHD governance category. To assess the differences by jurisdiction size, we used Somer’s D. We performed all analyses for this study using STATA and SPSS (version 23.0).

● Results

Activities related to uses and analysis of data

A majority of LHDs stated that they extract data from information systems (69.5%) and use and interpret quantitative (66.4%) and qualitative (55.1%) data. Almost half also stated that they use geographic information systems (45.0%) or statistical or other analytical software (39.7%) (Table 1). For all of these activities, LHDs serving jurisdictions with larger populations reported that a significantly higher proportion ($P < .001$) of activities related to data use and analyses were conducted in or for their LHDs compared with LHDs serving smaller jurisdictions. The proportion of LHDs performing informatics activities varied significantly by type of LHD governance for extracting data from information systems and use of statistical/analytical software. The proportion of LHDs performing the other 3 activities related to uses and analysis of data did not vary significantly by LHD governance (Table 1).

System design

LHDs were less likely to report system design activities such as project management (35.8%), business

process analysis and redesign (24.0%), and developing requirements for informatics system development (19.7%). LHDs serving jurisdictions with larger populations reported that a significantly higher proportion ($P < .001$) performed activities related to system design compared with LHDs serving smaller jurisdictions, including provision of project management, business process analysis and redesign, and formulation of requirements for informatics system development. The proportion of LHDs performing system design activities by governance type also varied significantly ($P < .001$) by type of LHD governance, with LHDs in shared and local governance more commonly performing systems design activities than the state-governed LHDs (Table 1).

Routine use of information systems

Of all the activities, LHDs were most likely to maintain or modify content of a Web site (72.1%). However, only a third of LHDs (35.8%) reported acting as “super users” for their information systems. Maintaining Web sites and acting as super users were performed significantly more often by the LHDs serving larger jurisdictions (500 000+ people) than smaller LHDs ($P < .001$). LHDs in shared governance were significantly more likely to perform the activities indicating routine use of informatics than LHDs with other governance type ($P < .001$). Overall, 10.3% of LHDs did not perform any of the listed informatics activities (Table 1).

Who performed informatics-related activities for LHDs?

Most activities were performed within the LHD, either by staff within each department or through a central department (Table 2). A majority of LHDs stated that LHD staff within each department extract data from information systems (60.30%) and use and interpret quantitative data (62.50%), and half (51.60%) use and interpret qualitative data. For these 3 major data functions, the state health department represented the second highest choice, followed by LHD staff from a central department. Use of geographic information systems was most often performed by LHD staff within each department (34.00%), as was use of statistical or other analytical software (29.00%). LHDs reported that staff within each LHD department most often performed system design activities such as business process analysis and redesign (15.30%), developing requirements for informatics system development (10.70%), and project management (20.40%). Staff within each LHD department were also most likely to act as super users for information systems (23.70%) and maintain and modify a Web site (44.60%), followed by LHD staff from a central department at 18.60% and 35.80%, respectively.

● Discussion

LHDs with a larger population size within their jurisdiction were overall more likely to perform informatics activities across all 3 categories of uses and analysis of data, system design, and routine use of information systems. Given the cost involved in implementing informatics activities within an LHD, this finding is not surprising. A possible reason for this is that larger health departments have economies of scale in which multiple public health programs provided by an LHD can produce a wider range of informatics capacity for additional activities, contributing some resources (eg, personnel, equipment, software licensure) across public health programs within the same LHD. While this economic theory is not addressed by this study, additional analysis of the cost of performing activities would help inform solutions to the varying degrees of informatics activities between LHD governance and population size. Smaller LHDs may consider models with shared services across multiple LHDs to provide informatics activities within a region. This could mirror the functionality of a larger LHD, taking advantage of resources across multiple programs and LHDs. To implement shared informatics services, LHD leadership and policies must align across jurisdictions.

Informatics activities performed by LHDs were also affected by the LHD governance. Shared governance

frequently appeared to provide the most benefits to performing additional informatics activities. This increase in activities shows the benefits of local and state governments working together to create the most conducive environment for a successful informatics program. With the addition of state resources within an LHD, shared governance can provide ways to streamline, economize, improve quality, and coordinate informatics activities across jurisdictions within a state. Local and state health departments should consider a shared governance structure to further advance the capacity to perform informatics activities across LHDs within a state. However, changing the governance of LHDs within a state can be time-consuming and additional considerations outside of informatics capacity must be considered, including policy changes and implementation and effects on other public health programs within LHDs.

LHDs were most likely to perform informatics activities related to the use and analysis of data compared with system design and routine maintenance of information systems. However, the most commonly performed activity, extracting data from information systems, was only performed by 69.5% of LHDs, with a significant increase with shared governance and larger population size within the LHD. Extracting data from information systems such as EHRs, immunization registries, and surveillance systems is essential to LHDs' understanding of their communities' health and identifying public health problems. As a fundamental start to any informatics program, more LHDs would benefit from extracting data from existing, accessible systems to use data to inform public health decisions. It is unclear if the LHDs did not extract data as a result of not having the staff capacity, not having access to the data systems, or another reason.

The percentages of LHD staff, both within each department and through a central department, are mirrored closely in those that extract data from information systems and those that use and interpret quantitative data, indicating that LHDs extracting data are utilizing it within their public health programs through quantitative analysis. While accessing data is an important first step, what LHDs do with the data is even more critical to ensuring the results can inform programmatic and clinical decisions. LHDs need to be able to identify trends and data quality problems that may alter their response to public health events or outbreaks. Completing the more complicated data tasks of using geographic information systems and statistical software is more limited at smaller jurisdictions, increasing use as the population within the jurisdiction increases. Smaller health departments have more limited resources to buy the necessary software and dedicate skilled staff time to devote to

these projects. However, being able to analyze large data sets and map health data through geographic information systems is essential to identifying disparities and program deficits so that resources can be allocated effectively. To address this need, free and low-cost software packages are available to the public, and staff training should be offered where possible to increase LHDs' capacity to use local data to its full potential.

Only a third or less of LHDs performed the system design activities of project management, business process analysis and redesign, and developing requirements for informatics system development, highlighting the need for LHDs to acquire staff experienced in informatics and with the leadership skills necessary to design and manage projects. The lack of LHD participation in system design activities also demonstrates that LHDs have little input in the informatics development processes that determine what tasks can be performed at the local level and how the systems operate. Giving LHDs input in system design decisions could help make LHD informatics tasks more efficient and adaptable to local needs, which is especially important, given the limited resources available to LHDs.

Participation in the routine use of the information system activities of Web site design and maintenance and acting as a super user varied. The most commonly performed informatics activity was maintaining or modifying a Web site (72.1%), which is important for keeping the public up to date on local public health events and resources. However, a statistically significant difference existed between LHDs with super users, with jurisdictions of more than 500 000 people most commonly acting as super users. Super users are typically most knowledgeable of the system and can help others understand how the system works, how to use it most effectively, and possibly modify system contents. Given the ability of larger LHDs to provide project management, conduct business process analysis and redesign, and develop requirements for informatics system development, it is expected they would also have the greatest capacity and knowledge to act as a super user. These measures also indicate the likelihood and capacity of large jurisdiction LHDs to manage and develop their own information systems rather than rely on statewide or regional systems. Information systems are most useful when staff know how to effectively use the systems and all of their possible tools; this can be accomplished through training of local super users or access to a super user at the state health department. However, if capacity allows, it is important for all health department staff members to have informatics training, so as not to limit knowledge to one super user who may leave the department, and allow for more active discussion about potential informatics activities or advances.

Finally, 10.3% of LHDs reported that none of the informatics activities were performed either by or for the LHDs, with the majority of these LHDs having a population of less than 50 000. These LHDs may be relying on paper reporting and data collection, which take more time and are more difficult to summarize and interpret. Informatics activities are expensive, require staff knowledge and training, and require support of LHD leadership to be successful. Small LHDs that do not currently perform informatics activities or that do not perform the range of informatics activities outlined in the study could consider alternative models of an informatics program to capitalize on opportunities such as shared services between LHDs.

Most LHD informatics activities are completed by LHD staff within each department or a central department, but many state health departments also contribute their expertise to informatics at the local level. However, LHD staff must be able to perform informatics activities without the help of the state health department, since this can take additional time and may delay project progress. State health departments also may not be interested in including data at the local level (ie, zip code, census tract, neighborhood) in their data systems. LHDs will be more efficient and effective when equipped to ensure that available data are relevant for their community and allow them to plan and target interventions appropriately.

There are several limitations to this study. Only 50% of LHDs included in the sample completed the survey; therefore, input from nonresponding LHDs was missing from the data. Although NACCHO addressed the survey to the most appropriate contact at the LHDs, the survey may not have been completed by someone with a full knowledge of all informatics activities. The study explored only a limited number of activities as a result of time constraints and staff capacity; however, a more detailed investigation of activities and cost is warranted to identify gaps. In addition, an inherent limitation of surveys is that respondents may have interpreted questions differently from other respondents; therefore, their answers may not be accurate to the intent of the question.

LHDs need effective leadership, a skilled workforce, strong partnerships, and policies that foster implementation of health information systems to successfully engage in informatics.¹⁵ However, LHDs have a long way to go in accomplishing these key components of an effective informatics program. LHDs face important training needs, including data analytics, project management, and geographical information systems, so they can adapt to the increasing availability of electronic data and changes in technology. These and other informatics needs should guide practice as well as advocacy efforts at the local and national levels to ensure adequate informatics capacity at LHDs.

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