Investigating Informatics Activity, Control, and Training Needs in Large, Medium, and Small Health Departments

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Introduction: A recent National Association of City & County Health Officials survey shed light on informatics workforce development needs. Local health departments (LHDs) of various jurisdictional sizes and control over informatics may differ on training needs and activity. Understanding the precise nature of this variation will allow stakeholders to appropriately develop workforce development tools to advance the field. **Objective:** To understand the informatics training needs for LHDs of different jurisdictional sizes. **Methods:** Survey responses were analyzed by comparing training needs and LHD population size. **Results:** Larger health departments consistently reported having greater informatics-related capacity and informatics-related training needs. Quantitative data analysis was identified as a primary need for large LHDs. In addition, LHDs that report higher control of informatics/information technology were able to engage in more informatics activities. **Conclusion:** Smaller LHDs need additional resources to improve informatics-related capacity and engagement with the field.

KEY WORDS: *informatics, NACCHO, workforce development*

Informatics can be described as the interface between data science and information technology (IT). It is the process of encapsulating existing data from disparate sources with an interoperable wrapper[1,2] and securely transmitting the data to an end user who can apply the data toward decision making.[3] Literature review revealed that public health informatics as a field is growing in breadth, depth, and complexity.[4] Several Essential Services have benefited from informatics, notably, "Monitor Health," "Diagnose & Investigate," and "Evaluate." Yet, many Essential Services still have not yet benefited from advances.

The vision of using informatics to enhance public health surveillance and issues associated with it were identified by Centers for Disease Control and Prevention leadership as 1 of 6 major concerns that must be addressed by the public health community to advance public health surveillance in the 21st century.[3] One of the primary roles for public health informatics is to foster collaboration among disconnected data systems.[5] However, informatics has been a force multiplier of public health impact that has been largely unrealized, especially in smaller health departments.[6] Biomedical informatics is the interdisciplinary field that studies and pursues the effective uses of biomedical data, information, and knowledge for scientific inquiry, problem solving, and decision making, motivated by efforts to improve human health.[7]

Currently, much of the field of public health informatics is focused on receiving electronic laboratory reports (ELRs) and electronic health records (EHRs) to be used for disease surveillance. These focuses were driven by the American Recovery and Reinvestment Act's Health Information Technology for Economic and Clinical Health (HITECH) provisions, which authorized incentives for health care providers if they demonstrate "meaningful use" of certified EHR technology.[8] A recent national survey identifies unmet

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public health informatics needs at state health departments. There is a need for emphasis on leveraging EHRs for public health functions, as well as necessary training to fully utilize technology.[9] The hurdles to accomplish this are not trivial due to legal, technological, and financial barriers. But, perhaps, the largest hurdle, and the focus of this article, is the workforce development needs of informaticians at local health departments (LHDs).[10]

A healthy informatics program will provide secure and timely data for all mission-critical programs in an LHD.[3] There are many different data inputs to a successful informatics system, including ELRs, EHRs, immunization records, cancer registries, birth and death records, demographic data, and others.[11,12] Ideal informatics systems will be platform agnostic, or able to successfully ingest data into an informatics system (eg, an NEDSS-based system would be able to receive HL7 or XML data types for ELRs and EHRs). Producing a healthy informatics program will require extensive collaboration between national stakeholders who develop standards to set an industry-wide vision and local players who buy into the vision and are successful in implementation,[13] and successful implementation requires well-trained informatics staff at the local level.[6]

Although the development of public health informatics was initiated at the federal level, there is a growing need in understanding the capacity and capability at the local level and how local informaticians have utilized informatics in public health. In addition, as LHDs have various capacity and expertise in informatics, federal partners need to be aware of the landscape of training needs at the local level.

To gain an understanding of the current training needs at LHDs, the National Association of City & County Health Officials (NACCHO) conducted an Informatics Capacity and Needs Assessment Survey (http://essentialelements.naccho.org/archives/2314). The responses from this survey inform much of the conclusions drawn for this publication. The survey provides a voice to local informaticians to collectively report on several items: (1) the informatics activities that LHDs engage in; (2) the informatics training needs of LHDs; and (3) the differences in capacity between large and small health departments to engage in informatics.

● Methods

Data were collected using the 2015 Informatics Capacity and Needs Assessment Survey, conducted by Jiann-Ping Hsu at the College of Public Health at Georgia Southern University, in collaboration with NACCHO. The survey methods, described elsewhere,[14] included

a Web-based survey of a representative sample of 650 LHDs. Departments were stratified by size, systematically oversampling LHDs with large populations (≥500 000). A presurvey designated targeted respondents, informatics staff within the department. A total of 324 LHDs completed the survey, for a response rate of 49.8%.

Variables of interest were the control of LHD informatics arrangements, activities performed by LHDs, size of jurisdiction, and reported training needs of informatics/IT staff. Surveys with incomplete information for these variables were discarded, leaving a total of 283 survey responses that were used.

Local control of LHD informatics/IT was defined as identifying "Who controls the following for your LHD?" as "Your LHD." The other values were considered nonlocal control. Each LHD was given a score that corresponded to the total number of "Yes" responses. This control score corresponds to increased local control for informatics/IT activities.

In addition, each LHD was given an activity score and a workforce development needs score. These scores are the total number of "Yes" responses for questions relating to whether an LHD was engaged in a particular informatics activity or questions relating to workforce developmental needs of the informatics/IT staff.

We examined the variables that may drive increased informatics capacity by using linear regression to create a model to explain a department's activity score. The needs score, population, control score, and interaction of control and population were the dependent variables. Finally, we looked at respondents' rating of IT scores compared with needs, activity, and control scores.

● Results

The distribution of respondents' jurisdiction size skews right, accurately reflecting the fact that most LHDs serve populations less than 100 000 persons.[15] The median jurisdiction size of respondents was 58 356. Jurisdictions with populations of more than 500 000 persons were oversampled and are represented by 50 respondents for the full survey; however, 3 respondents' answers were discarded because of incomplete responses for the variables of interest. Twenty-five jurisdictions have a population size of more than 1 000 000.

Overall, we found that large health departments were more likely to have local control, be more engaged in informatics activities, and have additional workforce development needs for informatics/IT staff, as seen in Table 1. Conversely, the smallest health departments had the least control, activities, and workforce needs.

TABLE 1 ● **Average Control, Activity, and Workforce Development Needs Scores of Respondents Based on Jurisdiction Size**

	Jurisdiction Size		
	<50000	50000-499 999	500000+
Control score	4.1	4.5	7.6
Activity score	3.7	5.9	8.5
Workforce development needs score	3.0	4.3	6.2

Respondents were asked 15 questions regarding informatics/IT staff's training and workforce development needs. In general, respondents reported that informatics staff had fewer identified needs (range, 8%-39%) than agency staff overall (range, 28%-63%). This is especially evident with questions regarding basic computer and word-processing skills, where respondents identified general staff as being more than 3 times more likely to need additional training and development than informatics staff.

Overall, the proportion of respondents to indicate a workforce development need was less than 50% for each question (Table 2). The highest identified need, using statistical or other analytic software, was only identified as a need in 44% of the respondents. However, when breaking down needs by LHD jurisdiction size, it becomes evident that additional workforce development needs exist in larger LHDs. In large jurisdictions, 8 of the 15 questions had more than 50% of the respondents give an affirmative for a workforce development need. Only development needs for basic computing skills, using office suite software, and Web site maintenance were higher in the smallest jurisdictions.

For basic computing skills, most informatics staff show minimal need for additional development; only 8.5% of respondents identified a need for training. Using basic office software (word processor, spreadsheet, and presentation software) was slightly higher at 13% needing additional development. Maintaining a Web site was a reported need in 20% of informatics staff. Focusing on responded needs when breaking these questions down by jurisdiction size of respondent, it becomes evident that the needs for these areas are more pronounced in smaller LHDs.

For more advanced analytic skills, including using and interpreting qualitative, quantitative, geographical, and statistical data, respondents were more likely to report greater needs. Qualitative and quantitative needs were identified in 36% of LHDs. Using geographical information systems (GIS) was a reported need in 37% of LHDs. Finally, utilization of statistical and analytic software was a reported need in 44.5% of LHDs. These needs were among the highest for informatics staff.

Approximately 100 LHDs identified running reports and project management as a workforce development need for informatics/IT staff. Among all LHDs, 27% of respondents reported having trained staff on informatics in the past 12 months. There is a large disparity in opportunity to train at LHDs; more than half of LHDs with population sizes of 500 000 or more indicated that staff had been trained within the past 12 months. Respondents for these large LHDs were also less likely

TABLE 2 ● **The Percentage of Respondents Who Indicated a Workforce Development Need, Broken Down by Jurisdictional Size**

	Percentage of Respondents Who Indicated a Workforce Development Need for:			
	<50000 (n = 126)	50000-499999 (n = 112)	500000+ (n = 45)	Overall Average
Basic computing skills	9.6	8.0	6.5	8.5
Using office software	14.4	12.5	13.0	13.4
Project management	29.6	40.2	63.0	39.2
Using and interpreting quantitative data	29.6	37.5	54.3	36.7
Using and interpreting qualitative data	31.2	37.5	50.0	36.7
Using statistical or other analytic software	35.2	43.8	71.7	44.5
Designing and running reports from information systems	28.8	45.5	63.0	41.0
Using geographical information systems	25.6	42.0	56.5	37.1
Conducting business process analysis and redesign	20.8	43.8	69.6	37.8
Developing requirements for informatics system development	16.8	43.8	73.9	36.7
Acting as a "super user" for your informatics systems	19.2	33.9	32.6	27.2
Maintaining a Web site	21.6	18.8	19.6	20.1
Using clinical data	15.2	26.8	47.8	25.1

TABLE 3 ● **Regression Model That Predicts Informatics Activity at a Local Health Department as a Function of Population Size, Local Control of Informtaics/IT Infrastructure, and Their Interaction**

Coefficients	Estimate	Standard Error	t	P
(Intercept)	2.84392	0.36191	7.858	<.001[a]
pop50 000-499 999	2.26234	0.51528	4.390	<.001[a]
pop500 000+	3.63479	0.93760	3.877	<.001[a]
control	0.20022	0.07027	2.849	<.005
pop50 000-499 999: control	− 0.02972	0.09440	− 0.315	<.76
pop500 000+: control	0.06620	0.12515	0.529	<.60

Signif codes: [a]indicates significant at <.05
Residual standard error = 2.453 on 277 *df*
Multiple R^2 = 0.3691, adjusted R^2 = 0.3577
F-statistic = 32.41 on 5 and 277 *df*, $P < 2.2e-16$

to report that they did not know whether training had occurred (6%) than the medium (11%) and small (11%) LHDs.

Large LHDs consistently performed more informatics-related activities than smaller LHDs. Health departments with a population of more than 200 000 reported engaging in at least 1 informatics-related activity. The largest health departments also report being the most likely to be engaged in developing rules for the governance of informatics processes.

We used linear regression to estimate the significance of population size, LHD control of informatics/IT infrastructure, and their interaction on the number of informatics activities for the LHD (Table 3). Each LHD was assigned a score based on "Yes" answers that indicate hardware acquisition, software selection, software support, data management, data quality, IT system security, IT maintenance, and IT budget allocation were within each program or through a central department. The activity score was the sum of all "Yes" responses to questions asking whether a particular informatics/IT activity was conducted by the LHD. The model is follows:

$$Y_a = \alpha + X_p + X_c + X_p \times X_c$$

where Y_a is the response variable of number of informatics/IT activities conducted by an LHD, α is the intercept, X_p is the population size, and X_c is the control score.

This model explains a moderate amount of the variation observed in LHD activities ($r^2 = 0.36$). Workforce development needs score was not significant in the model. Control and population size, however, were significantly associated with increased informatics activities ($P > .01$). The interaction of these variables was not significant.

Finally, we compared each score (control, activity, and workforce development needs) with the rating of the IT infrastructure (Table 4). There is a clear trend that satisfaction increases with increased local control and increased activities. There is no obvious trend with workforce development needs.

● Discussion

Informatics appears to be a capacity that grows with the size of the jurisdiction of an LHD. Large jurisdictions conduct more than twice as many informatics activities as small LHDs. Health departments with jurisdiction populations of less than 500 000 persons felt less confident in staff skill and capacity in informatics. Smaller jurisdictions are also less likely to train staff on informatics. This finding has significant implications for the future state of informatics in local public health: if small LHDs are less engaged in informatics, then industry tools may not adequately address their needs. In addition, individuals living in jurisdictions without an informatics-savvy health department may experience inferior health outcomes on average. Something similar seems to be playing out with EHRs in the health

TABLE 4 ● **Ratings by Respondents of Their IT Infrastructure, Cross-Referenced to That Respondent's Control, Activity, and WFD Needs Score**

Rating of IT Infrastructure	Control Score	Activity Score	WFD Needs Score
Excellent	6.2	7.1	4.9
Good	5.2	5.9	3.5
Average	4.8	5.4	4.5
Fair	4.4	4.3	4.1
Poor	3.1	3.5	3.6

Abbreviations: IT, information technology; WFD, workforce development.

care sector where there is significant heterogeneity with respect to EHR adoption and utilization.[16]

Survey respondents express a clear need to improve informatics capacity to analyze data. Four of the top 6 identified needs are in data analysis: quantitative, qualitative, statistical, and geographical (GIS). These skill sets require specialized education and training and may be difficult to produce internally. Again, smaller LHDs are more adversely affected, as these LHDs were less likely to train staff in these areas.

Interestingly, LHDs with the least informatics activities also report the least amount of need for training. This will have important implications in terms of how small- and medium-sized LHDs utilize informatics-related tools. Both analytic and GIS tools are important for an LHD of any size. It may require focused efforts to impress on smaller LHDs to invest in development of informatics/IT staff. It is also important for larger health departments with resources to become informatics-savvy to share their lessons learned with colleagues whose informatics capacity within their departments are not as well established. This will allow citizens anywhere in the United States to benefit from public health informatics.

Information must be in the hands of decision makers to be useful. As such, respondents identified designing reports and project management as training needs for informatics staff. Pressure to develop this capacity in informatics staff suggests that public health informaticians at the local level need to improve information dissemination. One area where large and small LHDs have identified similar needs is in improving project management and reporting. This may reflect accreditation pressure from the Public Health Accreditation Board, which requires LHDs to document and categorize local efforts. Survey respondents may view informaticians as the logistical arm of acquiring, storing, and transmitting information across divisions within an LHD.

Local health departments that wish to become savvy at informatics would seemingly benefit from maintaining (or regaining) local control of the IT infrastructure. Lack of control was associated with fewer informatics activities and a lower rating of the IT infrastructure.

This study has several limitations. It is evident that smaller LHDs have less capacity to perform informatics-related activities; however, they also report lesser need to develop capacity. It is unclear if they report a lesser need because they feel such tools are of little use or if they are unaware of the benefits from increased informatics training. To answer this, follow-up surveys or other evaluation tools would be necessary. This issue is compounded by the fact that respondents had different levels of informatics expertise. Some LHDs had the administrator respond, whereas others delegated the response to personnel in the informatics department, IT department, or another department, which may reflect depth of staff in the area.

In addition, a limitation arises due to a lack of weighting for the different questions. Maintaining a Web site clearly requires less sophistication than using GIS; yet, "Yes" responses to either question were scored the same.

● Conclusion

This study shows that large and small health departments are engaged differently in the science of informatics, which represents a disparity in public health practice in the 21st century. This will have profound effects as the practice develops at the national level. We believe that regardless of informatics-savviness, stakeholders at every size LHD must be engaged in the conversation. National and state leaders in informatics should make a concerted effort to include LHDs that are not savvy in informatics to be part of the conversation. This will allow those jurisdictions to have a voice in the future of the field. It will also build relationships that may allow smaller LHDs to learn from experienced departments and to become more engaged. The impact of this would be improved health outcomes for citizens in all jurisdictions, regardless of size. This is important, as almost 20% of the US population lives in rural regions, served by small health departments.

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