11-2016

# An Iterative, Low-Cost Strategy to Building Information Systems Allows a Small Jurisdiction Local Health Department to Increase Efficiencies and Expand Services

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**Objective and Methods:** The objective of this case study was to describe the process and outcomes of a small local health department's (LHD's) strategy to build and use information systems. The case study is based on a review of documents and semi-structured interviews with key informants in the Pomperaug District Health Department. Interviews were recorded, transcribed, coded, and analyzed. **Results and Conclusions:** The case study here suggests that small LHDs can use a low-resource, incremental strategy to build information systems for improving departmental effectiveness and efficiency. Specifically, we suggest that the elements for this department's success were simple information systems, clear vision, consistent leadership, and the involvement, training, and support of staff.

KEY WORDS: **capacity building, informatics, local health departments**

## Informatics Development in Local Health Departments

Public health informatics is a critical component of local health departments' (LHDs') operational infrastructure and an important foundational capability.[1,2] The national Public Health Accreditation Board requires LHDs seeking accreditation to demonstrate that they have developed and maintained adequate informatics capacity, including secure and confidential data and information systems, to support LHDs' administrative and essential public health functions.[3] Maintaining a robust health informatics capacity can improve LHDs' abilities to monitor, capture, integrate, and analyze information about health status and health needs of their communities.[4-6] Also, a robust informatics capacity can be instrumental in improving LHDs' efficiencies through timely partner and patient communication and information sharing, evidence-based decision making using public health knowledge, environmental health monitoring and protection, community health promotion, reportable disease surveillance and control, and support for administrative functions such as billing.[6] With such capacity, LHDs can proactively employ information technology (IT) to create efficiencies that offset the impact of recent staff reductions.[7] Utilized optimally, information

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The data for this article were collected as part of a contract issued to Dr Shah by the National Association of Local County & City Health Officials (NACCHO) for the 2015 NACCHO Informatics Capacity and Needs Assessment Study. The manuscript was written without funding and reflects only the views of the authors. The authors are grateful for the assistance of the Local Public Health Informatics Needs Assessment Advisory Group, whose members offered feedback on the study design and questionnaire, and the employees of Pomperaug District Health Department, including Neal Lustig, MPH, Health Director, Laurie Reinheimer, Office Manager, and Mona Labissoniere, Health Educator/Sanitarian, who willingly shared their experiences and thoughtful reflections on the process and value of implementing informatics to improve public health practice.

The authors declare no conflicts of interest.



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DOI: 10.1097/PHH.0000000000000444

systems have potential to revolutionize public health surveillance, communication, and decision making.[8-10]

LHDs' size is a documented barrier to informatics capacity building and maintenance.[11,12] Smaller LHDs have a significantly lower capacity for implementation and use of electronic health records, health information exchanges, electronic disease reporting systems, and electronic environmental health and laboratory reporting.[11-13] LHDs that lack scope and scale have difficulty meeting many of the core functions and essential services.[13-15] The purpose of the case study described in this article was to explore how a smaller LHD could implement and use informatics to meet core functions and deliver essential services on a limited budget with few personnel resources.

## Methods

In 2015, the National Association of Local County & City Health Officials (NACCHO) partnered with Georgia Southern University to conduct the *2015 NACCHO State of Informatics Capacity and Needs Assessment Study* (*2015 NACCHO Informatics Study*). Along with the quantitative survey of a representative sample of LHDs across the country, 3 qualitative case studies of LHDs were conducted to better understand the processes used to implement and use informatics in several LHDs considered to be high performing in informatics for their jurisdiction size. Furthermore, we explored factors, not currently available in quantitative data, that may be associated with LHD adoption and use of informatics. Case studies have some advantages over experimental or quasi-experimental designs in the study of local initiatives that are heavily influenced by contextual factors. Because we had little control over the phenomenon studied, the case studies allowed us to focus on the unique, particular aspects of what was happening locally and to understand the "how" and "why" some LHDs implemented informatics within important circumstances.[16]

### Sample

We used the informatics group at NACCHO and the study advisory group, comprising national public health informatics experts, as key informants to identify LHDs that were part of the survey sample and were known for their informatics capacity. Because most US LHDs serve jurisdiction sizes of less than 500000 people, the advisory group recommended choosing 1 LHD serving a small jurisdiction (≤50000 people) and 2 LHDs serving medium-sized jurisdictions (~50000-500000 people). The NACCHO Program Analyst in Public Health Informatics contacted each of the selected LHDs and requested and secured their participation.

### Interview questions

The 2 case study investigators, Drs Lovelace and Shah, along with input from the advisory group, adapted questions previously used in a study of the implementation of public health informatics in LHDs.[17] Questions were finalized and organized into the following topic areas: (1) the role of the interviewee regarding development and use of the LHD's informatics; (2) history of informatics implementation; (3) use of informatics systems and databases; (4) successes and challenges in the implementation and use of informatics; (5) the value of informatics to the health department and the community; and (6) lessons for other health departments. The study and interview protocols were reviewed and approved by the Georgia Southern University institutional review board.

### Procedure

In each LHD, we identified persons who were responsible for informatics systems development and use. Their potential roles included the health director/departmental administrator, the information systems director/manager (if one existed), a clinical and/or epidemiology program director, and an office administrator. From May to June 2015, the first author conducted and digitally recorded 1-hour telephone interviews with 3 to 4 key informants from each LHD. Interviews were coded with NVivo 10 software using the question topics listed earlier as codes; text was also marked with these codes whenever these topics arose in the discussion. In addition, the authors reviewed documents available on each agency's Web site. Finally, the first author consulted with the interviewees to obtain more information about issues that needed further elaboration. Participants reviewed the initial reports for accuracy.

The health department described here, Pomperaug District Department of Health (PDDH), was selected as an example of a small jurisdiction LHD that extensively uses IT to deliver the essential services of public health. The first author interviewed 3 of 7 employees: the health director, the health educator/sanitarian, and the office manager.

## Findings

### Site description

Pomperaug Local Health District was formed in 1986 as a municipal subdivision of Connecticut government governed by the Public Health Code and Connecticut laws. Because the public health system in Connecticut is decentralized, the staff are local government employees. PDDH serves the towns of Southbury, Woodbury, and Oxford (approximate jurisdiction size = 50 000) in

3 main program areas: environmental health protection; reportable disease control; and community health promotion. PDDH has an annual budget of about $1 million and 6.5 employees including an MPH health director, 2 sanitarians (1 sanitarian also serves as the health educator), a public health nurse, an emergency preparedness coordinator, a business manager, and an office manager. Next we discuss our findings by topic.

## Implementation and use of informatics

Early in the 1990s, the health director responded to a conflict between the health department and one of the PDDH towns by developing databases to organize the department's operations. The director reported: "We wanted to get this all organized to the point that if John Q. Public called up, you can give them an answer instead of: 'We'll have to find your file. Call us back in a week.'" At the time that PDDH began developing information systems, there were few informatics options for small organizations, as most databases were housed on mainframes. As a MacIntosh user, the agency director built FileMakerPro databases to track reportable diseases and inspections for food services and wells: "We built our whole permitting system, our whole information sharing system on the FileMakerPro database as the backbone of this health district and ran on it."

Because of limited resources, the PDDH agency director used the principles of "low-cost, simplicity, and operational IT" and pursued an incremental strategy for the development of informatics capacity. The director reported that

> Creating a master database ... was beyond my capacity. I felt that it was extraordinarily expensive to try and do something like that at a regional, local, small community level. Something I picked up by the late 90s was that government agencies that tried to do stuff like that crashed; they ran out of steam. We [PDDH] can handle one project for $5000 and then, maybe the next year, we'll do another one.

This strategy allowed the PDDH staff to be deliberative about which informatics systems they used and to continually improve them. Over time, PDDH built databases for complaints, subdivision reviews, subsurface sewage disposal and private well approvals, day care facilities, pool inspections, emergency response, health department volunteers, vaccinations, communicable diseases, bookkeeping, and blood pressure monitoring in senior centers (Table). At each step, the director considered: "Do these [databases] do the job? Are they effective? And, do they work?" More recently, PDDH has used state data systems, including Maven, the Connecticut system for communicable disease data. Consequently, PDDH is phasing out its own FileMakerPro database for communicable disease data: "If we have everything we need on their [system]. ... why don't we just put ours to bed [so we won't duplicate efforts]?"

**TABLE ● Systems/Data Used and/or Collected on a Daily Basis**

| |
|---|
| Maven, the Connecticut electronic disease surveillance program |
| Communicable diseases |
| Lead |
| Data from health clinics |
| FileMaker |
| Food safety and outbreak data |
| Inspections and licensing for restaurants, pools, salons |
| Vaccinations—linked with off-site billing vendor |
| Wells and septic systems |
| Blood pressure screenings |
| Tracking communicable diseases and follow-up on these disease |
| Emergency personnel needed in an emergency |
| Day care facilities |
| Health department volunteers |
| Data on demographic characteristics of clients |
| Administrative data systems |
| Tracking PDDH work in the community (eg, environmental health, permitting) |
| Billing private insurers and Connecticut Medicaid from the vaccination database |
| QuickBooks for the budget |
| Social media |
| Facebook and Twitter |
| Mobile |
| iPads for collection of data in the field and iPhones for staff members |

Abbreviation: PDDH, Pomperaug District Department of Health.

PDDH also uses databases for vaccination billing, which it began in the late 1990s. In the 2010s, a Centers for Disease Control and Prevention (CDC) grant funded PDDH (and the director) to write a vaccination billing manual for the state of Connecticut. At that time, PDDH contracted with a vendor for billing services. PDDH found a vendor who would communicate well with the staff to adapt departmental databases for interoperability with the vendor's billing functions and to work out kinks with insurance companies, Medicare, and Connecticut Medicaid.

Training and technical assistance helped develop employees' knowledge of and facility with the new IT and software. Two employees became adept at editing features and getting reports. Some employees were willing to test new applications and be early adopters and champions. The director found that employees, although sometimes reluctant, began to see the usefulness of informatics in efficiency, access, and client services compared with that of paper records. Monitoring new systems implementation ensured that employees used systems appropriately and consistently.

## Successes

According to all of the PDDH employees who were interviewed, PDDH's use of informatics has resulted in improved efficiency and effectiveness. Specifically, the efficiencies created in environmental health have allowed PDDH to expand health promotion programs without adding personnel. Databases allow employees to respond quickly to information requests to send reminders, notices, and information to the public. For example, the office manager reported: "If someone calls in, ... I can usually go in and find what I need without having to search through paper files, and [without waiting to talk with someone]." The databases have allowed the office manager to answer most factual questions about accounts payable, billing, and permits for septic systems, wells, pools, and salons without having to triage questions to a specialist. Parents can call to get proof of vaccination for their child's school records. Before the databases were built and implemented, it would often take a week for employees to respond to information requests compared with several minutes after the databases were built. The health educator/sanitarian reported that mobile apps allow the field staff to check inconsistencies that show up in inspections in real time. Patient records for blood pressure monitoring and education programs are entered directly at the point of service on secure iPad databases. Overall, employees report that the ability to work efficiently and to respond quickly to requests has been instrumental in creating community and policy maker goodwill.

PDDH also uses information systems to market services and programs and communicate about health issues. Databases of previous clients were used to market influenza vaccinations. Bar-coded influenza reminders on postcards were mailed to these clients. Clients could pick a clinic time and fill out preliminary consent forms before coming to the vaccination clinic. On the day they arrive at the clinic, clients check the vaccinations they want, answer prevaccination questions, date, and sign the consent form. Scanning the bar-coded reminders enables PDDH to see patients quickly, to keep track of immunized residents so reminders can be sent in subsequent years, and to interface with the vendor for billing. Prior to vaccination billing, PDDH picked up the cost of the vaccinations and absorbed the staff time. With the new billing system and a 95% reimbursement rate, PDDH now nets between $18 and $28 per vaccination. The vaccination program is now self-supporting.

When constituents did not enroll in a chronic disease self-management program, PDDH used databases to identify patient addresses and offered a gift card to recruit participants. The program filled within a day. PDDH has also started experimenting with social media, primarily with Facebook and Twitter, to get out general public health information as updates on local weather, program, and public health news. Employees reported that the visibility that PDDH has achieved through these communication channels has gained support from their local constituents.

The health director reported that resource sharing with other LHDs has paid off for PDDH. The health director sold PDDH's initial data systems and programs to other small LHDs in Connecticut for $200 each. In turn, these LHDs are now developing even more advanced systems and sharing their work with PDDH.

## Challenges/limitations

Building, maintaining, and using informatics can be beyond the financial ability of small LHDs. A server version of FileMakerPro networks and runs PDDH's databases. In addition to about 15 computers, all employees carry iPhones and a number of iPads run mobile applications. Consultants, who often charge in excess of $150 per hour, are used only to build applications when there are complicated fixes, adjustments, additions, reports, or other special projects beyond the capabilities of the staff. PDDH dealt with limited resources by using small amounts of money and grants, for example, revenues from immunization billing, to gradually build its informatics capacity, most of it in-house. Recently, a 2013 CDC grant for system, policy, and environmental change funded the development of mobile health and nutrition surveys.

It is especially challenging for small LHDs to maintain the safety and security of their information systems. Operations and maintenance funding is needed, so PDDH budgets between $4000 and $7000 per year for equipment replacements and software updates. However, fire, theft, or equipment failure could still threaten IT capabilities. Recently, PDDH ran from a backup for several days when a server and 3 drives failed. An IT contractor restored the data within a day. Having redundant backups (to another drive and to the cloud) protects the integrity and safety of the system.

Although PDDH maintains a vaccine database, it does not meet the electronic health records and health information exchange standards for the Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009. PDDH is not part of a health information exchange, except in a limited way with Maven. Internal databases do not communicate with each other, and it is beyond the capacity of PDDH at this time to create such an interoperable database. Interoperability between state and LHDs is restricted because state informatics systems are still undergoing development and not all providers in the state participate in electronic entry of records.

## Discussion and Further Lessons

The research described here is a case study of 1 LHD. Resources and personnel (both skills and vision) will vary by LHD as will contextual factors such as governance structures and policy maker buy-in. We do not argue for the generalizability of these findings. Instead, we suggest that LHDs in small jurisdictions consider the transferability of these strategies to their own situation.

There are more lessons to be gleaned here. While small LHDs tend to have fewer resources, this example shows that they still have much to gain from using even simple informatics systems. All the interviewees stressed the efficiencies that came with their information systems and databases. Still, the director reported that implementation is challenging and requires systematic planning, marshaling resources, and having patience with the pace of implementation and with employees. Keeping employees, who now all use informatics, in the loop, training them, and working with them to implement informatics were critical. This incremental approach may be optimal for small LHDs with fewer resources. PDDH's successes demonstrate that an LHD can manage its own data systems with some help. Big IT support is not always necessary. Furthermore, resource sharing among LHDs may help some departments overcome entry barriers for informatics capacities that they may not be able to build alone.

Stable leadership was instrumental in the development of PDDH's informatics capacity. The director started building an informatics system relevant to the health department's informatics needs and integrating informatics into all the department's work more than 2 decades ago. While it is possible that the same progress might be made with other personnel, it appears to us that the director's leadership and the persistence with which he added system after system using the limited resources of the department was crucial.

The importance of having an operations and maintenance budget was illustrated by the aforementioned example. Preparing for information systems threats and having a sustainability strategy are fundamental requirements to maintain the technical capacity of the health department and the confidentiality, integrity, and availability of the information housed in the system. In jurisdictions such as the one described here, where information systems rely on in-house expertise, succession planning, and cross-training of personnel are also essential.

Damschroder et al[18] argued that there is often a dynamic interplay between the outer and inner settings through which organizational interventions or innovations are implemented. This interplay is illustrated by PDDH's implementation of informatics. External demands such as the need to satisfy stakeholders' concerns may interact with aspects of the organization such as existing systems, leadership engagement, and available resources. All of these came into play in PDDH. The director started building systems to address issues raised in a conflict with city officials; CDC grants funded enhancement of vaccination billing and development of mobile apps for health and nutrition surveys. Internally, the director had the vision and skills to build a system with limited resources and PDDH staff members became skilled in using the system.

The modern public health enterprise runs on data and IT. Our study highlights an example of innovation and decision support in an LHD with only 6.5 full-time equivalents. It can inform other small-size LHDs in their efforts to boost up their use of IT. The findings about the importance of in-house expertise and leadership, incremental strategies, and partnerships can guide other LHDs as they seek to increase their effectiveness and efficiency using informatics.

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