In the past 10 years, a number of national reports have quantified the extent to which local public health departments fail to respond quickly to potentially urgent public health problems called in from health-care professionals through telephone-based disease surveillance systems. This article describes how one local health department used published business process analysis and redesign methods to improve its local response time. It then adapted a RAND test-call protocol to evaluate the impact of its redesign on a small sample of subsequent provider calls. The development of performance measures is a critical step toward improving preparedness, but these measures are only useful when routinely evaluated. Although this evaluation was small, Kovach et al. are to be commended for prioritizing the full quality improvement cycle.

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BUSINESS PROCESS ANALYSIS AND REDESIGN METHODS: IMPROVING RESPONSE TO TELEPHONE-BASED REPORTS IN A LOCAL HEALTH DEPARTMENT

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In February 2008, the RAND Corporation reported on a test of a national sampling of local health departments (LHDs) to determine if they could respond to disease reports from callers within a 30-minute standard recommended by the Centers for Disease Control and Prevention (CDC).1 The authors found that only 31% of participating LHDs were able to respond to a caller within 30 minutes.2 At the Mahoning County District Board of Health, an LHD serving a population of 240,000 in northeastern Ohio, we decided to test our own response time using the RAND test protocol. Our objectives were twofold: (1) determine if the length of time between the initial call reporting a potential communicable disease and the response of the action officer was within the 30-minute CDC standard, and (2) address any deficiencies in response time by employing business process analysis and redesign methods.

Health department staff had recently participated in the Common Ground project, a three-year, $15 million national initiative of the Robert Wood Johnson Foundation and Public Health Informatics Institute (PHII) intended to help public health agencies use analytical methods to describe how work is done now and design changes in workflow to improve quality and performance (Figure 1). The need to achieve greater efficiency and effectiveness in the District Board of Health’s business processes had become more acute following funding cuts in early 2008 that resulted in workforce reductions of nearly 16%. As a consequence, communicable disease response duties were shared by...
fewer staff with more duties and other staff who had no previous experience in this role.

INITIATIVE SUMMARY

Testing methods
The first round of testing was conducted in the spring of 2008. A standardized report form and instructions for placing the calls were created based on the RAND protocol. Individual call scenarios were created to make the test calls more realistic (Figure 2). The regional crisis call center placed the test calls to the District Board of Health after receiving a brief orientation from test planners. Only the health department’s commissioner and key staff directly involved in planning the test calls knew that the calls would take place.

The first test calls were placed on days randomly chosen by crisis call center staff between April and June 2008. The calls were made during business hours, evenings, and weekends.

Following a business process analysis and redesign described later in this article, second and third rounds of test calls were placed on randomly chosen days during March and April 2009 and again in September and October 2009 by crisis call center staff using the RAND protocol and test scenarios developed by test planners.

Business process methods
After the first round of testing, a team of health department staff that included nurses, secretaries, epidemiologists, and managers was convened for four one-hour sessions in December 2008 and January 2009 to review the agency’s process for responding to communicable disease reports. Existing processes for reporting communicable disease during and after business hours were mapped using two analytical tools from the Common Ground project: the context diagram and the task flow diagram.4

A context diagram gives an overall structure of the entire environment in which a process takes place. It is a diagram of the entities and transactions that occur between these entities and focuses on who is involved in the process and the information they exchange. A task flow diagram is a graphic description of the tasks showing inputs, processes, and results for each of the steps that go into the task. It focuses on how information and products/services flow during the process.

OUTCOME AND EVALUATION

The task flow diagram for the existing business hours response process depicted the confusion that occurred at each level when a telephone report of a communicable disease was received. Multiple entities could be involved, which increased the likelihood that the call could be routed to the incorrect person or to a voice mail not continuously monitored, or could be lost entirely (Figure 3).

By comparison, the after-hours process was more straightforward. A caller followed the prompts to leave a message in a designated voice-mail box that then called the cell phone of an action officer. The team identified the after-hours response process to be a useful model and redesigned a similar process for use during normal business hours, a change consistent with the RAND study finding that reaching a live person upon dialing was the strongest predictor of optimum performance (Figure 4). The redesign provides for multiple options to route calls directly to a live person or to the communicable disease reporting line that is either answered directly or calls a cell phone, alerting the duty officer of a communicable disease report message to be retrieved. All calls are logged to make sure the response time remains consistent.

After reconfiguring the health department’s telephone system to conform to the new task flow diagram developed by the process improvement team, health department staff were trained in the new process for responding to telephone-based disease reports. Two additional successive rounds of testing were initiated using the same protocol as the first test round.

The health department and crisis call center were able to successfully replicate the RAND test protocol for testing the health department’s response to telephone-based disease reports. Median response time to test calls was reduced from 42 minutes before the business process redesign to about 13 minutes in the second round of calls and one minute in the third round of

Figure 2. Test call scenarios used by crisis call center staff testing the Mahoning County District Board of Health’s response to telephone-based disease reports, 2008–2009

A) A physician from a local emergency department calling after hours because of a raccoon bite
B) A physician from a local emergency department calling after hours regarding a possible infectious disease case
C) A local daycare administrator calling regarding a spread of strange symptoms among the children
D) A school nurse calling about a potential infectious disease in some of the students
E) A local nursing home administrator reporting an increase in specific symptoms in staff and residents in one wing of the nursing home
Figure 3. Mahoning County District Board of Health’s business process for responding to telephone-based disease reports before process redesign in 2008
Figure 4. Mahoning County District Board of Health’s business process for responding to telephone-based disease reports after process redesign in 2008
calls (Table). All calls in the second and third rounds of tests were returned within 30 minutes as recommended by CDC (Figure 5).

Significant limitations to the health department’s response process were identified in the first round of test calls and during the subsequent business process analysis. It was discovered that there was no one place for a caller to report an urgent communicable disease. Calls were directed to different areas within the health department with little consistency. Some of the test calls were returned only after an extended period of time, and some calls never made it to a voice-mail box and were lost completely. Crisis call center staff reported that the telephone system automated prompts were confusing and made it difficult to successfully identify which option to choose to report a communicable disease. Test callers also reported that some health department staff who answered or returned a test call seemed unprepared to respond to disease reports.

The business process analysis and redesign that followed these test calls was accomplished with a minimum investment of staff time (24 person-hours during a four-week period), enabling the health department to make rapid-cycle improvements to the

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*Not used
NA = not applicable
NR = no response

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Figure 5. Mahoning County District Board of Health’s response times to disease report test calls, 2008–2009

*Could not reach action officer or leave message

CDC = Centers for Disease Control and Prevention
disease reporting process. It demonstrated to health department staff that quality improvement processes such as these, when undertaken by a cross-disciplinary team with a facilitator trained in process improvement methods, could yield measurable improvements in organizational performance.

Context and task flow diagrams provided a good visual model of the existing business process and aided in identifying opportunities for an improved redesign. The successive rounds of test calls confirmed that this redesign contributed to ongoing improvement in response time.

**DISCUSSION**

Beginning in 2010, CDC Public Health Emergency Preparedness sub-grantees in Ohio are required to test their response times to telephone-based disease reports at least once each year and meet a 15-minute response standard. This new standard will require all 88 county health departments in Ohio to test their responsiveness and make process improvements if necessary to meet this new standard. Using a standard test protocol such as RAND’s will enable health departments to compare their performance with others and determine if any process changes have led to sustained improvements in response time. Business process analysis and redesign methods, such as those developed by PHII, may be useful to LHDs in Ohio and across the country as they strive to improve their performance of this essential public health function in their communities. The Mahoning County District Board of Health will continue to monitor response times to communicable disease reports with periodic testing and call logs to meet CDC Public Health Emergency Preparedness funding requirements and sustain the performance improvements reported in this article.

The LHDs that participated in the Common Ground project continue to apply these process improvement methods to business processes within their health departments. In Mahoning County, the health department has also used these methods to improve tracking of public health law violations and issuance of wastewater discharge permits, as well as to streamline regulatory approval for homebuilders. In Kane County, Illinois, the health department used these methods to design a virtual emergency operations center linking the department’s emergency management, animal control, and communicable disease control programs. In Summit County, Utah, the health department redesigned work interactions among foodborne illness investigation, disease surveillance, restaurant inspection, and case management staff. In Columbiana County, Ohio, a small Appalachian public health agency has adapted the Mahoning County telephone-based disease reporting process for its own use with a manageable investment of time from its small staff. The agency has also used business process analysis to track animal bites and reduce the need for post-exposure rabies prophylaxis.

**CONCLUSIONS**

The response time improvements described in this case study were based on a limited number of observations in one health department and, thus, should be interpreted with caution. However, practice-based research such as this will improve in robustness and quality as public health practice-based research networks develop around the U.S. to link researchers with multiple practice settings in which to conduct public health systems and services research.

PHII is preparing to disseminate these materials developed by Common Ground project participants to a wider audience of public health executives and health departments to help them develop requirements for information systems that support the work of public health.

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**REFERENCES**