

# State Public Health Laboratory System Quality Improvement Activities

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## ABSTRACT

The Association of Public Health Laboratories (APHL) and the APHL Laboratory Systems and Standards Committee manage the Laboratory System Improvement Program (L-SIP). One component of L-SIP is an assessment that allows the members and stakeholders of a laboratory system to have an open and honest discussion about the laboratory system's strengths and weaknesses. From these facilitated discussions, gaps and opportunities for improvement are identified. In some cases, ideas for how to best address these gaps emerge, and workgroups are formed. Depending on resources, both monetary and personnel, laboratory staff will then prioritize the next component of L-SIP: which quality improvement activities to undertake. This article describes a sample of quality improvement activities initiated by several public health laboratories after they conducted L-SIP assessments. These projects can result in more robust linkages between system entities, which can translate into improvements in the way the system addresses the needs of stakeholders.

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Public health laboratory (PHL) systems are continually challenged by how best to improve and advance their operations and the services they provide for the public's health. To move forward, the system must determine where its strengths lie, where opportunities for improvement and collaboration exist, and what resources are available.<sup>1</sup> Participation in the Association of Public Health Laboratories' (APHL's) Laboratory System Improvement Program (L-SIP) allows for this in-depth study. Past PHL participants have used L-SIP<sup>2</sup> as a springboard for quality improvement (QI) activities, which can result in a more connected laboratory system.

L-SIP began as a collaborative effort between the Centers for Disease Control and Prevention and APHL in 2004 and focuses on the evaluation of system performance within the framework of the 10 Essential Public Health Services (Figure 1)<sup>3</sup> and 11 Core Functions of State Public Health Laboratories (Figure 2).<sup>4</sup> Through a series of discussions about public health system standards, assessment tool development, and pilot testing, the program was formally implemented in 2007. L-SIP is based on a performance management tool that allows assessment participants to systematically evaluate the PHL system against an optimal level of performance with respect to each of the 10 Essential Public Health Services.<sup>5</sup> As of February 2013, L-SIP assessments had been completed by 29 state PHL (SPHL) systems and one local PHL system. New Hampshire is the first and only state to complete a follow-up L-SIP reassessment (Figure 3).

**Figure 1. The 10 Essential Public Health Services<sup>a</sup>**

1. Monitor health status to identify and solve community health problems.
2. Diagnose and investigate health problems and health hazards in the community.
3. Inform, educate, and empower people about health issues.
4. Mobilize community partnerships and action to identify and solve health problems.
5. Develop policies and plans that support individual and community health efforts.
6. Enforce laws and regulations that protect health and ensure safety.
7. Link people to needed personal health services and assure the provision of health care when otherwise unavailable.
8. Assure a competent public and personal health-care workforce.
9. Evaluate the effectiveness, accessibility, and quality of personal and population-based health services.
10. Research for new insights and innovative solutions to health problems.

<sup>a</sup>Centers for Disease Control and Prevention (US). 10 essential public health services [cited 2013 Apr 10]. Available from: URL: <http://www.cdc.gov/nphsp/essentialservices.html>

Following an assessment, the L-SIP coordinators review the findings and determine how to address the weaknesses and system gaps identified during the process. The PHLs and their systems have embarked on a variety of post-assessment QI activities that have impacted their respective systems in a positive way. This article describes several examples of post-L-SIP assessment QI activities, which are divided into four categories: improving laboratory operations, network building, increasing awareness of the laboratory system, and convening a reassessment. Lack of funding had prevented the SPHL systems from beginning these QI activities soon after their assessments, but APHL was subsequently able to secure grant funding to help defray the costs.

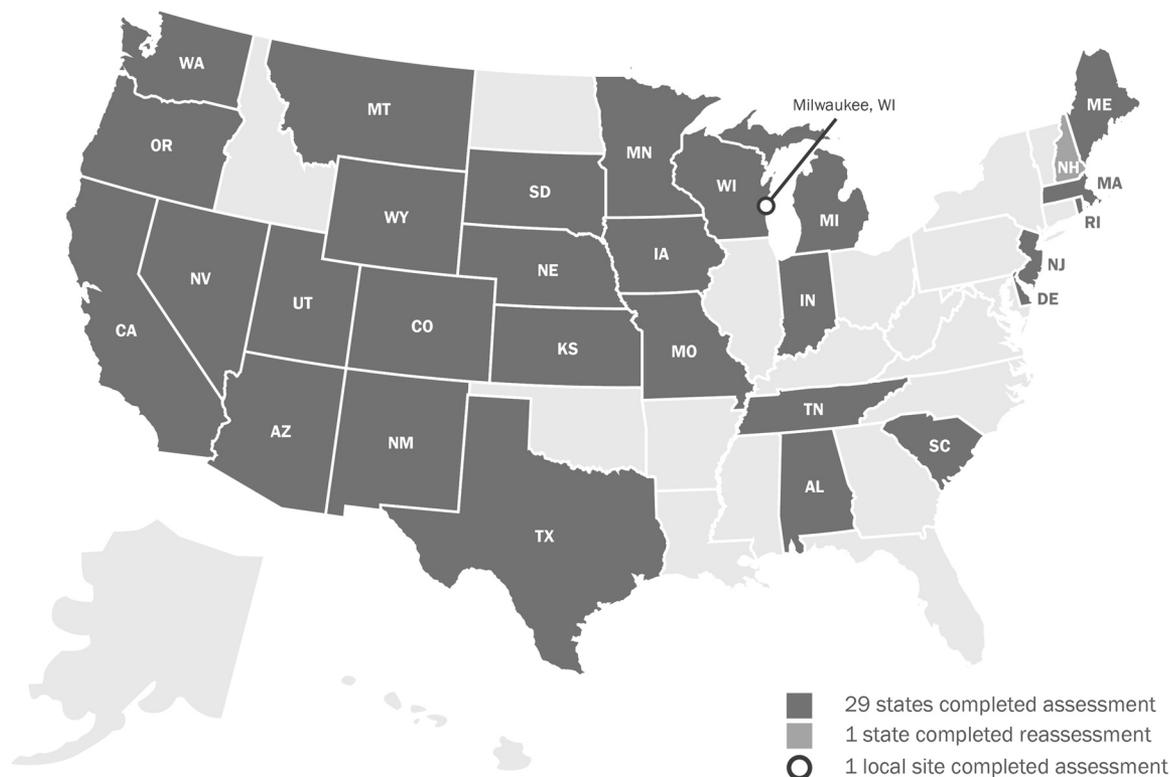
## IMPROVING LABORATORY OPERATIONS

QI can be measured quantitatively by determining a baseline of performance, implementing a program, and comparing the end results with the baseline. For example, as a result of conducting an L-SIP assessment in 2007, the Utah PHL system identified problems with the quality and timeliness of test results that are crucial in the justice system. The laboratory results were not reliably relayed to appropriate authorities in a timely fashion; as such, evidence was not available for hearings, trials, or death certification. Because customers had expressed their dissatisfaction with the quality and timeliness of test results, the laboratory focused on Essential Service 4 (mobilize community partnerships and action to identify and solve health problems) and Essential Service 9 (evaluate the effectiveness, accessibility, and quality of personal and population-based health services) and sought to decrease its turnaround time of 28–29 days.

**Figure 2. The 11 Core Functions of State Public Health Laboratories<sup>a</sup>**

- Disease prevention, control, and surveillance
- Integrated data management
- Reference and specialized testing
- Environmental health and protection
- Food safety
- Laboratory improvement and regulation
- Policy development
- Public health preparedness and response
- Public health-related research
- Training and education
- Partnerships and communication

<sup>a</sup>Association of Public Health Laboratories. The core functions of state public health laboratories. Silver Spring (MD): APHL; 2010.

**Figure 3. Laboratory System Improvement Program participation map: U.S., 2007–2013<sup>a</sup>**

<sup>a</sup>Association of Public Health Laboratories. Laboratory System Improvement Program [cited 2013 Apr 12]. Available from: URL: <http://www.aphl.org/aphlprograms/lss/performance/Pages/default.aspx>

To address the issues, Utah's forensic toxicology laboratory staff members were trained on Lean Six Sigma principles during a 12-week pilot program as one of their post-assessment QI activities. The Lean Six Sigma approach to QI is based on the philosophy that all activities with an organization must be valuable. Each process needs to be defined, measured, and assessed as to how much value it contributes to the organization and its customers. Optimal performance is characterized as sustaining and improving valuable processes while removing activities that have no added value.<sup>6</sup> This intervention in Utah resulted in positive changes, including a decrease in test result turnaround time to 10–14 days and a measurable increase in the number of cases reported daily. Daily reports increased by about 300% for driving under the influence toxicology cases and 200% for postmortem toxicology cases. These improvements consequently reduced backlog by 50%–75%.<sup>7</sup> Improving the laboratory operations, in turn, strengthened the laboratory's relationships with its system partners. The positive feedback received from the customers improved employee satisfaction and morale. The success of this pilot project was docu-

mented in a blog called *Diary of a Lean Six Sigma Lab*<sup>8</sup> that received positive attention from the state health department's Performance Improvement Program. This publicity is anticipated to lead other state and local public health departments (e.g., the medical examiner's office) to consider implementing Lean Six Sigma Principles to improve their processes.<sup>7</sup>

As of December 2012, approximately a year and a half following implementation, the group has maintained the turnaround time at levels comparable with that of the beginning of the project. The group has also demonstrated that the new workflow is rigorous enough to withstand scheduling changes necessitated by events such as holidays, court testimony responsibilities, maternity leave, and even the intense pressures of preparing for a first-ever laboratory accreditation inspection. The Utah PHL system has also embarked on a new post-assessment project related to improving the testimonies toxicologists give in court by reaching out to the Utah Prosecution Council to provide moot court opportunities so prosecutors and toxicologists can practice court procedures.

## NETWORK BUILDING

PHLs can use the L-SIP assessment to generate momentum for bridging system partners together, both to build new partnerships and strengthen existing ones. For example, the State Hygienic Laboratory of Iowa's post-assessment QI activity was to begin building an environmental laboratory system network by holding a summit and improving communication with environmental partners. This activity specifically addressed Essential Service 4 (mobilize community partnerships and action to identify and solve health problems). The first Iowa Environmental Laboratory Response Network (I-ELRN) Summit on June 28, 2011, brought together representatives from many environmental-related departments across the state, including commercial, county, municipal, and state laboratories; the Iowa Department of Natural Resources; and the Iowa Department of Public Health. The summit allowed partners to have an open discussion about how a system would be beneficial for all parties and what common needs must be met for the system to be successful. The group determined that a functional system ideally would allow departments to come to each other's aid during emergencies and collaborate to share each other's strengths and resources when budgets are strained. To give this new network structure, an I-ELRN Laboratory Advisory Board, including members from the State Hygienic Laboratory, commercial laboratories, local laboratories, Iowa Department of Public Health, and Iowa Department of Natural Resources, was created at the summit.

The results from the post-summit evaluation survey completed by meeting participants showed that 83% of the respondents would either consider joining or would join the I-ELRN.<sup>9</sup> There were two follow-up meetings in 2012; unfortunately, the laboratory has experienced difficulty in maintaining interest and momentum in the consortium. One possible reason is that some of the laboratories that have joined the network are in direct competition with each other for business; therefore, there is not enough incentive for them to actively participate in the I-ELRN. The I-ELRN has since decided to concentrate on broader system goals (e.g., assuring the sustainability of environmental health service and enhancing the capacity to identify and respond to environmental health risks) rather than laboratory-specific goals.

While post-assessment follow-up meetings and activities generally require some advanced planning and may occur after an extended period of time, Alabama, the 28th state to convene an L-SIP assessment, experienced an almost immediate positive impact in terms of network building as a result of the interest and publicity

the event garnered. With the focus on the SPHL and what it offered, the January 2012 L-SIP assessment determined that some participants were unaware of its services, as recorded in comments captured on the tool and on the evaluation. A couple of days after the assessment, laboratory staff were invited to several speaking engagements, among which was a local university's Laboratory and Medical Technology Honor Society function to reaffirm students' decisions to explore clinical laboratory science careers. The laboratory was also invited to the department's area public health nurses' orientation session to educate them about the laboratory's services and their roles as partners of the system.<sup>10</sup> While these presentations are not formal QI activities, new interactions between system entities will help foster budding relationships by better educating system partners about roles and responsibilities, thereby facilitating future collaboration.<sup>11</sup>

## INCREASING AWARENESS OF THE LABORATORY SYSTEM

Often, the "system" concept is new to L-SIP assessment participants, and they want to understand it more fully before addressing system gaps. Fortunately, the L-SIP assessment day is designed to educate participants about the system. Results of Minnesota's June 2010 L-SIP assessment demonstrated that the assessment process is effective at developing an understanding of the laboratory system. Pre- and posttest data showed that 19% of L-SIP participants felt they understood the difference between the SPHL and the SPHL system before participating in the L-SIP assessment, while 76% felt they understood the difference after participating in the assessment process.<sup>12</sup> However, the assessment process revealed that many system partners desired a more formalized definition of "laboratory system" as a next step in the system's development. Through an APHL L-SIP grant, Minnesota set off to develop the concept of an ideal SPHL system. A design group was created with system partners comprising broad representation and perspectives from all areas of the SPHL system, including clinical, environmental, and newborn screening disciplines. The group was challenged with the following three goals: (1) design and create a map with explanatory narrative detailing an ideal SPHL system, (2) articulate and communicate the roles and responsibilities of stakeholders in an ideal SPHL system, and (3) develop a high-level work plan for implementing an ideal SPHL system. All of these goals would be transferable to other SPHL systems for implementation.

A result of the design was an overarching steering

committee and two domain-specific councils—the Clinical Domain Council and the Environmental Domain Council—that were created to oversee their respective parts of the laboratory system. The system was also formally defined. Identified next steps included development and dissemination of educational materials to inform stakeholders about the importance and rationale of the system, as well as the benefits of being an active system participant.<sup>12</sup> Additional funding and staff resources would be required to implement the ideal SPHL system fully in Minnesota. The philosophy moving forward was that the more people are aware and knowledgeable about the system and its benefits, the more willing they would be to actively participate. Minnesota’s final report for the design process, “Implementing an Ideal State Public Health Laboratory System,” is available on the APHL Member Resource Center for all APHL members to use.<sup>13</sup>

Sometimes, post-assessment QI activities require some creativity. After its 2009 assessment, the Michigan PHL system had created a Laboratory System Advisory Group (LSAG) to allow system partners to meet to discuss common concerns and collaborate to address system problems.<sup>14</sup> Over time, participation and interest in the LSAG started to wane until current events reenergized the group. The political scene in Michigan at the time of the November 2010 elections created unprecedented citizen interest in state government and resulted in a turnover in approximately 65% of the Michigan Legislature the following January. Logistically, holding a workshop for legislators would not have been feasible given their complicated schedules. However, there was still value in helping the new decision makers understand the importance of laboratory and epidemiology science to the public’s health.

Therefore, Michigan laboratory system partners, including members of the LSAG and the Michigan Association of Local Public Health, sponsored a one-day workshop on the legislative process and related practical communication skills for laboratorians, epidemiologists, and health-care workers throughout the state. Sessions on health policy issues, laboratory medicine, and the bill approval process, as well as tips on interacting with legislators and the communication of science, were enthusiastically received by participants.

Benefits of the workshop included the engagement of a new group of clinical and academic laboratory partners who were attracted by the unique topics and increased interest in and knowledge of the Michigan state government process among laboratory system partners who attended the workshop, as measured by survey results.<sup>15</sup> In addition, the workshop raised awareness of the SPHL system and the current laboratory workforce shortage with two key state senate committee

chairs, one of whom toured the Michigan Department of Community Health Bureau of Laboratories a few weeks later.

## CONVENING AN L-SIP REASSESSMENT

To have an accurate reading on the laboratory system’s performance, system partners should convene every few years to reevaluate the system’s strengths and weaknesses and discuss how they compare with the prior assessment’s findings. In May 2011, New Hampshire was the first state to hold an L-SIP reassessment. The initial assessment had taken place in March 2007, and a low newsletter circulation was identified as an opportunity for improvement. Many interested staff members worked to strengthen the content of the newsletter and increase its circulation, resulting in positive feedback from the readership. The laboratory leadership decided that it would be valuable to bring the partners back together to reassess the system using the performance measurement tool and then compare the 2011 results with those from 2007.

On the day of the reassessment, 51 participants worked through the assessment tool, scoring the system based on the 10 Essential Services. At day’s end, the 2011 scores were projected alongside those from 2007, revealing that the scores for five of the Essential Services (Essential Services 3, 4, 6, 9, and 10) had increased. Two scores (Essential Services 2 and 8) remained the same, and three scores (Essential Services 1, 5, and 7) had decreased.<sup>16</sup> Since the reassessment, the New Hampshire PHL has helped the University of New Hampshire’s veterinary laboratory set up a quality management system, which was an identified need. In turn, the New Hampshire PHL director was invited to sit on the university’s Veterinary Diagnostics Laboratory Advisory Board, strengthening relationships between the two partners.

A reassessment can recharge the PHL system by acknowledging how the system has improved since the initial assessment and also by identifying gaps that have yet to be filled or new ones that need to be addressed. One caveat learned from the New Hampshire experience is that scores will change depending on a variety of factors, such as participating stakeholders, their involvement in the previous assessment, and public health-related events occurring at the time of the assessment. The increase in scores between assessments may also be attributed to educating the laboratory system members about the 10 Essential Public Health Services. While it is important to document the scores from each assessment, capturing the themes during the discussions is more valuable, as it will help the system participants better understand the reasoning behind the scores and how to address

the concerns identified during the assessment. All of these factors must be taken into consideration before time and resources are invested in post-reassessment QI activities. Because only one PHL system has conducted a reassessment, APHL continues to encourage PHL systems that have conducted an initial assessment to reconvene for reassessment. This reconvention will ultimately demonstrate the impact a reassessment and continuous QI has on the PHL system.

## LESSONS LEARNED

The aforementioned examples demonstrate that the L-SIP assessment process is very effective at identifying opportunities for improvement in the laboratory system; however, moderate resources are often required to address these gaps. QI activities identified by L-SIP have a positive impact on how partners connect and how the laboratory system operates. Regardless of the size of the project, all activities impact the system and its partners in some way, including helping system partners become more aware of each other's strengths and resources, which is advantageous as operational budgets continue to be strained. Partners within the laboratory systems must build closer relationships to collaborate on QI efforts, research projects, workforce development, and other important laboratory issues, as political and financial climates continue to change. It is also important that systems seek QI activities that answer the question, "What's in it for me?" As described in a few of the state examples, one of the biggest challenges to a truly collaborative laboratory system is that partners need to clearly see how being engaged in the system adds value. Without this knowledge, their participation may become a low priority.

Many times, ideas for QI activities are explored during post-assessment stakeholder meetings, but additional financial resources are required to bring them to fruition. To help ensure that the laboratory system advances in the way it operates and serves its stakeholders, public health organizations need to continue to offer grant opportunities so that laboratory systems can maintain the momentum of their post-L-SIP assessment QI activities. The QI projects and the resulting positive changes to the laboratory systems that are mentioned in this article would not have been possible were it not for the modest funding provided by grants.

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