2018 Training Needs Assessment Focus Groups Report

MAY 2019

APHL ASSOCIATION OF PUBLIC HEALTH LABORATORIES®

Acknowledgments

The APHL Training and Workforce Development Program would like to thank:

- eLearning Talent for drafting the initial report
- APHL Institutional Research Program for their assistance in data collection
- APHL Workforce & Development Committee for their support and contribution during the development, analysis and completion of this report
- CDC's Center for Surveillance, Epidemiology and Laboratory Services/Divison of Laboratory Systems (CSELS/DLS) for their generous support of this training needs assessment project.

On the cover:

Top left: Laboratory scientists participate in a training session at the North Carolina State Laboratory of Public Health

Center: Public health laboratory leaders participate in a Lean training workshop at the 2016 APHL Annual Meeting

Bottom right: Participants engage in a group discussion at the APHL-GWU International Institute for Public Health Laboratory Leaders 2012 Seminar held in Dar Es Salaam, Tanzania

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Executive Summary

In an effort to revise and update its laboratory training offerings for its members and associates, the Association of Public Health Laboratories (APHL) convened 10 live, virtual focus groups. The focus groups were held concurrently with a quantitative online training needs survey, which addressed a broader APHL and US Centers for Disease Control and Prevention (CDC) audience. This report contains aggregated comments collected from a selected group of public health laboratory (PHL) directors, managers and other key laboratory informants.

Results of the focus group analysis revealed the following major findings:

- Laboratory management finds it challenging to hire appropriately educated staff, to motivate staff, and once trained, to retain skilled staff.
- The top five technical training needs revealed are:
    1. Whole genome sequencing (WGS)
    2. Basic laboratory skills presented as new skills or as a refresher
    3. Bioinformatics
    4. CLIA regulations
    5. Microbiology (basics, classic and manual methods).
- The top four leadership/management training needs include:
    1. Conflict resolution/management (administrative and laboratory)
    2. Interpersonal communications
    3. Ethical issues (clinical, laboratory ethics and responsibilities, scientific)
    4. Facilitating (meetings, committees and training).
- The most-preferred training method is hands-on/face-to-face/interactive, followed by a combination of training methods and tools, also known as a blended learning approach.
- Participants unanimously agreed that training is critical for growth and retention.

Conclusion

The consensus of the focus groups was that training is integral to assure the necessary capacity and capability to meet the needs for public health laboratory services. Participants were extremely motivated to share their experiences—both positive and challenging. The findings, which were the thoughts of the group—most in laboratory leadership roles—identified that training priorities are dependent on the specific population and could not prioritize science technology topics over leadership topics.

The focus group data show that leadership and management training is vital for supervisors and managers. Priority leadership topics include conflict resolution, interpersonal communications, ethics and facilitation skills. Technical training needs for laboratory staff focused on emerging technology like WGS and skills-based topics like bioinformatics, Clinical Laboratory Improvement Amendments (CLIA) regulations, general laboratory functions such as pipetting, and basic microbiology techniques such as culture identification from an agar plate. Curriculum tailored towards development of leadership skills in staff with management potential was identified as a new opportunity with benefits to the entire public health laboratory organization.

Throughout the focus groups, participants noted a list of shared interests and concerns which included:

- the impact of an aging workforce facing retirement
- staff turnover and retention
- certification requirements within jurisdictions
- new-hire education gaps
- salary competition with other entities
- perceived resistance to change by seasoned staff
- access to training

Challenges are described further in this report.

Recommendations

The following recommendations for future training programs were developed from the aggregate analysis of focus group participant responses.

Training development

- Address the top three topics or concerns listed in *Table 3: Top-ranked Technical Topics* and *Table 4: Top-ranked Leadership/ Management Topics* first. Then continue to the next item on each list as time, budget and need dictate.
- Compare the focus group selections to the results of the online survey for similarities, looking for trends that intersect. Revise the priority topics as needed.
- Review APHL and CDC course offerings against findings from focus groups and online survey to determine which courses are still relevant and which courses can be either retired or updated. Align the list with the Top Three list.
- Research available training by vendors that meets APHL standards to avoid duplicating development effort.
- Plan and develop new training modules based on new and emerging technologies and processes. Prioritize the development of laboratory training activities to align with new industry methodology and developing technology.
- Develop laboratory training for all staff levels in the laboratory.
- Apply nationally-recognized and industry-accepted quality standards and guidelines to training development process.
- Ensure quality standards are used in developing training content either by in-house or recommended commercial resources.

Technical

- Develop curriculum framework grounded in public health laboratory competencies.
- Advise laboratories on ways to cross-train laboratory personnel to maintain staff with required and appropriate skillsets.

Leadership/Management

- Develop competitive grant writing skills courses to increase funding for laboratory resources, staffing, and technology support.
- Advise laboratories on how to develop potential supervisors/managers with training incentives that will increase their responsibilities and authority within the laboratory. These opportunities would be outside of APHL's Emerging Leader Program but may help prepare them for future access to the Emerging Leader Program.

Training tools and methods

- Consider alternate forms of presenting the content, e.g. different formats, locations, groupings, and timings. For instance, offer face-to-face, hands-on training using two-way video cameras.
- Develop 10-15-minute training modules on one topic that can become part of a series.
- Support teach-back options for staff sent to training.

Career development

- Provide or teach coaching for short term objective-based advancement (assign more responsibility, learning new or updating skillset)
- Advise on how to select a mentor. Mentoring relationships are usually initiated by the individual employee seeking career guidance.

These recommendations are by no means all-inclusive of appropriate possible actions. However, this analysis supports implementing these recommendations as a positive step towards improving technical and leadership/management skills of laboratorians and impacting individual careers in public health laboratories.

Background

According to the 2016 APHL Focus on Public Health Laboratories: A Workforce Survey Report,[1] there is expected to be an approximate 30% loss of trained personnel in the public health laboratory industry in the near future. This is attributed to the impending retirement of an aging workforce and lower enrollments in related fields of study towards a laboratory science career.

To keep ahead of this trend, APHL conducted focus group discussions to gather information about the training needs of individual laboratories and the national public health laboratory system. The focus groups were held concurrently with a quantitative online training needs survey which addressed a broader APHL and US Centers for Disease Control and Prevention (CDC) audience.

The purpose of the focus groups was to obtain in-depth qualitative information on ideas and perceptions of the importance of training, to identify critical training needs and discuss how training affects individual careers in public health laboratories.

The information learned in the focus groups will inform those responsible for public health laboratory training of the topics needed within the public health laboratory field. Data gathered from the focus groups provide impressions of the training environment and will be used in concert with quantitative data from APHL's 2018 nationwide online Training Needs Assessment to create a comprehensive picture of the needs for the current and future public health laboratory workforce.

Methodology

The sampling methodology used identified relevant stakeholders who were a representation of public health scientists performing the work and other key informants to assure comprehensive representation of the PHL core functions with regard to field to compare the "gap" between current state and anticipate future state training desired and required. Focus group participants were selected from the following stakeholder categories:

- Laboratory directors
- Emerging Leader Program alumni
- Workforce Development Committee members
- PHL trainers
- Biosafety officers
- Individual contributors with interest in training and workforce development.

The initial invitation to participate was sent to 79 invitees compiled by APHL. Fifty-three participants accepted APHL's invitation to share their opinions and experiences in focus group discussions. Participants represented a wide variety of positions including:

- Current and retired laboratory directors
- Training coordinators
- Safety/biosafety officers
- Quality assurance officers and managers
- Training supervisors and managers
- Technical supervisors and managers
- Laboratory Response Network (LRN) coordinators
- Industry consultants.

APHL conducted ten sessions, sorting participants into groups with similar titles and responsibilities. Statistically, laboratory directors accounted for 40% of participants, followed by technical supervisors/managers at 11%, and safety/biosafety officers representing 10%. Participants were located in 32 states and the District of Columbia. Table 1 shows a breakdown of participants by type of laboratory. Data counts calculated throughout this report are aggregates of individual participants.

Table 1: Participation by Laboratory Type

Laboratory Type	# of Participants	Percent
PHL state	36	68.0%
PHL non-state (Agricultural, Environmental)	3	6.0%
PHL local	4	7.0%
Key laboratory stakeholders with relationships to PHL profession	10	19.0%
TOTAL	**53**	**100%**

Focus groups sessions took place over a four-week period, facilitated by a consultant and a technical assistant. The technical assistant coordinated the session schedules, controlled the video conferencing and recording and served as the official note-taker. Sessions were 60-90 minutes in length and conducted virtually using an online video conferencing application. PowerPoint slides helped guide the interviews.

Open-ended questions, formulated by APHL, were used to gain the best perspective and scope of individual responses and what mattered to the individual's area of interest and expertise. Facilitator notes ensured uniformity among focus group discussions and kept each discussion on target. Participants introduced themselves including name, organization and position. The purpose of the focus group, as per email communication, was repeated as a reminder. An opportunity was given to rescind consent to participate. Responses were recorded, and participants were assured their comments would be kept confidential. Ground rules were established and used during each discussion.

Each question was read twice to the participants, and the facilitator encouraged full engagement from each participant to maximize a thorough compilation of data. If any answers were unclear, the facilitator would ask probing questions, such as:

- Can you talk about that some more?
- Help me understand what you mean.
- Can you give me an example?

The facilitator summarized main points of participant responses for a question before moving on to the next question. After the last question, the facilitator read each question one more time to give participants an opportunity to make additional comments.

Discussion Questions

APHL staff developed a list of five questions to guide the discussion of each focus group session. Each session used the same group of questions. Participants received the questions in advance of their scheduled session to encourage advance preparation. Since the composition of each group varied by job duties and titles, several perspectives were represented in their responses. Table 2 lists the five questions used in each session.

Table 2: Focus Group Questions

1. What are your most critical TECHNICAL training needs and why?
2. What are your most critical LEADERSHIP/MANAGEMENT training needs and why?
3. If you had to prioritize between technical and leadership/management training, which would be most important to you and why?
4. How best do you learn and what tools support your learning experience?
5. How critical is training in your career path or part of your career development?

Shared Issues and Concerns

During each focus group conversation, significant overarching issues and concerns emerged as to what laboratories have in common from the perspective of the participants. These shared issues and concerns from the Focus Group participants developed into the following major themes.

Aging workforce/retirement/succession planning/expertise loss

Baby Boomers (born 1944-1964) are retiring in record numbers either voluntarily or by incentive. Gen X (born 1965- 1979) will be moving into the retirement cycle in the next decade. This aging workforce is leaving the job and creating a knowledge vacuum. Much needed knowledge capital is leaving the laboratory science industry with each departure and there does not seem to be sufficient training for succession planning. Laboratories are finding gaps in required skillsets, and loss of specific expertise is not easily replaced from within current staff. Retention of knowledge is at risk when there is no cross-training plan within a laboratory.

Turnover and retention

A 2016 Gallup report, *How Millennials Want to Work and Live*,[2] supports the description that Millennial or Gen Y workers (born 1980-1994) have a reputation for moving from job to job more often than other age groups. Whereas, seasoned employees tend to be of the extended-stay or company loyalty culture and grow within the same company. New experiences, meaningful work and employers who support their development motivate Millennials. According to a Pew Research Center report, Millennials are the largest generation in the US labor force[3] and are expected to form the largest percentage of the workforce by 2020. As of 2017, Millennials make up 35% of the labor force.

Some scientists leave public laboratories for non-public laboratories, who may offer higher pay or opportunities not offered at public laboratories, such as being offered a chance to work with more emerging areas in the industry.

Many times, once employees are experience in a certain skillset, they may take a new job elsewhere to apply that skill and for increased responsibility and pay. Laboratories are constantly training and orienting new or existing employees to cover the loss of knowledge capital.

Jurisdiction requirements for certification and licensing

Public laboratory requirements vary by jurisdiction—federal, state, local or territorial. Staying current within a jurisdiction can be a balancing act of maintaining required technical skills mandated by state-specific licensure laws and regulations. For example, some jurisdictions require licensing or proof of technical training by maintaining continuing education units (CEUs) acquired within a given time period. The cost of either is an issue for employees and employers, which in some cases may cost $300 per employee or more a year.

Education gaps with new hires

While new hires may have credentials in the laboratory technology field, the type of credential may not specific to the job they are hired to do. In addition, traditional science tracks, such as microbiology and chemistry, have expanded options for distance learning and online degrees may circumvent laboratory hands-on coursework. Recently graduated medical technologists (MT), medical laboratory scientists (MLS) or medical laboratory technicians (MLT) may not yet be certified and have yet to acquire enough laboratory experience and knowledge to assure technical competencies. Scientists may not have been exposed to some emerging areas during initial formal education.

> *People have different degrees, so technical needs vary based on academic background and type of lab work being done. As a county lab director, [I] recognized the needs, but couldn't necessarily pay for them. Non-licensed staff may not have funding for training vs. licensed staff had budgeted training amounts.*

> *[P]eople are hired with molecular backgrounds, but they don't have classic microbiology techniques. This is flipped from what used to happen where people were classically trained but not for new techniques.*

Salary competition with non-public laboratories

As mentioned earlier, there is no parity between public health laboratories and non-public laboratories. It is a considerable effort to recruit and retain employees and provide competitive salaries. Public health laboratories are often limited by funding and

structured salary guidelines maintained by their governing body, leaving management to fill workforce gaps with lower skilled employees and provide essential training during onboarding.

Perception of resistance to change among seasoned staff

Some staff that have been on the job for a number of years feel comfortable in their positions and sometimes see no reason to learn new skillsets. This may be attributed to an individual's complacency, where change is sometimes seen as an inconvenience: their way seems to work, so why change? This attitude is challenging to laboratories striving to maintain staff with skills in new or evolving technologies. Here are some of the perceptions that the respondents shared:

Change readiness

Employees cherish training opportunities because pay is not always competitive, so [training] is seen as a benefit of the job in PHLs.

Certain people don't want to learn more and are fine staying on the bench, but others want to learn something new each year.

Training is critical to learn and develop because there are always new things to learn (operational, technical, HR, management).

Even the littlest piece of new knowledge is helpful.

Lab is a lifelong learning experience. Technology and leadership skills have changed and the only way to have career development.

Depends on where you are in your career path makes a difference, personally not too important, but mentoring in career path is important and as important as training in career path.

Succession planning, shared experiences and employee development is most important right now (respondent states they are close to retiring).

Change challenges

Some employees push back against molecular testing because they've been doing bench work for 30+ years and don't have a desire to learn molecular side and so have stopped trying to force molecular on them…They don't understand technology, but they also find pipetting in little spots difficult.

Pushback about rearranging bench top or doing quality improvement or adding antimicrobial resistance. Reason? Comfortable with current situation/fear of change/stubbornness. Starts with people who have been there for a long time but trickles down to all peers.

People who are ready to retire have no desire to learn new things but everyone else has a desire to get trained and wants to be prepared for the future.

Mid-career level people are frightened of WGS.

Access to training

Participants cited several challenges to accessing training:

- Limited budget for outside training.
- Limits placed on funds to train and retrain when there is staff turnover.
- Old computers and outdated equipment, narrow bandwidth or sometimes no internet access, making it difficult to take online/virtual courses.

Key Findings

The following is a summation of the findings compiled from the focus group participants. Responses represent those relating to:

- Technical training needs
- Leadership and management training needs
- Training priorities between technical versus leadership/management training
- Preferred learning methods and tools
- Training effects on career development.

Technical training needs

What are your most critical TECHNICAL training needs and why?

Across all groups, participants' responses regarding their most critical technical training needs fell into three prominent categories--the need for emerging technologies training, specific technical skills, and basic laboratory skills training. The following table lists the top topics (out of 77) mentioned most often during focus group discussions on technical needs. A complete list of topics generated from participant responses are on file with APHL.

Table 3: Top-ranked Technical Topics

Rank	Category	Topic	% of Responses
1	Emerging Tech	Whole genome sequencing	6.3%
2	Skill-Basic	Laboratory skills training -basics introduction/refresher -sterile techniques -glassware cleaning	5.6%
3	Skill-Specific	Bioinformatics	5.0%
4	Skill-Specific	CLIA Regulations/101 -series of modules for all levels	3.8%
5	Skill-Basic	Microbiology basics/classic/manual	3.8%
6	Skill-Basic	Biosafety, general	3.1%
7	Other	Risk assessment -biological -optimize -internal state PHL	3.1%
8	Skill-Tech	Molecular diagnostics/technologies	2.5%
9	Skill-Tech	Mycology	2.5%
10	Skill-Tech	Parasitology	2.5%
11	Skill-Basic	Safety, general	2.5%

Leadership/Management training needs

What are your most critical LEADERSHIP/MANAGEMENT training needs and why?

Making the distinction between leadership and management is key to identifying this group of training needs. One participant pointed out that "one leads people and manages things." Along with leadership training and management training, a need for personal development training became apparent.

The following table represents the top topics (out of 69) mentioned most often during the focus group discussions for leadership and management training needs. A complete list of topics generated from participant responses are on file with APHL.

Table 4: Top-ranked Leadership/Management Topics

Rank	Category	Topic	% of Responses
1	Leadership	Conflict resolution/management - administrative - laboratory	6.8%
2	Personal Development	Communications-Interpersonal	5.4%
3	Leadership	Ethical issues - clinical ethics - laboratory ethics and responsibilities - scientific	4.1%
4	Leadership	Facilitating - meetings/committees - training	3.4%
5	Personal Development	Time management	3.4%
6	Leadership	Coaching training	2.7%
7	Management	Budget/Finance/Fiscal management - oversight - spending plans - forecasting	2.7%
8	Management	Strategic planning	2.7%
9	Non-Managers	Leadership for non-managers training ELP-type training for non-managers or those not in the program - ELP toolkit - Professional development webinar series	2.7%
10	Personal Development	Grant Writing - general techniques - competitive grants - performance objectives	2.7%
11	Personal Development	Public speaking - press/media communications	2.7%

Several participants reported that it was difficult to get support from leadership to provide leadership training because they are not required to provide it; executive management participation and support is needed in this area. Further affecting this area are the large numbers of managers that have retired or left for other employment opportunities. Also, new staff hired from outside or promoted internally don't always possess adequate management skills.

> *[New hires] need to know how to manage people, prioritize and manage their time. Succession planning is also part of this. Some have been thrown into new roles and need new manager's skills like conflict resolution, and motivation.*

Laboratory staff training in management and leadership skills

Suggestions were made in support of developing a leadership curriculum for bench staff and lower-level managers. This curriculum would borrow a selection of topics offered in APHL's Emerging Leader Program to benefit individuals who would like to develop management and leadership skills at the bench. For example, scientists promoted to leaders who are typically analytical could take advantage of this type of training as they move toward working more with people on an interpersonal level.

Another viewpoint offered on this topic is:

> *Should people who are masters in their area also be masters of managing? Most people are good in one or the other, not always good at both. Do scientists need management skills or should labs be hiring better managers? Top scientists aren't always best suited as managers even with training.*

Training priority—Technical versus Leadership/Management

If you have to prioritize between TECHNICAL and LEADERSHIP/MANAGEMENT TRAINING, which would be the most important to you and why?

Forty percent of group participants voiced a greater need for leadership/management training than technical. While some participants selected one versus another, a fair number were split equally.

Table 5: Training Priority Ranking

Category	# of Participants	% of Participants
Leadership/Management	19	40%
50/50	14	29%
Technical	14	29%
Other	1	4%

Leadership/Management

When directors and managers answered for their personal needs, the choice was usually leadership/management training. When considering the laboratory staff, they saw a more critical need for technical training. Some of the outstanding reasons supporting Leadership/Management training include:

- *Leadership training is needed across the organization for everyone not just managers. Needs to be integrated into the culture.*
- *Generally able to find avenues for technical training when needed, but leadership/management training is harder to find for all levels.*
- *Demands for technical skills are always changing, so investment-wise, it might be smarter to invest in leadership/management training because they're universal and unchanging.*
- *Leadership management trainings are more important because the laboratory is lacking expertise to train internally.*

Technical

Reasons some participants felt technical training was more important for everyone overall include:

- *Management is only as strong as the team working with you–so technical is most important.*
- *Technical is important because Leadership/Management training can come from other avenues [and] there are fewer resources available for technical issues.*
- *More outside sources for Leadership/Management training are more readily available than technical, so more training emphasis should be on technical.*
- *There is higher turnover in the technical areas of the laboratory.*
- *Leadership/Management training is more static; technical training needs to keep up with ever-changing new techniques and technologies, so [technical] is more important.*
- *If you can't do technical testing in your laboratory, you don't have a need for leadership/management to help.*

Equal weight

Twenty-nine percent of participants found it difficult to select technical training over leadership/management.

- *We can't discount technical training because staff aren't always trained, but excellent leadership means you can maintain the expertise once you've trained them.*

In this category, respondents felt that there was a need for both types of training, with new supervisors needing management training but new staff needing technical training. They also indicated a strong management team can help build a strong technical team, so both are equally important.

Other training priorities

Other priorities were more situational. For instance, the timing of the training need can dictate what type of training is currently required. This is controlled by current staffing and their abilities.

Preferred learning methods and tools

How do you best learn and what tools support you learning experience?

Participants responding to this question listed their preferred training methods that are shown in Table 6. A complete list of preferred learning methods generated from participant responses are on file with APHL

Table 6: Preferred Learning Methods

Preference	# of Participants	% of Participants
Hands-On/Face-to-Face/Interactive	26	40.0%
Blended Approach	11	17.0%
On-demand	10	15.0%
Webinars	5	8.0%
Self-Study	2	3.0%
Various methods not listed above	11	17.0%
TOTAL	**65**	**100.0%**

Hands-on

Responses for preferred learning tools and methods overwhelming favored hands-on experiences. As one respondent said, "Hands-on is hands-down the best". Hands-on training that is offered in a face-to face setting provides critical interaction, immediate feedback and opportunities to practice new skills. Hands-on training can also be part of on-the-job training. It was also noted that:

- *Hands-on tends to be more labor-intensive and more expensive to produce, it is also the most effective way to train laboratory professionals.*

Blended approach

A blended training approach can include any combination of learning methods and activities—hands-on, on demand, self-study or online/virtual modules. The learning situation can dictate the most effective collection of methods. Some suggested:

- *Pre-work, applied practice and interactive activities.*
- *Homework assignments plus hands-on [which] pushes some people to put it into practice [and] keeps them accountable.*

On-Demand

Participants provided multiple suggestions for on-demand training. They included:

- The convenience of online, on-demand, interactive web-based training. Both seasoned and novice staff seem to prefer virtual training over training in person, which allows them to go at their own pace
- Podcasts and other audio medium
- Simplified checklist/cheat sheet or job aid Is helpful; like a one-pager visual process flowchart
- Q&As – small, quick, easy to learn and understand trainings
- Video record a process/procedure and then evaluate mistakes, for instance. Short videos may help keep interest of younger generation
- Apps are popular and may be beneficial when used for trainings.

Webinars

The Webinar category includes any live web-based interactive training sessions. The benefits of this method include:

- The convenience of not having to travel to attend training
- Interaction and immediate feedback.

The challenges of this method include:

- Being available at the scheduled time of the training
- Having the appropriate technology—usually a computer with high-speed internet access and adequate bandwidth.

Self-Study

Self-study is similar to on-demand, but the perspective is from one seeking out their own content as a means of research and skills enhancement. This could include reading scientific papers and periodicals and watching relevant videos. Like on-demand, an individual can work at a pace within their learning preference, availability and work schedule. Some participants who prefer self-study commented that it is:

- Better to read at own pace than be spoken to at a speaker's pace.
- Best to go at own pace (read papers, watch recordings of videos) and can be interrupted or distracted as necessary. Face-to-face is least productive.

Other training methods and tools

Using other training methods seemed to be primarily situational, involving things like type of content, timing or availability of equipment and technology. Options suggested included:

- Simulations
- Train-the-trainer sessions to develop or update existing trainers
- Teach-back, where one who attends a training returns to the laboratory and teaches the team or a colleague.

There was a strong emphasis on the value of providing visuals, whether face-to-face or virtual. Shorter sessions or mini-sessions were suggested to increase focus and save time.

Career development

How critical is training in your career path or part of your career development?

This question drew some very passionate responses. All respondents felt that training is absolutely critical to one's career development. The top three perspectives expressed, in order of most occurrences are:

- Keeping up-to-date
- Career planning
- Staff retention.

The breakdown of responses is shown in Table 7.

Table 7: Career Development Training

Purpose	# of Participants	% of Participants
Keeping up-to-date	28	40.0%
Career planning	16	23.0%
Retention	10	14.0%
Individual responses	16	23.0%
TOTAL	**70**	**100.0%**

Keeping up-to-date

Stay current of industry technology and techniques is the most frequent response. Forty percent agreed that there is always a need to learn for many reasons. Among them are:

- Acquiring or maintaining certification
- Learning and applying the many changes within public health laboratories
- Growing and keeping in touch with technology and industry innovations
- Cross-training to help in more areas of a laboratory.

Others expressed the following:

- *[E]ven the smallest piece of new knowledge can be helpful in daily operations.*
- *The laboratory is a life-long learning experience. Technology and leadership skills have changed and [training is] the only way to have career development.*
- *If they don't continue training, they may be in the wrong profession.*
- *Young people are very interested to learn new things and cross-train.*

Challenges to keeping up-to-date

Staying current and keeping one's skills up-to-date can be a challenge when appropriate training is not available. However, individual actions and reactions are situational and can be affected by:

- Lack of management support; for example, webinars and online training get a low priority from management staff and get pushed off for other things
- Resistance to change, comfortable with current situation and have no desire to learn something new
- Resistance to inconvenience and routine disruption, especially among mid-career and longer serving staff
- Fear of new technology or techniques, such as WGS or working with information technology (IT).

Career planning

Closely related to keeping-up-to-date is the desire to control one's career planning. Responders expressed a sense of well-being by including training in their career plan. Training contributes to their advancement, certification and accumulated credentials. A few expressed the following comments.

- *[You] need to understand where you want to be and how to get there.*
- *[I] wouldn't be at this level without training—both technical and management training.*
- *Happy laboratorian = happy laboratory.*
- *[W]ithout training, you can't move forward in your career–from bench to management.*
- *Mentoring in career path is important and as important as training in career path.*

Trainings with credits encourage people to complete training, but this is dependent on position and if they need credits.

Retention

The topic of staff retention was a recurring theme within almost every group discussion. Training opportunities help with retention and finding ways to retain talent affected related areas such as succession planning and knowledge management. Several responses include those listed below.

- *More training = higher pay, more responsibility, so all laboratorians relish the chance to get training.*
- *[We] need to provide staff with an opportunity to use the skills.*
- *Off-site training is seen as a perk of the job.*
- *Succession planning, shared experiences and employee development is most important right now.*
- *[P]artner a state training coordinator (STC) in one state with an STC in another for tools and advice/support between public health laboratories.*

Other considerations

Additional comments fell into the categories relating to work environment, technology and travel.

Working Environment

- Good mentors and role models are valuable. Most training has been informal, but formal leadership/management training may be beneficial
- Need national perspective and standardization between states
- Training helps create network within a laboratory
- There is a need for "bigger picture" training, so one knows how things fit within a laboratory and in the public health laboratory universe.

Technology

Technology was reported to be a challenge to training in some of the following ways:

- Most major webinar providers are allowed on laboratory computers. For restricted providers, most laboratories can access with advanced notice. In some situations, one can only view the screen and listen, but not interact.
- Online training should be archived for later viewing because it is not always easy to be available for a live online training. In addition, IT and connectivity problems can make attending live trainings unrealistic.
- The best trainings are in-person to multiple attendees at the facility–can troubleshoot technology there if any problems arise.

Travel Impacts

Several participants shared situations that reflect some of their staff's resistance to attending training when it involves travel:

- Fear of flying
- Not wanting or being able to leave their families for extended periods
- Not wanting to be away from the bench for too long
- Willing to drive to training if necessary but would focus best with in-person trainings held at one's own office or location.

Conclusions

The consensus of the participants is that training is critical to assure the necessary capacity and capability to meet the needs for public health laboratory services. Participants were extremely motivated to share their experiences—both positive and challenging. The focus group findings confirmed that training priorities are dependent on the specific population, and could not prioritize one focus area over the other.

Leadership and management training continue to be critical for supervisors and managers, highlighting leadership topics in conflict resolution, interpersonal communications, ethics and facilitation skills. Technical training needs for laboratory staff focused on topics for the emerging technology whole genome sequencing and skills-based topics for basic laboratory skills, bioinformatics, CLIA regulations and microbiology basics. Curriculum tailored towards development of non-managerial leadership skills was identified as a potential new opportunity with benefits to the entire public health laboratory organization.

Throughout the discussions, participants mentioned a list of shared interests and concerns, which included an aging workforce facing retirement, staff turnover and retention, certification requirements within jurisdictions, new-hire education gaps, salary competition with other entities, perceived resistance to change by seasoned staff and access to training.

Human resources

Participants shared several of the same challenges with staffing, including developing strategies to:

- Identify and attract appropriately educated or experienced candidates
- Approximate salary parity with non-public laboratories
- Motivate and retain existing employees by offering incentives such as training to update skills and provide opportunities to use new skills at their laboratories.
- Retain and preserve knowledge capital by actively executing a succession plan to replenish skills that are lost to retiring staff and those lured away by outside opportunities.

Technical

WGS was the most mentioned topic in the emerging technology category.

Basic laboratory skills such as pipetting, sterile techniques and glassware cleaning are needed for both new employees and as a refresher for individuals transitioning from one laboratory area to another. These standard courses would help laboratory workers who had not been trained to relevant or basic laboratory techniques in their course of education, or for veteran laboratory workers who need to be reminded of proper required basic procedures.

Bioinformatics was the most often mentioned topic in the specific skills category, followed by using information technology applications in molecular biology.

Leadership/Management

Leadership skills development was mentioned most often by participants. Conflict resolution both at the administrative and laboratory levels topped the list of courses most needed.

In the category of Personal Development, interpersonal communications ranked highest.

Training priority

When comparing training priorities, Technical versus Leadership/Management training needs, both sides were supported by compelling arguments—40% for Leadership/Management versus 29% for Technical. Even with those that were split equally, the ratio for Leadership/Management wins out.

Proponents of leader/management training felt that in order for a team to work cohesively with intended purpose and appropriate resources, there must be effective direction from management.

Training tools and methods

Hands-on was by far the most preferred and referenced training method reported by focus group participants. A blended approach, which can incorporate a collection of methods (hands-on, lecture, online/virtual, on-demand, self-study) for a topic, was next most popular. On-demand tools were also prevalent among comments, which could be in the form of videos, podcasts, checklists, or job aids.

Career development

It was clear from 77% of participant responses that training is integral for:

- Staying current in technology topics and processes
- Planning career moves and developing expertise
- Retaining staff with valuable skillsets
- Succession planning.

Recommendations

The following recommendations for future training programs have been developed from the aggregate analysis of focus group participant responses.

Training development

- Address the top three topics or concerns listed in *Table 3: Top-ranked Technical Topics* and *Table 4: Top-ranked Leadership/Management Topics* first. Then continue to the next item on each list as time, budget and need dictate.
- Compare the focus group selections to the results of the online survey for similarities, looking for trends that intersect. Revise the priority topics as needed.
- Review APHL and CDC course offerings against findings from focus groups and online survey to determine which courses are still relevant and which courses can be either retired or updated. Align the list with the Top Three list.
- Research available training by vendors that meets APHL standards to avoid duplicating development effort.
- Plan and develop new training modules based on new and emerging technologies and processes. Prioritize the development of laboratory training activities to align with new industry methodology and developing technology.
- Develop laboratory training for all staff levels in the laboratory.
- Apply nationally-recognized and industry-accepted quality standards and guidelines to training development process.
- Ensure quality standards are used in developing training content either by in-house or recommended commercial resources.

Technical

- Develop curriculum framework grounded in public health laboratory competencies
- Advise laboratories on ways to cross-train laboratory personnel to maintain staff with required and appropriate skillsets.

Leadership/Management

- Develop competitive grant writing skills courses to increase funding for laboratory resources, staffing and technology support
- Advise laboratories on how to develop potential supervisors/managers with training incentives that will increase their responsibilities and authority within the laboratory. These opportunities would be outside of the Emerging Leader Program

but may help prepare them for future access to the Emerging Leader Program.

Training tools and methods

- Consider alternate forms of presenting the content, e.g. different formats, locations, groupings, and timings. For instance, offer face-to-face, hands-on training using two-way video cameras
- Develop 10-15-minute training modules on one topic that can become part of a series
- Support teach-back options for staff sent to training.

Career development

- Provide, or teach, coaching for short term objective-based advancement (assign more responsibility, learning new or updating skillset)
- Advise on how to select a mentor. Mentoring relationships are usually initiated by the individual employee seeking career guidance.

These recommendations are by no means all-inclusive of appropriate possible actions. However, this analysis supports implementing these recommendations as a positive step towards improving technical and leadership/management skills of laboratorians and impacting individual careers in public health laboratories.

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Glossary of Terms

Baby Boomer	A member of the generation born between 1944 and 1964.
Classroom	A place in which all students interested in a particular topic or concept meet in person at certain time(s) under the supervision of a teacher who provide structured dissemination of information and content sharing.
Clinical	A laboratory where testing is performed on samples to obtain information about the health of a patient to aid in diagnosis, treatment and prevention of disease. Most hospital laboratories are considered clinical laboratories.
For self	A person (either supervisor or non-supervisor) sharing their personal training needs.
For staff	A supervisory person conveying the training needs of the people they lead.
Gen-Xer	A member of the generation born between 1965 and 1979.
Group activities with a tutor/teacher	Learners construct their own knowledge and learning supported by a guide or instructor.
Leadership and Personal Development	Topics related to activities by which a person influences others to maximize their efforts towards the achievement of a greater goal for themselves and others
Management	Topics elated to the processes of dealing with or controlling things or people. It is the organization and coordination of the activities of a business in order to achieve defined objectives
Micro-learning	An instructional technology that deals with relatively small learning units and short-term learning activities. The term is used in e-learning and related fields in the sense of learning processes in mediated environments.
Millennial	A member of the generation born between 1980 to 1994.
Non-governmental	Laboratories found in organizations that are separate from a government structure (local, city, state, federal). For example, laboratories found in private hospitals or physician offices are considered to be non-governmental laboratories.
Non-manager	Laboratory staff who perform tasks and work under the direction of a lead person. Could also be referred to as laboratory staff.
Non-probability sampling method	A sampling technique where the samples are gathered in a process that does not give all the individuals in the population equal chances of being selected. Convenience sampling is probably the most common of all sampling techniques. With convenience sampling, the samples are selected because they are accessible to the researcher.
Other laboratories	Not clinical or public health laboratories. These laboratories are can be in universities, reference or research facilities.
PHL	Public health laboratories (PHL) focus on diseases and the health status of population groups. Most perform limited diagnostic testing. Laboratory testing is focused on reference testing, and/or disease surveillance. They also provide laboratory emergency response support, may perform applied research, and often conduct or support training for laboratory personnel, including those found in clinical, non-governmental and other laboratories.
Scientific/Technical	Topics related to performance of analytical testing in a laboratory setting for the monitoring, detection, diagnosis and treatment of disease
Seminar	An in person conference or other meeting for discussion or training where a group of people address a specific topic or subject matter.
Sentinel	In the broadest sense, all laboratories capable of analyzing or referring samples that may contain microbial agents, biological toxins, chemical agents, chemical agent metabolites, or radiological agents of public health significance function as sentinels in the public health laboratory system.
Staff	Personnel who perform assigned tasks and work under the direction of a supervisor or manager.

Supervisory	Personnel who perform the organization's administrative tasks and work to direct and lead the staff in a work unit. A job classification that represents any of the following job titles: • Laboratory Director • Associate Director, Assistant Director or Deputy Director • Quality assurance officer or manager • Safety or biosafety officer • Training supervisor or manager • Technical supervisor or manager • Administrative services or support services supervisor or manager.
Technology	Topics related to development and application of laboratory instrumentation and computerization to perform complex work in an analytical laboratory setting
Webinar	An educational, informative or instructional presentation that is made available online, usually as either video or audio with slides. The activity may be attended as a live presentation or recorded, archived and viewed at another time or location.
Workshop	A usually brief intensive educational program for a relatively small group of people that focuses especially on techniques, discussion, activities and skills in a particular subject or project. There is a period of discussion or practical work on a particular subject in which a group of people share their knowledge or experience.

Association of Public Health Laboratories

The Association of Public Health Laboratories (APHL) works to strengthen laboratory systems serving the public's health in the US and globally. APHL's member laboratories protect the public's health by monitoring and detecting infectious and foodborne diseases, environmental contaminants, terrorist agents, genetic disorders in newborns and other diverse health threats.

This project was 100% funded with federal funds and is supported by Cooperative Agreement #U60OE000103 funded by the Centers for Disease Control and Prevention (CDC). Its contents are solely the responsibility of the authors and do not necessarily represent the official views of CDC or the Department of Health and Human Services.

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