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Toolkit for Ensuring a Future Workforce of Qualified Public Health Laboratory Scientist-Managers and Directors

FINAL REPORT

Public Health Leadership Institute Year 15

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I. Project Title: Toolkit for Ensuring a Future Workforce of Qualified Public Health Laboratory Scientist-Managers and Directors

II. Abstract:

There is a severe and continuing shortage of qualified, doctorate-level, public health laboratory (PHL) scientist-managers available to succeed the currently retiring generation of PHL directors. In addition there is no pipeline to develop future scientist-managers in the specialty of PHL practice. This shortage is due in large part to a lack of specialty visibility, educational opportunities and competitive salaries. A team sponsored by the Public Health Leadership Institute (Chapel Hill, NC) and the Association of Public Health Laboratories (Washington, DC) identified and developed a set of tools needed to establish a pipeline that will prepare qualified future generations of state PHL scientist-managers and directors. These tools include: Personnel standards (job titles, definitions, and education requirements; job classifications; career paths); core academic and professional courses required for this specialty; criteria for a graduate scholarship program in PHL practice for PHL employees; specialty marketing, employee recruiting, and retention strategies; and the use of benchmarks, against which, competitive salaries may be justified.

III. Introduction/Background:

A. Brief Description of the Public Health Problem and Underlying Causes

A fully qualified cadre of public health laboratory (PHL) scientist-managers and directors are required to oversee the operation of the country's state public health laboratories. These PH laboratories protect the public by monitoring and identifying newly emerging infections (e.g., monkey pox, SARS, avian influenza), sporadic outbreaks (e.g., food poisonings, norovirus, pertussis, mumps, etc.), terrorist threats (e.g., anthrax, ricin, tularemia, cyanide, nerve agents), environmental hazards (e.g., chemical spills, unknown powders) and the effects of natural disasters (e.g., contaminated wells and commercial drinking water systems). Unfortunately, there is a severe workforce crisis involving PHL scientist-managers and directors, without whom, the complex infrastructure and vital evolving mission of these laboratories will deteriorate.

In 2001 the U.S. Bureau of Labor Statistics reported that fewer than 5,000 new laboratory scientists enter the workforce annually, less than half needed each year.[1,2] In 2002 the Institute of Medicine (IOM) found[3] that the governmental public health laboratories and laboratory workforces had been neglected. In this same report the IOM urged that federal, state, and local public health agencies prioritize leadership training, support, and development within government public health agencies and academic institutions that prepare this workforce. In April 2003 the U.S. Government Accounting Office expressed concern about staffing in health departments, including laboratories, and the impact of workforce shortages on national preparedness efforts.[4]

From the late 1960's through the mid-1980's a national academic program co-sponsored and fully supported by the Centers for Disease Control and Prevention (CDC) in Atlanta and the University of North Carolina School of Public Health in Chapel Hill, NC, graduated four future scientist-managers and directors of state and federal public health laboratories each year. All these graduates received MPH and DrPH Degrees in Public Health Laboratory Practice. This program provided a pipeline that, for nearly 40 years, ensured a ready pool of future leaders for the Nation's public health laboratories. However, the most recent of these graduates are now approaching retirement age and there has been no effective pipeline-program supporting the specialty of PHL practice for the past 20 years.

Public health laboratories and public health laboratory scientists often make up the first line of defense in protecting the Nation's citizens against disease and other public health threats. Yet public health laboratory scientists account for less than 3.1% of the total public health workforce in the country.[5] In a survey conducted in December 2002, the Association of Public Health Laboratories (APHL) reported[6] a severe shortage of qualified laboratory personnel in state laboratories. Between 2002 and early 2005, 17 of the 50 state PHL directors vacated their posts, largely due to retirements.[7] By 2006, the vacancy rate for SPHL directors was expected to reach 26% with even higher rates in the subsequent three to five-year period.[8] Reversing this loss will require efforts on many fronts,[8,9] and the breadth and depth of education and experience[10] needed to produce PHL scientist-managers and directors will require significant effort over an extended period of time.

The current environment for PH laboratories seeking to hire qualified scientist-managers and directors is one in which there:

1. Are fewer students pursuing careers in the laboratory sciences;
2. Are fewer trained individuals willing to serve in the public sector;
3. Is currently no federal support for academic programs providing advanced degrees in PHL practice;
4. Is a continuing decline in federal funding to support allied health careers in general;
5. Are few state PH laboratories that have salaries competitive with those paid in federal or private-sector laboratories;
6. Is no academic pipeline producing doctoral-level scientists who meet federal CLIA (Clinical Laboratory Improvement Amendments) mandates and possess necessary experience in public health laboratory practice; and
7. Is no set of tools that has been defined and provided for use in educating, recruiting, developing, and retaining PHL scientist-managers and directors.

B. Problem Statement:

The continuing workforce crisis in the nation's state public health laboratories is caused and exacerbated in large part by a number of unmet challenges that severely hamper the effectiveness of educating, recruiting and retaining qualified professionals in the specialty field of PHL practice. These challenges include providing specialty visibility by developing and implementing national personnel standards, identifying marketable educational opportunities, identifying and establishing competitive salary ranges, and fostering the use of effective recruitment and retention mechanisms—all tools needed to help create and maintain a pool of qualified PHL scientists to serve as the Nation's future PHL scientist-managers and directors.

C. Benefits of Completing this Initiative include:

1. Tools to facilitate recruitment and increase retention of qualified current and future PHL scientists for the nation's state PHL laboratories;
2. Tools to facilitate promotion and transfer of qualified PHL scientists within and among state public health laboratories;
3. Support and justification of higher salaries for qualified PHL scientist-managers and directors based on national educational standards and defined personnel competencies; and national recognition of PHL practice as a marketable specialty career, accessible through specialized graduate education and work experience;
4. Published information on how to use workforce tools to develop a pipeline of future PHL scientist-managers and directors; and
5. Eventual abatement of the PHL workforce crisis for laboratories seeking qualified PHL scientist-managers and directors.

IV. Project Description, Objectives and Methodology:

A. Project Description and Overall Project Goal

1. Description - This project developed or identified and marketed a set of workforce development tools for use by state public health and environmental laboratory directors and state offices of human resources both to facilitate the recruitment, professional development,

and retention of current PHL scientists and to ensure a continuing pipeline of qualified, future PHL scientist-managers and directors.

2. Overall Goal - To help abate the continuing workforce crisis in the nation's state public health laboratories by developing and marketing a set of workforce development tools to expand the pool of qualified public health laboratory scientist-managers and directors available for promotion and succession within the nation's state public health laboratories

B. Project Objectives:

1. Develop and recommend standardized job titles, definitions, classifications and career paths for PHL scientists that can be marketed to, and adopted or adapted for use by, state PHL laboratories and offices of human resources;
2. Identify a set of core academic courses most appropriate for students pursuing graduate degrees in PHL practice and careers as PHL scientist-managers and directors;
3. Identify academic institutions and programs offering coursework and graduate degrees most appropriate for future PHL scientist-managers and directors;
4. Identify criteria and characteristics of a model graduate tuition reimbursement or scholarship program that a state health department or other state agency can implement to help ensure a pipeline of future doctoral-level PHL scientist-managers and directors;
5. Make available and foster use of a set of minimum competencies that every state should look for when recruiting a SPHL director;
6. Identify important recruitment and retention strategies for PH laboratories to use when recruiting potential PHL scientists on a college campus and at job fairs;
7. Use standard job titles, job classifications, and available benchmarks to identify and propose competitive salary ranges for PHL scientists;
8. Identify and compile both effective mentoring strategies for experienced PHL directors and market a national mentoring program to support scientists newly hired or promoted into the position of PHL director;
9. Develop a team-marketing plan and actively market/distribute the tool kit for use by state human resources departments as well as within state PH laboratories throughout the country.
10. Market the toolkit.

C. Project Strategies and Methods

The Team, consisting of four PHL professionals, began looking at the overall problem (workforce crisis) by identifying possible causes. These "causes" were then reduced to a number (see items 5-7 under section III, A, above) that fell within the Team's ability to develop workable solutions within project limits. The Team developed an overall goal, a set of 10 objectives (see section IV, A and B, above) and a logic model of action steps (see **Appendix 1**) needed to meet each objective. Next the Team developed a project planning strategy and timeframe (see **Appendix 2**). Each Team Member then selected two objectives and served as the research lead and drafted related initial reports for those sections. All team members worked equally on objectives 1 and 10, in preparing all reports and manuscripts for publication.

The team carried out team functions and project demands through weekly or biweekly conference calls between December and February, as well as in August and September, through several face-to face meetings between March and June, and through frequent, often daily, e-mail throughout the project year (December 2005 through November 2006).

V. Results by Objective

Objective 1: ***To develop and recommend standardized job titles, definitions, classifications and career paths for PHL scientists that can be marketed to, and adopted or adapted for use by, state laboratories and offices of human resources***

Every state operates a state environmental and/or PHL and hires the same types of scientific employees to provide the same types of analytical testing services. However, every state has a different set of personnel standards for their public health laboratorians. What some states call scientists other call technologists or technicians. Where one state requires a bachelor's degree another may not. One state may have multi-step job classifications and several career paths for PHL scientists while other states may provide very limited opportunity for promotion. This lack of "standard" personnel standards for PHL scientists among the country's state public health laboratories results in an unacceptably wide range of job titles, differing minimum qualifications, varying career opportunities, widely different salary ranges, confusion between states, and many recruitment and retention problems. This variability also contributes to the lack of visibility for PHL practice as a rewarding specialty career and makes it more difficult to develop a pipeline of future PHL scientist-managers and directors who can seek similarly rewarding PHL careers in every state.

The purpose behind meeting Objective 1 is two-fold. First, the objective provides a standard set of terms and definitions on which to base this project, as well as its associated reports and publications. Secondly, this project provides a standardized set of state-adoptable or state-adaptable personnel titles, definitions, classifications, and career paths for laboratorians that help set the stage for effectively marketing these standards to public health laboratories and state personnel departments throughout the nation. It also lays needed groundwork to present and effectively market careers in PHL practice to current and future PHL scientists.

Since Objective 1 was basic to the entire project, developing standardized job titles and definitions, classifications and career paths for PHL scientists had to be completed before undertaking any other objectives. Meeting this objective was not difficult because Team members had extensive experience in working with various PHL personnel systems and were well aware of the many shortcomings and inconsistencies of current systems. A complete listing, explanation, and discussion of the products developed in meeting this objective are located in **Appendix 3**.

Objective 2: ***To identify a set of core academic courses most appropriate for students pursuing graduate degrees in PHL practice and careers as PHL scientist-managers and directors***

A career in the specialty of PHL practice requires both laboratory work experience and a formal graduate academic education. Both are required to prepare for a career in public health laboratory practice. In the past a doctoral degree in a basic biological or chemical science (Ph.D., Sc.D., D.Sc.) or a doctoral professional degree in laboratory practice (Dr.P.H.) or medicine (M.D.) was considered to fully qualify someone pursuing a career in PHL practice.

While each of these degrees may provide the necessary scientific knowledge to direct one or more specialty fields in PHL practice, it is now apparent that over the past 25 years, the job of PHL scientist-manager and director has evolved to entail much more than a good knowledge of laboratory science. Today PHL must depend more on subordinate scientist-managers to implement, validate, and monitor analytical services. Now directors spend much more time planning, leading staff, managing safety and security, partnering, writing, lobbying, recruiting, budgeting, and designing-constructing new laboratory facilities.[11]

This evolution now requires a much broader education that, in many cases, only begins after the scientific doctoral degree had been earned. The team was aware that academic needs of PHL scientist-managers and directors are now much broader and more complex than in the past and understood the importance of identifying the most important, or "core", courses for current and future PHL scientist-managers and directors.

This core-course information is extremely important when developing new graduate programs for students pursuing careers in PHL practice. The Team developed an initial list of 56 possible core courses. This list was then developed into an electronic questionnaire (see **Appendix 4**) by the APHL and distributed electronically to state PHL directors throughout the country. A copy of questionnaire results, provided by 40 (80%) of 50 possible respondents, and the resulting 27 core courses identified are listed and prioritized by importance in **Appendix 4**.

Objective 3: ***Identify academic institutions and programs offering coursework and graduate degrees most appropriate for future PHL scientist-managers and directors***

The intent of this objective was to use the list of core PHL practice courses identified in Objective 2 to determine which graduate schools and graduate programs are providing degrees that accommodate the needs of future PHL scientist-managers and directors. It soon became apparent that the work involved in obtaining and reviewing coursework in a large number of programs would require more time and effort than was available to Team Members. The Team also considered sending out the list of core courses with instructions to the deans' offices of graduate schools, but it was felt that the response would be very low. However, once a list of core courses was identified, the Team realized that in calendar years 2005-2006 there was no graduate program in the country that provided both formal scientific doctoral degrees and breadth of coursework needed to prepare future scientist-managers and directors for state public health laboratories.

As a result, the Team turned its energies toward identifying and working out mechanisms by which state PHL directors could work with local schools of public health to establish local masters and doctoral programs for their current and future PHL employees. The need for appropriate graduate education is local and should be met near the state PH laboratory—not halfway across the country. Many, if not most, PHL scientists are married with family responsibilities. They must continue to work, and cannot move their families for several years while pursuing advanced degrees. A local graduate education option is needed, one that can provide the science and non-science competencies required of future PHL scientist-managers and directors.

Currently, at least one team member has identified needed mechanisms to implement this type of local graduate program. This Team Member approached the Deans of two local schools of public health, one private and one public. By offering to accept masters-level students who would meet the school's requirement for a "practicum" within the state PHL, the Team Member has been able to obtain agreement by the private university to accept PHL employees as graduate students at the same tuition rate charged by the state public university. A similar agreement with the public university provides adjunct faculty appointments for the public health laboratory's doctoral-level staff who take that university's students into the PHL to meet their requirements for a masters-level "capstone" project. This agreement also allows PHL adjunct faculty to develop and teach courses in PHL practice both for PHL employees who are graduate students and for other students throughout the state university system.

It is essential to have experienced PHL senior staff directly involved in teaching graduate courses in PHL practice. This initiative is the only effective way to ensure that the real world enters the ivory tower of academia and its students are exposed to, and discuss, actual PHL issues. In so doing, they develop workable and effective solutions to real world PHL problems before they have to face them on the job. How a state PHL director and state personnel department develop a funding mechanism for, and oversight of, PHL employees who take advantage of graduate programs to pursue advanced degrees in PHL practice, is presented in detail under Objective 4.

Objective 4: ***Identify criteria and characteristics of a model graduate tuition reimbursement or scholarship program that a state health department or other state agency can implement to help ensure a pipeline of future doctoral-level PHL scientist-managers and directors***

With or without a workforce crisis, it is very difficult for most states to effectively compete and recruit nationally for qualified state PHL directors. It is difficult to entice the few qualified individuals to leave their home state. It is still more difficult to get scientists without PHL experience to accept current PHL salary levels. In addition, once hired, it may be a matter of chance whether a newly appointed director survives in his or her new political environment, or just finds the job and workload too stressful.

The most reliable way to obtain and retain future doctoral-level scientist-managers and directors is for a state PHL to develop them from among current state laboratory employees. This can be done by providing an opportunity for these scientists to obtain an appropriate doctoral degree. Employees earning their doctoral degree after already serving several years as a state PHL employee are much more likely to remain long-term employees, to be loyal to their PHL system, and to have already begun the climb into managerial positions in which they gain useful and reliable on-the-job experience.

To provide a means by which a state PHL could provide such an opportunity to its employees, the Team is proposing a program developed in Maryland as a model "graduate tuition scholarship/reimbursement program" (GTRP) that can be copied, modified and adapted by other states and state PHL laboratories. The Team used this program to identify key GTRP criteria that include: program sponsors, funding, applicants, applicant selection, acceptable degrees, tuition payback, and various program limitations.

For example, the results of a project survey of state PHL directors agreed with the Team's belief that the sponsors of a GTRP should be a state's health department in conjunction with the state's PHL. The Team and state PHL directors also agreed that the funding could be most effectively accessed and used by PHL employees if a state's health department provided and controlled the funding, as opposed to having the funding come from a state-wide educational or university fund. Funding should cover the full cost of tuition based on or pegged to the rate per graduate credit hour charged by the state's university system.

The Applicants should be limited to current PHL scientists with a minimum length of employment (1 year). The process of selecting employees should be controlled by policy developed by the state PHL and a majority of the selection committee members should consist of PHL scientist-managers and the director. Acceptable terminal degrees (e.g., M.S., M.P.H., M.S.P.H., Ph.D., D.Sc., Sc.D., Dr.P.H.) will depend on an employee's prior education, available degree program(s) at the local university, and the particular needs of the state PH laboratory.

The issue of "payback" refers to the Team's belief that a student who enters the funded graduate program should be required to payback the tuition received under the program if the student decides not to complete a degree. "Payback" should also include a period of time after receiving a degree or degrees that the employee agrees to remain employed at the PH laboratory (e.g., the model calls for six months service for every 15 credit hours or part thereof). These and other issues covered in the model (e.g., employee release time, maximum allowable credit hours per semester and per year, maximum time to fund a student earning a degree) are presented in greater detail in **Appendix 5**.

Objective 5: ***Make available and foster use of a set of minimum competencies that every state should look for when recruiting a state PHL director***

The director of a state PH laboratory should possess certain minimum competencies and state officials should look for those competencies when recruiting and interviewing candidates for the position of state PHL director. There are two types of competencies for this position — scientific competencies (e.g., laboratory science, technical knowledge, analytical skills, and health and safety knowledge), and leadership competencies (e.g., technical, interpersonal, and critical thinking skills). The Team developed a sample set of necessary scientific competencies from the set of previously identified core courses in PHL practice. This set of scientific competencies for a state PHL director is presented in **Appendix 6**.

Most PHL directors are less familiar with leadership competencies because most directors did not have an opportunity to develop these competencies while pursuing a doctorate in a basic science (e.g., Ph.D.) or in a professional program (e.g., M.D., Dr.P.H.) However, directors eventually realize that, in the long run, leadership competencies become just as important as their scientific competencies. This is borne out by the fact that six of the top seven identified core courses in PHL practice (**Appendix** 4, Table 1) are managerial and leadership courses.

Fortunately, the Team had tremendous assistance in identifying leadership competencies. A task force of the Association of Public Health Laboratories' (APHL) former Workforce Planning Committee, previously identified 65 leadership competencies for the Team to review. This listing of competencies is also listed in **Appendix 6**.

Objective 6: ***Identify marketing/recruiting strategies for PH laboratories to use when recruiting potential scientists on the college campus and at job fairs***

A project questionnaire was used by the Team to identify and rank in importance both PHL workforce recruitment and retention strategies. Forty active, state PHL directors ranked recruitment strategies as follows:

1) Competitive salaries;
2) Career development/promotional opportunities;
3) Access to continuing education and to management/leadership training;
4) University partnerships;
5) College career fair participation; and
6) Advertising and marketing.

Retention strategies were ranked as follows:

1) Competitive salaries;
2) Career development/promotional opportunities;
3) Access to management/leadership training;
4) Adequate, qualified support staff;
5) Access to continuing education;
6) Workplace resources;
7) Laboratory facilities.

The questionnaire results clearly show that recruitment and retention strategies must first emphasize salaries, opportunities for career development, and managerial/leadership training above all others. Our findings concerning competitive salaries appears to correspond to similar findings by others[12] and further reveals that attitudes toward monetary compensation in recruitment does not appear to have changed significantly over the years. However, other publications[13,14] point out that employee retention of Generations X and Y depends on an employer keeping employees current by teaching them new skills, offering cross-training and job rotations, and providing more experiential training. For younger employees this also includes a flexible work environment, access to new hardware and software, and horizontal mobility. More information on understanding generational differences is located in **Appendix 7C**.

Objective 7: ***Use standard job titles and job classifications to develop, propose, and market national salary ranges for PHL scientists***

The issue of salaries represents both the Achilles heel and the cornerstone of both recruiting and retaining qualified PHL scientist-managers and directors. Salaries in the specialty of PHL practice are currently too low to entice many qualified candidates from outside the nation's PHL system. Unfortunately, compared to salary, other recruitment and retention strategies play only a secondary or supportive role. Competitive salaries were listed by current PHL directors in this project's questionnaire as the most important strategy that must be undertaken to attract and keep PHL scientist-managers and directors.

We have already mentioned under other project objectives how specialty visibility and personnel standards are important to help raise salaries. However, these positions are under state government and there is a general belief among many state legislatures that state salaries should not be equivalent to those in the private sector. Many states have policies, written or unwritten, that call for state salaries to be no more than 80-90% of what equivalent jobs pay in the private sector. Unfortunately, in may states the salaries of PHL scientists, scientist-managers, and directors currently pay only 50-70% of what both the private sector and the federal government pay.[15-18] Team Members are personally aware that salaries in the specialty of PHL practice are low compared to equivalent jobs in both the federal government and the private sector. However, the Team needed to identify mechanisms that state PHL directors can use to develop salary benchmarks for salary comparisons.

The Team identified two types of salary benchmarks, one based on federal salaries and another based on a region's private-sector salaries.[15,19] The federal government's salary ranges, for positions most similar to those we are proposing for state PH laboratories, provide the most familiar and readily available nationwide salary benchmarks (see **Appendix 8**). States could peg their PHL salaries to a percentage (e.g., 90%) of federal salaries for equivalent positions. As federal salaries rise, state salaries could be tied to the federal increases.

However, for the few states with PHL salaries that are already higher than federal salaries, there are no acceptable nationwide benchmarks. In these states PHL directors must identify salary ranges in their own localities or regions. An example of regional PHL salary benchmarks based on salaries from private laboratories is also summarized in **Appendix 8**.

State health departments and PHL directors seeking higher PHL salaries as a major tool in solving this workload crisis are urged to use these types of benchmarks. Just as important is the need to revise or develop and begin to implement logical and workable job classifications and career paths, even though complete revision in this area may take several years. Without a well-planned, overall job classification system with an accompanying salary structure, approved requests for salary increases will be piece-meal, will be more difficult to justify and sustain, and will likely lead to salary inequities and employee morale problems.

Objective 8: ***Identify and compile effective mentoring strategies for experienced PHL directors and market a national mentoring program to support scientists newly hired or promoted into the position of PHL director***

The team initially debated the need and requirements of a national mentoring program for newly appointed PHL directors. Initial reasons for developing such a program included sharing wisdom and experiences, helping the mentor and mentee evolve their thinking, developing new relationships, and helping experienced PHL directors further develop their skill as mentors. However, the most important reason, and the one that greatly tipped the scale in favor of a national mentoring program was the continuing need to minimize the number of newly hired directors that may start off on the wrong foot or may succumb to stress and other demands of the job within only a year or two of accepting the position. This is especially true for new PHL directors who are recruited outside the nation's state PHL systems and are neither fully prepared nor fully aware of all the skills these positions require.

The Team soon realized that it had neither the time nor expertise to develop a national mentoring program as part of this project. However, the Team did include mentoring questions in their project questionnaire. The survey showed that of the 40 responding PHL directors, 40 (100%) were willing to participate in occasional in-depth discussions with mentees. In addition, 36 (90%) of directors were willing to have in-depth discussions on PHL practice issues with mentees, and 17 (42%) were willing to serve as a mentor over several months in a formal mentoring program supported by APHL. The Team also learned that useful mentoring programs are already well defined in the private sector. One of those programs could be readily adapted as a workforce development tool in the public sector. More than 12 million mentor sites are available on the World Wide Web, from very broad services offered, to very specific and gender-related. Notably lacking are specific choices for lab director development.

A practical mentoring program must be realistic, with focused goals to minimize unreasonable expectations and fragmented objectives. Currently, the APHL has developed the following:

1. A manual for new lab directors
2. A meeting of new lab directors and key CDC contacts
3. A web board for discussions/queries
4. Professional development training for senior management
5. Opportunities to serve on committees, working with other members, to address significant lab-related topics

Although these APHL developed tools are an excellent start, the Team strongly advocated to the APHL that: a national mentoring program be incorporated in the report being prepared for the Robert Wood Johnson Foundation, that the APHL seek professional (private-sector) input to develop a national mentoring program, and that APHL implement and oversee the mentoring program.

Objective 9: ***Develop a team marketing plan and actively market/distribute the tool kit among partners for use by state human resources departments as well as within state PH laboratories throughout the country. In researching how to develop a plan to help implement the workforce development tools, the Team identified five important items in any marketing plan: Promotion, place, partnerships, price/cost, and products/rewards***

Under "promotion" the Team intends to develop a marketing package, in conjunction with the Association of Public Health Laboratories, which contains instructions for PHL directors on how to use the workforce tools discussed in this report. The primary places for PHL directors to promote these tools are within state health department offices of human resources, state legislatures, and local universities. Likewise the primary partners needed to implement these tools are various state agencies, local universities, and the Association of Public Health Laboratories. Price/cost includes the time PHL directors and their staff will need to spend to market the tools, partner with other agencies, implement the needed changes over an extended period, and release time for students pursuing graduate degrees. Costs to others will include higher PHL scientist salaries and fiscal and administrative support for graduate tuition programs. Products from marketing these workforce development tools will include national personnel standards that promote specialty visibility, salary justifications and fiscal saving associated with reduced recruitment and turnover costs, adjunct faculty appointments that support recruitment, and the opportunity for effective succession planning.

An appropriate marketing plan for this project is loosely based on a service company marketing plan[20] because the project product is primarily a toolkit that addresses the workforce shortage issues impacting management of PHLs. The goals and objectives of this project are clear and stated previously. Our proposed marketing approach relies heavily on the APHL to promote the toolkit, provide presentations to appropriate audiences, and support publications in appropriate specialty journals. Strengths of this approach are that the APHL is widely recognized among the state public health laboratory community, the workforce shortage issue is a major concern throughout public health, core courses have been identified to develop needed workforce, some state public health laboratories have developed "hands on" practicum projects in conjunction with local schools of public health to better develop a future workforce, and core competencies for public health laboratory directors have been identified. Weaknesses include the fact that the workforce shortage is not limited to public health and we are competing for candidates to fill the void, colleges of public health have not designed or developed a curriculum aimed toward public health laboratory practice, and although position descriptions, designations and salary ranges have been identified, each state must implement these recommendations individually which may function as an impediment to adoption. As mentioned previously, customers include local colleges and universities and state agencies. Proposed publicity of the toolkit is primarily through the APHL but other opportunities to present or publish tools developed by this project will be utilized as advantageously as possible.

Objective 10: ***Market the toolkit***

The Team has begun marketing the workforce development tools for PHL scientist-managers and directors by presenting project products and findings before the APHL membership, making findings available to individual PHL directors, and undertaking the drafting of project-related articles for publication in topic-appropriate national journals. Over the next few years Team Members also will remain available to personally support this project's products and findings at professional meetings, by supplying toolkit materials and information, and by continuing to work toward solving the current workforce crisis using what has been learned in researching and completing this project.

VI. Conclusions

Solving the current professional workforce crisis in state PH laboratories and developing a pipeline of future PHL scientist-managers and directors is a complex problem. It is one that requires multifarious problem-solving tools. These tools can be made available for use by state PHL directors and state offices of human resources working in conjunction with various partners who also have a stake in the solution.

The most appropriate and effective tools that the Team could identify within the limits of this project are: Personnel standards, core academic courses, academic partnerships, graduate tuition scholarship/reimbursement programs, minimum competencies for a state PHL director, recruiting and retention strategies, identifying salary benchmarks, mentoring new PHL directors, and developing and carrying out a plan to market these tools.

Individual Team Members have been able to take advantage of this project and the identified tools for their own personal development as well as that of their individual PH laboratories. For example, one Team Member has initiated partnerships with two local schools of public health that will place masters-level students in his PHL in exchange for those schools accepting qualified PHL scientists into graduate programs for tuition equal to the amount of tuition being made available through his laboratory's graduate tuition scholarship program. This was undertaken not only to profit the Team Member's PHL but also to show other PHL directors that such partnerships are both feasible and relatively easy to develop and implement.

Team Members were also afforded the opportunity to participate in the Robert Wood Johnson Foundation grant obtained by the APHL to support its workforce initiative addressing critical leadership vacancies in the PHL community. This participation resulted in an excellent cross-pollination of ideas between the National Public Health Leadership Scholar's project and APHL's Robert Wood Johnson workforce initiative.

An important question for this project is whether individual PHL directors will be willing and/or able to spend the time needed over an extended period to make use of these tools in a systematic and meaningful way to affect real change in the workforce crisis. Often the day-to-day needs of these positions push strategic planning and follow-up off the calendar. We hope that the networking we have accomplished among individual state PHL directors and within the APHL will lead to a continued demand for the use of these tools at both the state and national levels. In this respect the Team has strong expectations that APHL will move forward both with helping to distribute an instructional package to accompany use of these workforce development tools and to develop and oversee a formal mentoring program for newly hired state PHL directors.

VII. Opportunities for Dissemination or Publication

The Team has already begun to disseminate this project's findings. We started by making a Team presentation on the toolkit at the Annual Meeting of the Association of Public Health Laboratories on June 6, 2006, in Long Beach, CA. The networking that occurred at both the APHL's Robert Wood Johnson Foundation meetings and at the APHL Annual Meeting further provided opportunities to disseminate knowledge of these tools and has already resulted in several PHL directors contacting Team Members for additional information on the workforce development tools.

The Team also is planning to develop both an instructional document that PHL directors can follow when making use of the tools within their own states. At the same time the Team will develop one or more formal journal articles for publication. Reprints of these will be sent to state PHL directors and state health departments to make it easier for PHL directors to gain the attention and support of their state personnel departments in using this toolkit.

VIII. Leadership Development

This project provided team members with opportunities to meet the following leadership and public health development challenges:

1. Effectively contacting and interacting with potential academic partners and negotiating partnerships with academic institutions;
2. Effectively reaching out to and partnering with various professional organizations;
3. Researching and developing project products within a distance-learning, team environment that supports individual professional growth;
4. Negotiating acceptance of project products with partners in professional organizations and government agencies; and
5. Marketing project products to partners in the nation's PHL community and state health department offices of human resources.

The Future

Our team has learned that leadership development is a continuum, an ever-evolving process that is presented in more detail in **Appendix 9** – Leadership Development. It is a phenomenon that likely had its beginnings in that first course, that first workshop, that first discussion with a mentor, but leadership skills, styles and impacts continue to push us forward. The Year 15 APHL team will carry the Public Health Leadership Institute experience with us to improve and enhance public health opportunities in our laboratories and state health departments.

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Appendices

Appendix 1 - Logic Model

Appendix 2 - Project Planning Strategy and Timeline

Appendix 3 - Standardized Personnel Terminology

Appendix 4 - Questionnaire Results and Prioritized Core Academic Courses

Appendix 5 - Graduate Tuition Reimbursement Program

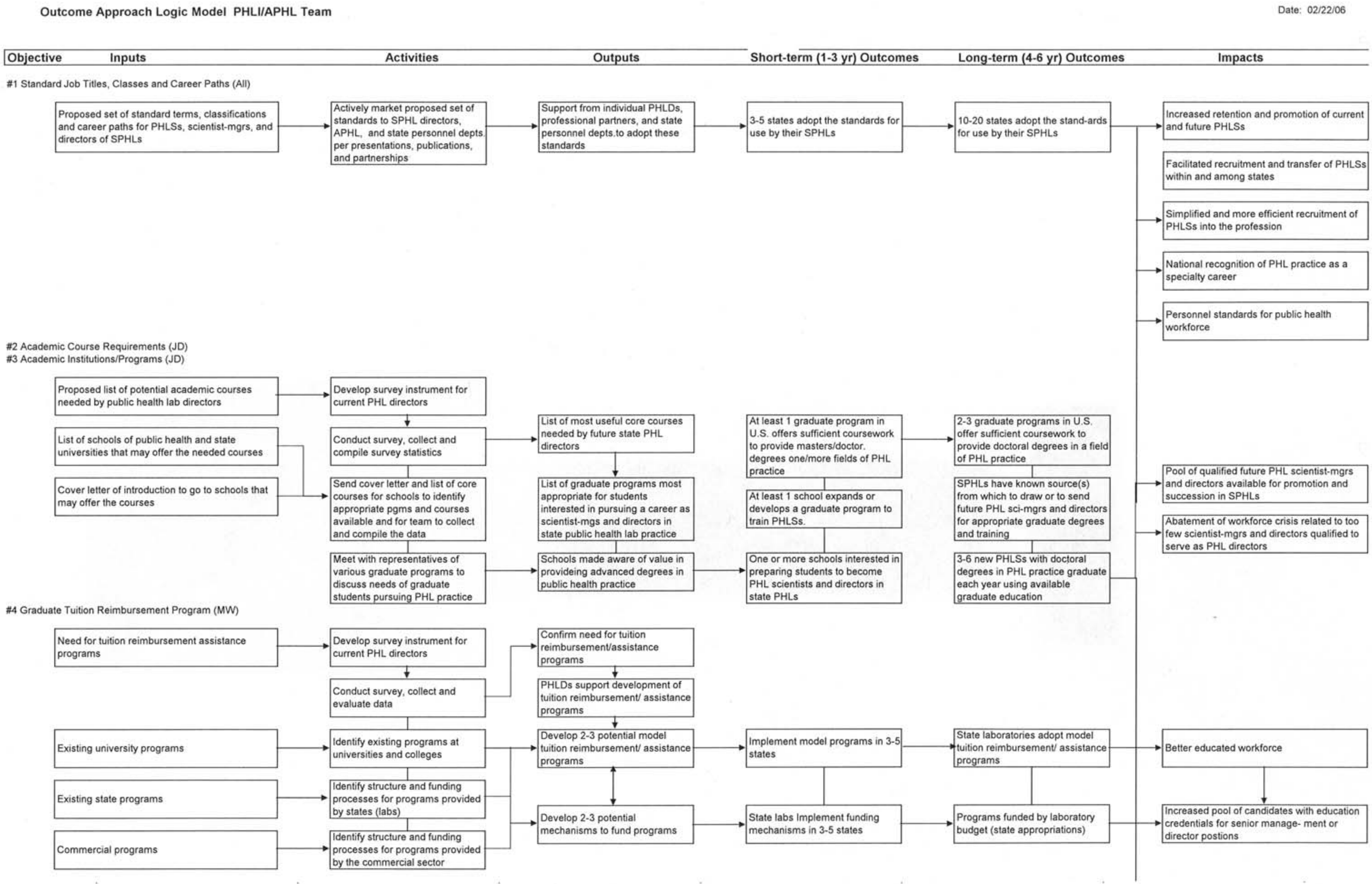
Appendix 6 - Laboratory Director Competencies

Appendix 7 - Recruiting Strategies

Appendix 8 - National/Regional Salary Benchmarks

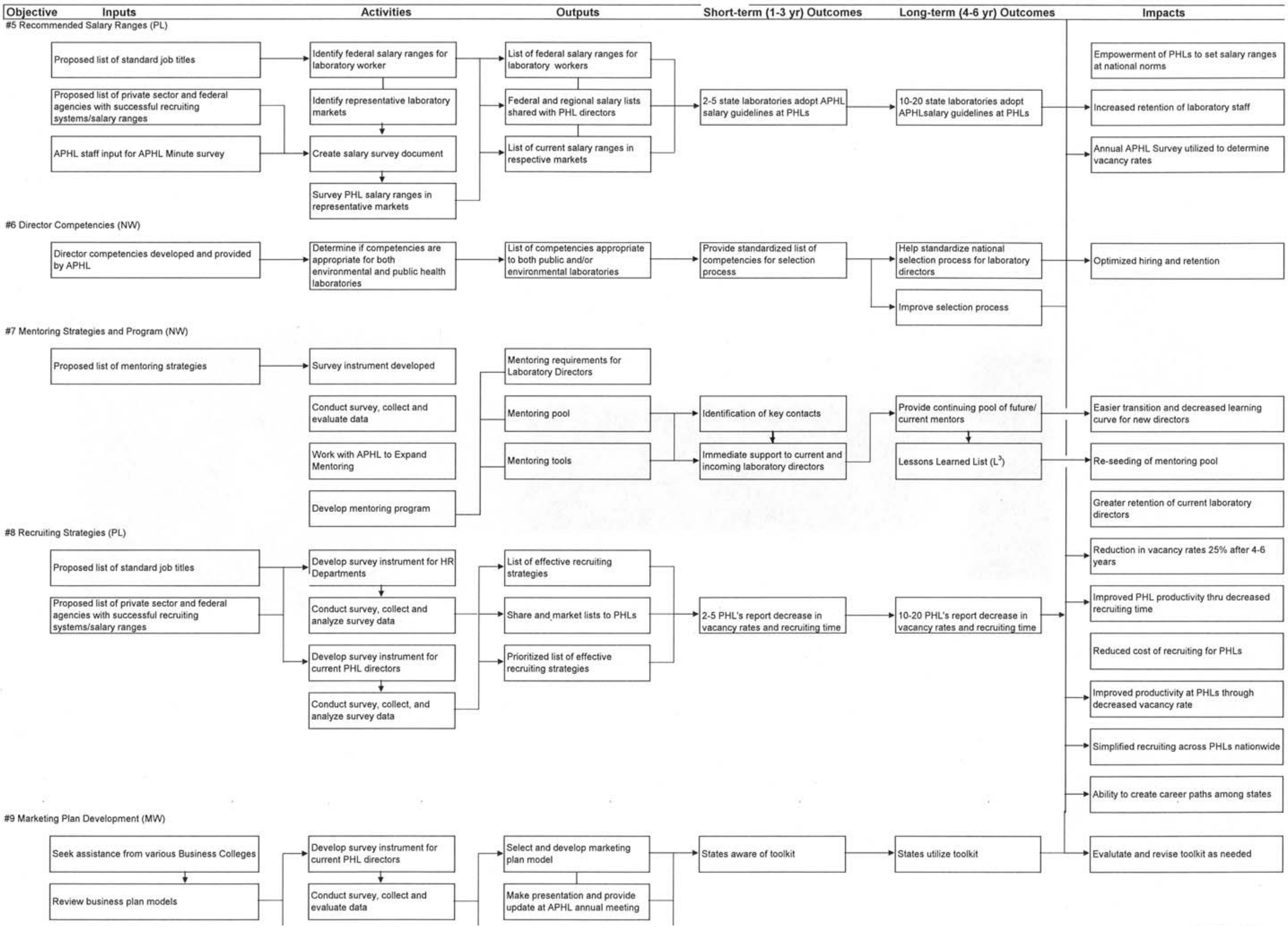
Appendix 9 - PHLI/APHL Team Leadership Development

Appendix 1 – Logic Model

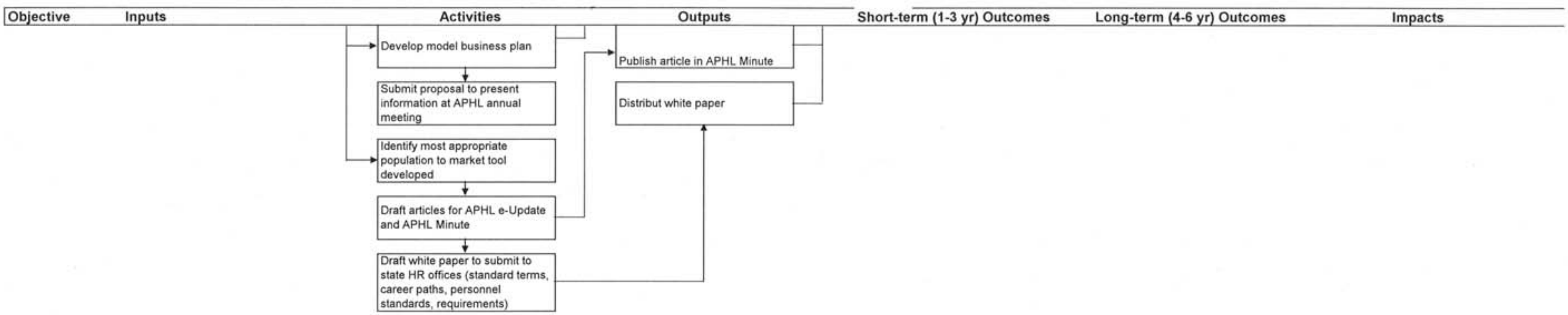


Outcome Approach Logic Model PHLI/APHL Team

Date: 02/22/06



Outcome Approach Logic Model PHLI/APHL Team Date: 02/22/06



#10 Toolkit Marketing (All)

List of acronyms:

APHL = Association of Public health Laboratories
PHL = Public health laboratory
PHLD = Public health laboratory director
PHLS = Public health laboratory scientist
SPHL = State public health laboratory

Appendix 2 **Date: 7/24/2006**

Project Planning Strategy and Timeframe for Activities and Objectives

Projected Worktime for Action Steps

	Objectives	2005	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2007
		Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Jan
One	Standard job titles, classifications, and career paths	■	■											
Two	Identifying required core academic courses			■	■	■	■							
Three	Identifying academic institutions		■	■										
Four	Graduate tuition reimbursement program			■	■	■	■	■						
Five	Director competencies				■	■	■	■						
Six	Recruiting strategies			■	■	■	■	■						
Seven	Identifying appropriate salary ranges		■	■	■	■	■	■						
Eight	Mentoring strategies			■	■	■	■	■						
Nine	Marketing plan development				■	■	■	■	■	■	■	■	■	?
Ten	Toolkit marketing							■	■		■	■	■	■
	Consulting on RWJ Project			■	■	■	■	■			■	■		
	Publication(s) development and submission								■	■	■	■	■	?
Logic Model and Project progress report submitted 2/22/06				■										
Spring retreat attended in Chapel Hill 4/9-13/06						■								
Post retreat report submitted 6/30/06								■						
APHL Ann. Mtg. general session project presentation 6/4-6/06								■						
Project presentation at APLI Launch on 11/4/06													■	

Appendix 3

Objective 1: Develop and recommend a set of standardized job titles, job classifications, and career paths for public health laboratorians that can be marketed and adopted or adapted for use in all state public health laboratories.

The overall mission of every State Public Health Laboratory in the nation is based on providing most of the same eleven core functions and capabilities.[1] These core functions and capabilities, in turn, require scientists, scientist-managers, and directors who possess similar types of scientific education and public health laboratory training, as well as technical, supervisory, managerial, and leadership skills.

> [**Note 1-1:** Throughout this project and paper the term "state public health laboratory" includes environmental public health laboratory, territorial public health laboratory, and local public health laboratory.]

However, among the 50 states and four territories operating public health laboratories, there are at least 51 different sets of personnel standards for these similar positions. This wide and often confusing variation in personnel position titles, job classifications, and minimum qualifications has made it very difficult to present public health laboratory practice as a separate and cohesive career requiring public health laboratory scientists throughout the nation who possess similar types and levels of education and training. The current, wide variation in personnel requirements for these important public health positions has also produced incomplete and disjointed systems in many states that contain personnel inequities involving position qualifications, responsibilities, and salaries.

Standard personnel terminology, education and qualification requirements are necessary to ensure minimum standards of staff quality from state to state, and to facilitate retention, promotion and upward mobility of laboratory staff within and among states. Standard job titles and classifications are also needed to identify, set, and support nationally competitive salary ranges for public health laboratory positions. In addition, standardized personnel terminology is needed to simplify recruitment and establish similar, logical career paths that support staff retention and succession. Standard personnel terms and definitions are also needed to simplify and facilitate state and national campaigns to market careers in public health laboratory practice and to recruit new scientists and scientist-managers into this career field.

The purpose behind meeting Objective 1 is two-fold. First it provides a set of terms and definitions that are used throughout this project and paper. Second it provides a standardized set of state-adoptable or state-adaptable personnel titles, definitions, classifications, and career paths for laboratorians that help set the stage for marketing these standards to public health laboratories and state personnel departments throughout the nation.

Objective 1.1: Standard Terms

A review of various state public health laboratory and federal laboratory position classifications[2-8] and federal CLIA requirements[9] covering public health laboratorians has led the Team to identify, define, and propose the following terms and definitions as potential national standards:

1.1.1 **Job Classification or Classification** means the set of job titles, grade levels, and certain minimum qualifications associated with a closely related set of positions.

[**Note 1-2:** Examples of job classifications being proposed under this project include: Public Health Laboratory Aide/Assistant, Public Health Laboratory Technician, Public Health Laboratory Scientist, Public Health Laboratory Developmental Scientist, Public Health Laboratory Scientist-Supervisor, Public Health Laboratory Scientist-Manager, and Public Health Laboratory Director.]

[**Note 1-3:** For the purposes of this project and paper, "certification" (i.e., formal recognition by an independent, national certifying body that an individual possesses a certain level of professional knowledge and experience) will not be included as a minimum qualification for any classification or grade level, except where mandated by state regulations or federal (CLIA) rules.]

1.1.2 **Lead** means a non-supervisory Public Health Laboratory Aide/Assistant, Technician, or Scientist whose job description includes assigning, reviewing and approving the work of lower-level laboratorians in the same classification.

1.1.3 **Supervisor** means an individual with responsibilities that include signing employee time cards, conducting performance appraisals, and initiating progressive discipline.

1.1.4 **Public Health Laboratory Aide/Assistant** refers to a laboratorian who usually:

- Possesses a high school diploma or equivalent
- Can be hired at an entry level without previous experience
- Performs simple to complex repetitive tasks and laboratory procedures
- Holds a grade level dependent on the nature/complexity of work and level of supervision received.

[**Note 1-4:** Although this project will not dwell in detail on the PHL Aide/Assistant and the PHL Technician classifications, they have been included to the extent required to provide an overall picture of PHL job classifications and career paths.]

1.1.5 **Public Health Laboratory Technician** refers to a laboratorian who usually:

- Possesses an earned associate degree in a laboratory science or medical laboratory technology degree from an accredited institution
- **C**an be hired at the entry level without previous experience
- Performs a variety of laboratory duties that can include processing specimens/samples, performing moderate or high complexity testing, and reporting test results
- Holds a grade level dependent on the nature/complexity of work and/or level of supervision received.

[**Note 1-5:** The term "technician" is not the same as "technologist". The latter term refers to a laboratorian possessing a bachelors degree, usually in, but not necessarily limited to, medical technology.]

1.1.6 **Public Health Laboratory Scientist** refers to a laboratorian who:

- Possesses an earned bachelors degree in a laboratory science or medical technology from an accredited institution
- Can be hired at the entry level without previous experience
- May perform a variety of laboratory duties that can include processing specimens/samples, performing moderate or high complexity testing, and reporting test results
- Holds a grade level dependent on the nature/complexity of work and/or level of supervision received.

[**Note 1-6:** Acceptable degrees, which depend on a particular position's requirements, may include or be limited to bachelor degrees in: biochemistry, biology, biotechnology, chemistry, genetics, immunology, medical technology, microbiology, molecular biology, pharmacy, and zoology.]

1.1.7 **Public Health Laboratory Scientist-Supervisor** refers to a laboratorian who:

- Possesses an earned bachelors degree in a laboratory science or medical technology from an accredited institution
- Is hired/promoted to perform supervisory duties in addition to scientific duties
- Usually also has administrative responsibilities
- Holds a grade level dependent on track record and time in grade

1.1.8 **Public Health Laboratory Scientist-Manager** refers to a laboratorian who:

- Possesses an earned doctoral degree from an accredited institution
- Possesses previous scientific and supervisory work experience in a public health, medical, or research laboratory
- Develops, oversees, and consults on a full range of public health laboratory tests, services, and operations related to a particular field (e.g., microbiology, molecular biology, newborn screening, environmental chemistry) of public health laboratory practice
- Holds a grade level dependent on track record, years of experience in the job, and laboratory-wide managerial responsibilities.

[**Note 1-7:** Acceptable doctoral degrees usually include: PhD, MD, DrPH, ScD, and DSc. PhDs, ScDs and DScs have the doctoral degree in an appropriate laboratory science. MDs are expected to have some level of prior medical laboratory training and/or experience. DrPHs are expected to have their doctoral degree in public health laboratory practice or have additional degree(s) in an appropriate laboratory science and/or possess substantial public health laboratory experience.]

1.1.9 **Public Health Laboratory Developmental Scientist** refers to a non-supervisory laboratorian who usually:

- Possesses an earned masters or doctoral degree in an appropriate laboratory science from an accredited institution,
- Possesses special scientific knowledge, skills and applied or basic research experience

- Has a variety of developmental responsibilities (e.g., developing new diagnostic assays, transferring and developing new technologies, researching and validating new analytical procedures, preparing grant proposals and writing scientific publications),
- Holds a grade level dependent on the level of supervision, track record, and years experience in the job

1.1.10 **Public Health Laboratory Principal Developmental Scientist** refers to a non-supervisory laboratorian who usually:

- Possesses an earned doctoral degree in an appropriate laboratory science from an accredited institution
- Is hired for possessing special scientific knowledge, skills and applied or basic research experience
- May have a variety of developmental responsibilities (e.g., developing new diagnostic assays, transferring and developing new technologies, researching and validating new analytical procedures, preparing grant proposals and writing scientific publications) including technical oversight of lower-level Developmental Scientists
- Holds a grade level dependent on track record and years of experience in the job.

In defining terms and job classifications, the Team actively worked to use general job titles (e.g., Public Health Laboratory Scientist) rather than more specific titles (e.g., microbiologist, chemist) for a number of reasons. The use of more specific job titles both greatly complicates the entire personnel process by requiring different sets of minimum qualifications (e.g., identifying specific coursework and job experience associated with each classification option [i.e., clinical chemist, microbiologist, serologist, etc.]), creation and maintenance of many more recruitment/eligible lists, and much more paperwork and personnel-related knowledge and time for effective use.

Team members have found that it is much simpler and more efficient to recruit when the recruiter has only general, written, minimum qualifications to which can be added other specific minimum qualifications. The latter might include compliance with the U.S. Patriot Act and willingness to accept certain immunizations. Additional work experience preferences (e.g., serology, PCR testing, food microbiology, analytical chemistry) can then also be added, based on the needs of the particular position.

This use of flexible secondary minimum qualifications and work experiences also means that the formal written minimum qualifications in job specifications do not have to be updated as often to keep up with ever evolving career-field changes related to education, experience, and regulatory requirements.

Objective 1.2: Standard Classification Criteria

A typical job classification should contain a number of pay-grade levels under the same job title. These grade levels may be based on the nature of the work (i.e., difficulty, complexity, required judgement, and lead responsibilities) and/or on control over the work (i.e., level of required supervision). More progressive classifications also allow for promotion from one grade level to the next, up to a certain grade level, based on time in grade and documentation that an employee has been satisfactorily meeting all job-related duties and accepting additional responsibilities in their current grade level. Promotion normally becomes competitive at the following levels: lead, introductory supervisory level, and at certain managerial levels.

The Team has named each classification title and grade title within a classification proposed in this project with the phrase, "Public Health Laboratory". This usage serves to limit these classifications to the public health laboratory. Other agencies can use these classifications with minor modification into how the classifications are defined, used, and updated. Limited access to these classifications is also important when working to increase salaries because the wider the use of a classification among different agencies, the greater the difficulty in justifying, obtaining, and equitably implementing salary increases.

The structure for each proposed job classification incorporates the criteria mentioned above, as follows:

Table 1-1. Basic template for constructing a job classification.

Classification	Grade Levels	Supervision Required	Minimum Qualifications	Promotional Criteria (Basic)
Classification X	1 (entry)	Close	A	N/A
	2 (journeyman)	Moderate[a]	B	Time in grade
	3 (full perform)	General[b]	C	Time in grade
	Lead	General	D	Competitive

[a]Moderate = close supervision at times and general supervision at times.
[b]General = limited or minimal supervision

The Team has used this template to develop standard job classifications for use in public health laboratories. These are listed below in Table 1-2.

Table 1-2. Standard job classifications for state public health laboratories in the U.S.

Classification	Grade Levels	Supervision Required	Minimum Experience	Minimum Education	Promotional Criteria
PHL[a] Aide/ Assistant	1	None	None	High School	N/A
	2	Moderate	1 year	High School	1 year in grade
	3	General	2 years	High School	1 year in grade
	Lead	General	3 years	High School	Competitive
PHL Technician	1	Close	None	A.A. Degree	N/A
	2	Moderate	1 year	A.A. Degree	1 year in grade
	3	General	2 years	A.A. Degree	1 year in grade
	Lead	General	3 years	A.A. Degree	Competitive
PHL Scientist	1	Close	None	Bach. Degree	N/A
	2	Moderate	1 year	Bach. Degree	1 year in grade
	3	General	2 years	Bach. Degree	1 year in grade
	Lead	General	3 years	Bach. Degree	Competitive

Classification	Grade Levels	Supervision Required	Minimum Experience	Minimum Education	Promotional Criteria
PHL Scientist - Developmental	1	Close	None	Masters Degree	N/A
	2	Moderate	1 year	Masters Degree	1 year in grade
	3	General	2 years	Masters Degree	2 years in grade
Principal Scientist-	1	General	3 years	Doctorate Degree	N/A
Developmental	2	General	5 years	Doctorate Degree	2 years in grade
PHL Scientist- Supervisor	1	General	4 years	Bach. Degree	Competitive
	2	General	6 years	Bach. Degree	2 years in grade
PHL Scientist-	1[b]	Managerial	2 years	Doctorate Degree	N/A
Manager	2	Managerial	4 years	Doctorate Degree	Time in grade
	3[c]	Managerial	6 years	Doctorate Degree	Competitive
	4[d]	Managerial	8 years	Doctorate Degree	Competitive
PHL Director	N/A	Managerial	8 years	Doctorate Degree	N/A

[a]PHL = Public Health Laboratory
[b]PHL Scientist-Manager 1 = a division chief
[c]PHL Scientist-Manager 3 = Laboratory Assistant Director
[d]PHL Scientist-Manager 4 = Laboratory Deputy Director
[e]May not be competitive if there is only one or no qualified internal promotional candidate(s)

The Team realizes that some flexibility is key to acceptance and implementation of standard terms and classifications. With the need for flexibility in mind, some details in Figure 4-1. (e.g., number of grade levels, minimum experience per grade level, and promotional criteria) should be open to modification by individual states. However, to maintain a minimum level of national standardization, some criteria (e.g., job and classification titles, minimum education per classification, and minimum salary ranges per classification) should be similar from state to state.

Objective 1.3: Standard Career Pathways

One of the greatest problems impacting retention in public health laboratories is the lack of formal career pathways for public health laboratorians. In many laboratories this means that an employee seeking a promotion must either meet an arcane set of personnel standards (e.g., a supervisor must oversee a minimum number of laboratories or sections) or wait for a position to open through death or retirement.

Today's young scientists are not willing to wait 5 to 10 years for an opening and they do not need to do so. After obtaining a year or two of experience, they are highly marketable and readily seek new employers who will pay them what they are worth. For decades this has made public health laboratories training grounds for the federal government, university laboratories, and the private sector. This costs public health laboratories a tremendous amount of time in recruiting, training, evaluating and qualifying staff, and in lost productivity related to excessive turnover, short-staffing, extended turn-around-times, loss of needed experience, and disruptions to operational planning, mission objectives, and succession.

The Team has identified, in Figure 1-1 below, a simple flow diagram that shows how the eight job classifications listed in Table 1-2 can provide primary and secondary career paths for public health laboratorians.

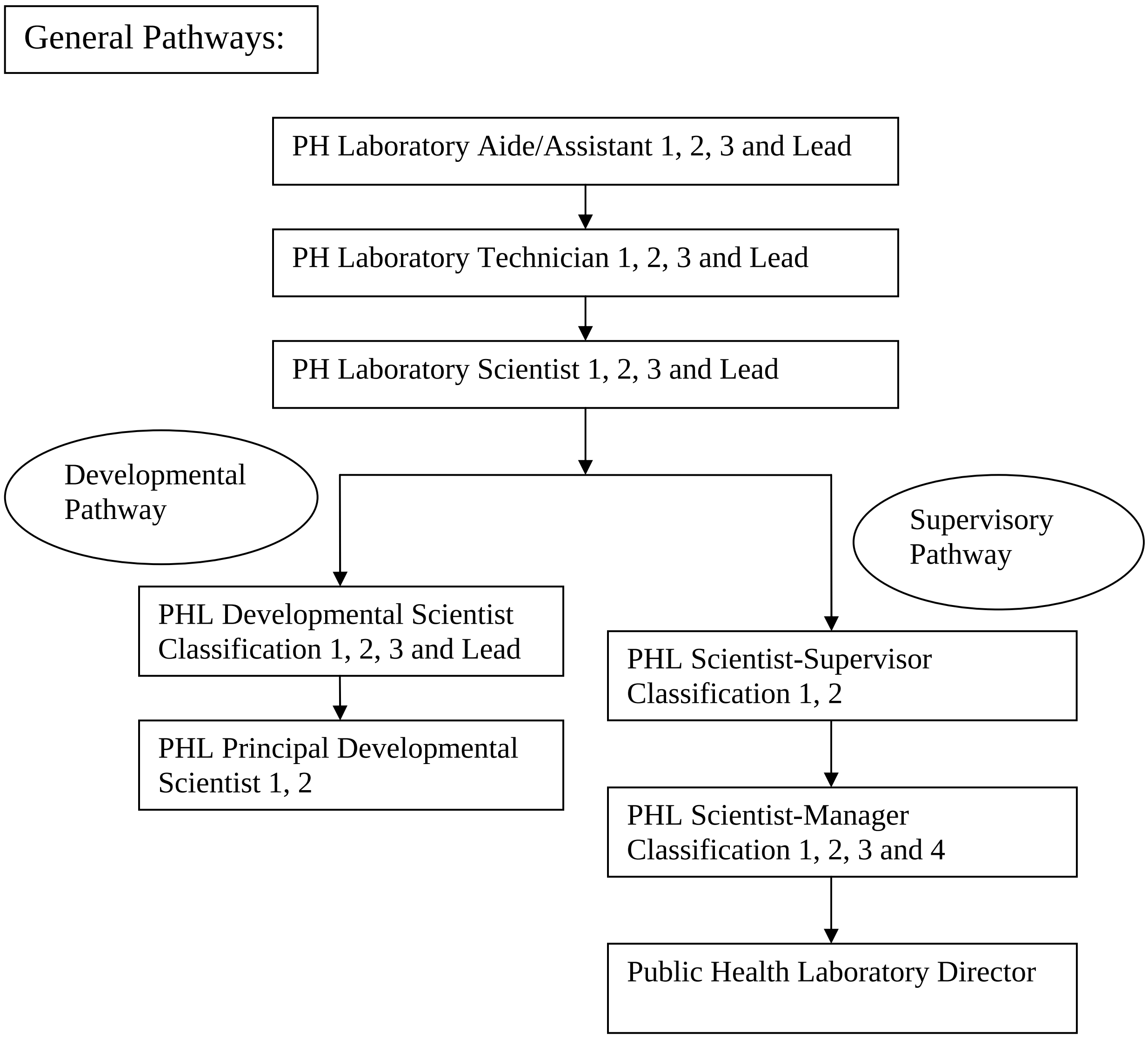
A primary career path consists of the 2-4 steps (1, 2, 3, and lead) making up each job classification. The secondary career consists of the various job classifications that serve as stepping stones for an employee who, by meeting each classification's higher-level minimum qualifications, can, over time, be promoted to the next higher classification. In a well-developed secondary career path, an employee who begins working as a PHL Aide/Assistant could, by obtaining the required education and experience, work their way up to laboratory director.

The classifications and secondary career paths depicted in Figure 1-1 are advantageous even for small public health laboratories that may not have sufficient numbers of technical employees to fill every classification or classification level at the same time. There is no need to keep all levels filled. However, it is important that sufficient classifications and classification levels be available to both encourage individuals to develop professionally and to provide each public health laboratory with the flexibility to employ different levels and classifications of staff as needed to meet both routine and special staffing requirements.

For example, a Public Health Laboratory Principal Developmental Scientist may only be employed routinely in a public health laboratory with a strong applied research component. But this classification level should also be available to the smaller public health laboratory that may obtain a grant or request to expand its mission to meet new technology requirements. Such changes may require the hiring of a masters or doctorate-level developmental scientist for a year or longer.

Figure 1.1's career-path bifurcation into supervisory and developmental paths also provides an important potential outlet for PHL scientists with higher education and excellent technical skills but no interest or limited ability to become a supervisor or manager. In the past this lack of supervisory and developmental career paths resulted in many good scientists being promoted to become poor supervisors.

Figure 1-1. Flow diagram of a proposed standard for primary and secondary career paths for technical and scientific positions in a state or territorial public health laboratory.



[1]Core Functions and Capabilities of State Public Health Laboratories". 2000. Association of Public Health Laboratories, 2025 M Street, NW, Washington, DC, pp. 1-14.
[2]Job Family Position Classification Standard for Professional Work in the Physical Science Group, GS-1300". 1997. U.S. Office of Personnel Management, HRCD-4 Dec., pp. 1-30.
[3]Position Classification Standard for Microbiology Series, GS-0403". 2002. U.S. Office of Personnel Management, TS-43 Dec.1962, WCPS-2 Aug. 2002, pp. 1-16.

[4]Position Classification Standard for Medical Technician Series, GS-0645". 2002. U.S. Office of Personnel Management, TS-72 Feb.1968, WCPS-2 Aug. 2002, pp. 1-15.

[5]State of Maryland specifications for public health laboratory positions in Maryland. 2004. www.dhmh.state.md.us/psa/class/index.htm,

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[8]State of Utah specifications for public health laboratory positions in Utah. ____.

[9]42 CFR Part 405, et al. "Clinical Laboratory Improvement Amendments of 1988". 1992. *Fed. Reg.*, vol. 57, no. 40, Feb. 28, HCFA, PHS, pp. 7173-7183.

Appendix 4

Objective 2: Identify the set of core academic courses most appropriate for students pursuing graduate degrees in PHL practice and careers as PHL scientist-managers and directors.

A. Introduction:

The Team developed a set of survey questions to identify those courses most important to an individual pursuing a position of director of a state PHL. A set of 56 questions, each representing a different course, was then submitted to the Association of Public Health Laboratories (APHL) to format into an electronic questionnaire (see part D, Appendix 4) that was sent to 50 state public health laboratory directors. This section of the questionnaire was titled: "Section 1: Academic Courses to Provide a Student Pursuing a Career as a state PHL Director with Core Career Knowledge and Skills". The associated instructions read as follows: "Based on your past experience and current personal needs as a state public health laboratory director, please rank the following by selecting 1 (important), 2 (useful), or 3 (not needed) before each type of course listed below". From May 6, 2006 through June 3, 2006, 40 (80%) of 50 PHL directors responded electronically to this portion of the questionnaire. Responses to each of the 56 three-part questions were tallied electronically and then analyzed to prepare the tables in part B, Appendix 4, below.

B. Results Tables.

Table 1. Twenty-five academic core courses identified as "important" to a student pursuing a career as a state public health laboratory director by $\geq$50% of 40 current public health laboratory directors in 2006.

Course Rank	Respondees Listing Course as Important in percentages	Type of Course	Course Title
1.	95%	L[a]	Lab QA, mission evaluation, improvement & regulatory requirements
2.	93%	M[b]	Public health laboratory management
3.	85%	L	Laboratory safety and security
4.	80%	M	Writing grant proposals
5.	80%	S[c]	Principles of molecular biology and molecular diagnostics
6.	78%	L	Leadership
7.	75%	M	Principles of management theory and practice
8.	75%	S	Principles of epidemiology
9.	74%	S	Clinical, medical, pathogenic bacteriology
10.	73%	S	Immunology
11.	73%	S	Principles of Virology
12.	70%	L	Ethics
13.	70%	L	Public health emergency/disaster preparedness and response
14.	68%	M	Surveillance systems in public health
15.	65%	S	Medical virology
16.	64%	S	Environmental/water microbiology
17.	63%	M	Principles of laboratory design, workflow and operations

Course Rank	Respondees Listing Course as Important in percentages	Type of Course	Course Title
18.	60%	L	Politics, partners and public relations in state & federal government
19.	57%	M	Principles of information management systems for public health data handling/communications
20.	55%	S	Epidemiology of infectious diseases
21.	55%	S	Writing for scientific publication
22.	55%	M	Principles of public health administration
23.	53%	S	Doctoral-level basic or applied research project[d]
24.	51%	S	Principles of environmental science/environmental health
25.	51%	S	Biochemistry
26.	50%	S	Epidemiology of food and waterborne diseases
27.	50%	S	Principles of biostatistics/public health statistics

[a]L = leadership course
[b]M = managerial course
[c]S = scientific course
[d]18% of respondees also identified this course as "not needed."

Table 2. Seventeen academic core courses identified as "useful" to a student pursuing a career as a state public health laboratory director by ≥50% of 40 current public health laboratory directors in 2006.

Course Rank	Respondees Listing Course as Important in percentages	Type of Course	Course Title
1.	78%	S[a]	Toxicology/drug testing
2.	73%	S	Medical mycology laboratory
3.	65%	S	Principles of environmental chemistry
4.	65%	M[b]	Environmental law
5.	64%	S	Clinical chemistry
6.	63%	S	Medical parasitology laboratory
7.	62%	S	Bioinformatics
8.	62%	S	Hematology
9.	60%	S	Statistical packages and use in data analysis
10.	59%	M	Human resources staffing and management in government
11.	57%	S	Environmental chemistry laboratory or practicum
12.	56%	S	Environmental microbiology laboratory or practicum
13.	55%	S	Zoonotic/veterinary microbiology
14.	54%	M	Principles of accounting, budgeting and healthcare financing
15.	54%	S	Medical genetics/hereditary metabolic disorders
16.	53%	S	Medical parasitology
17.	53%	S	Medical mycology
18.	50%	S	Epidemiology of food and waterborne diseases[c]
19.	50%	S	Epidemiology of HIV/AIDS

[a]S = scientific course
[b]M = managerial course
[c]50% of respondees also identified this course as "important".

Table3. Ten academic core courses identified as "not needed" to a student pursuing a career as a state public health laboratory director by ≥13% of 40 current public health laboratory directors in 2006.

Course Rank	Respondees Listing Course as Important in percentages	Type of Course	Course Title
1.	46%	S[a]	Advanced course(s) in biostatistics
2.	40%	S	Advanced course(s) in biochemistry
3.	23%	S	Environmental chemistry laboratory or practicum[b]
4.	21%	S	Hematology[b]
5.	18%	S	Doctoral-level basic or applied research project[c]
6.	15%	S	Molecular biology laboratory or practicum[b]
7.	15%	S	Newborn screening laboratory or practicum[b]
8.	15%	S	Medical mycology laboratory[b]
9.	13%	S	Medical parasitology laboratory[b]
10.	13%	S	Environmental microbiology laboratory or practicum[b]

[a]S = scientific course.
[b]≥50% of respondees also identified this course as "useful".
[c]50% of respondees also identified this course as "important".

Table 4. Four academic courses, each identified as both "important" and "useful" by 45-48% of 40 current state public health laboratory directors in 2006.

Course Title	Percentage of Respondees Listing Course as "Important"	Percentage of Respondees Listing Course as "Useful"
Public health law	48%	48%
Laboratory instrumentation/ instrumental analysis	48%	45%
Bacteriology laboratory or practicum	48%	45%
Virology laboratory or practicum	45%	48%

C. Discussion:

Looking at Table 1 we see that 27 (48%) of 56 possible courses are listed as being "core" courses. We define core courses as those identified as "important" by ≥ 50% of the 40 active state public health laboratory (PHL) directors (i.e., respondees) who electronically completed and submitted Section 1of the questionnaire.

Overall 14 (52%) of these 27 core courses are leadership or management courses. The remaining 13 (48%) are scientific courses. Four (80%) of the top five core courses ranked as important by ≥ 80% of respondees are leadership and managerial courses. Likewise, seven (54%) of the next

13 core courses ranked as important by $\geq$ 60 and $<$ 80% of the respondees are also leadership and managerial courses. However, only two (22%) of the remaining 9 core courses ranked as important by $\geq$ 50 and $<$ 60% of respondees are managerial courses. These numbers tell us that active state PHL directors in 2006 place more importance on coursework, and possibly experience, related to leadership and management than they do on scientific coursework at this point in their careers.

These numbers support the fact that the position of state PHL director has become much broader and more complex over the past 25 years. Many of today's directors went through doctoral (e.g., Ph.D. and M.D.) programs that provided no opportunity to take courses in leadership and management. Later on in their careers, if they were unable to pick up these courses or experience along the way, they were, or are, at a distinct disadvantage in their current positions. This is because the average director of a state PHL today spends most of his time leading and managing a scientific organization rather than acting as a full-time PHL scientist. Directors spend much of their time planning and evaluating mission objectives. They must seek funding through grants and partnerships, oversee organizational ethics, and ensure facility safety and security. They must lead scientists and others through external emergencies, budgetary cuts, and staff shortages. Directors must also deal with the politics of a large state bureaucracy and the demands of a state legislature.

At the same time PHL directors still see themselves professionally as PHL scientists. Most have advanced to their current positions by being excellent PHL scientists. In addition, these directors must be seen and respected as being scientifically competent both by their employees and the community they serve before they can provide the leadership and managerial expertise that goes along with operating a complex public, scientific organization.

Their need for this scientific basis shows up in Table 1 with the high rankings given to molecular biology (5), epidemiology (8), bacteriology (9, 16), immunology (10), and virology (11, 15). Clearly science remains an important aspect of these directors' jobs and most view themselves as products of their scientific training. This last statement is supported by the inclusion of "writing for scientific publication" and "doctoral-level basic or applied research project" as important core courses and experiences.

Tables 2, listing the "useful courses" reveals that state PHL directors continue to believe that a working knowledge of many PHL fields (e.g., toxicology, mycology, environmental chemistry, environmental law, parasitology, human resources, budgeting, medical genetics, and specialty epidemiology courses) is "useful" to excel in their jobs. Table 3, however, identifies courses that some directors believe to be "not needed", and reveals that state PHL directors are less willing to take advanced courses in various fields (e.g., statistics, biochemistry, hematology) that they do not utilize on a routine basis. Table 3 also shows that directors are less likely to value courses that they do not have time to use (e.g., laboratory/bench-level courses of nearly any type).

At the same time there are a number of courses (Table 4) showing a dichotomy as to whether they should be identified as "important" or "useful". Based on the high ranking of these courses in both categories, the Team believes they should also be considered "important".

What we conclude from this survey is that state PHL directors must continue to possess a strong background in laboratory science as a basic qualification to be considered for their positions. However, with that qualification met, future State PHL directors must also show that they possess knowledge and experience in the areas of leadership and management if they wish to make the candidate short list and succeed in the position. This dual set of qualifications, good scientist and good leader/manager, greatly reduces the pool of potential lab directors.

Individuals with the above qualifications are made, not born. The Team believes the information provided above will be very useful as PHL directors and states partner with local universities to develop graduate programs intended to produce future state PHL directors. For example, there is a need for programs offering a Dr.P.H. degree in PHL Practice/Science that successfully merges the PHL science and management components into one degree. There is also a need for programs offering M.P.H. and/or M.S.P.H. degrees in PHL Practice for individuals who already possess a Ph.D. or M.D.

For example, based on this project's survey data, these degree programs should include courses such as general management, laboratory management, leadership, lab safety and security, ethics, grant writing, and public health and environmental law as well as science courses in public health laboratory bacteriology, virology, molecular diagnostics, parasitology, immunology, human genetics, epidemiology, and environmental chemistry, as well as quality assurance, and laboratory design/workflow. One Team Member is currently developing a course in PHL management in conjunction with a local university that may establish a graduate program in PHL practice.

D. Questionnaire: Section 1

The following questions made up the "core" course survey taken by active state PHL directors in 2006:

Part I: Academic Courses to Provide a Student Pursuing a Career as a State PHL Director with Core Career Knowledge and Skills

Based on your own past, experience and current personal needs as a state public health laboratory director, please place a **2 (important), 1 (useful), or 0 (not needed)** before each type of course listed below:

____ 1. Principles of biostatistics/public health statistics
____ 2. Advanced course(s) in biostatistics
____ 3. Statistical packages and use in data analysis
____ 4. Principles of epidemiology
____ 5. Epidemiology of food and waterborne diseases
____ 6. Epidemiology of infectious diseases
____ 7. Epidemiology of HIV/AIDS
____ 8. Principles of information management systems for public health data handling and communications
____ 9. Bioinformatics
____ 10. Surveillance systems in public health
____ 11. General pathogenic microbiology
____ 12. Clinical/medical bacteriology
____ 13. Bacteriology laboratory or practicum
____ 14. Principles of virology
____ 15. Virology laboratory course or practicum

_____ 16. Medical virology
_____ 17. Environmental/water microbiology
_____ 18. Food/dairy microbiology
_____ 19. Environmental microbiology laboratory or practicum
_____ 20. Medical parasitology
_____ 21. Medical parasitology laboratory
_____ 22. Medical mycology
_____ 23. Medical mycology laboratory
_____ 24. Zoonotic/veterinary microbiology
_____ 25. Immunology
_____ 26. Serology/Immunology laboratory practicum
_____ 27. Biochemistry
_____ 28. Clinical chemistry
_____ 29. Hematology
_____ 30. Toxicology/drug testing
_____ 31. Medical genetics/hereditary metabolic disorders
_____ 32. Newborn screening laboratory practicum
_____ 33. Principles of environmental science/environmental health
_____ 34. Principles of environmental chemistry
_____ 35. Advanced course(s) in environmental chemistry
_____ 36. Laboratory instrumentation (qualitative/quantitative/instrumental analysis)
_____ 37. Environmental chemistry laboratory or practicum
_____ 38. Principles of molecular biology and molecular diagnostics
_____ 39. Molecular biology laboratory or practicum
_____ 40. Doctoral-level basic or applied research project
_____ 41. Writing for scientific publication
_____ 42. Writing grant proposals
_____ 43. Laboratory quality assurance, mission evaluation, improvement, and regulatory requirements
_____ 44. Laboratory safety and security
_____ 45. Public health emergency/disaster preparedness and response
_____ 46. Public health law
_____ 47. Environmental law
_____ 48. Principles of management theory and practice
_____ 49. Principles of accounting, budgeting, and healthcare financing
_____ 50. Human resources staffing and management in government
_____ 51. Principles of public health administration
_____ 52. Public health laboratory management
_____ 53. Leadership
_____ 54. Ethics
_____ 55. Principles of laboratory design, workflow and operations
_____ 56. Politics, partners, and public relations in state and federal government

Appendix 5

Objective 4: Identify standard criteria and characteristics of a graduate tuition scholarship or reimbursement program (GTRP) that a state health department or other state agency can implement to help ensure a pipeline of future doctoral - level PHL scientist-managers and directors.

A. Introduction:

The most reliable way to obtain and retain future doctoral-level scientist-managers and directors is for each state public health laboratory (PHL) to develop its own from among current state PHL employees by providing an opportunity for them to earn an appropriate doctoral degree. An important way that states and PH laboratories can help their employees pursue this opportunity is to support employees both by providing funding for tuition and partnering with a local university to make available a graduate program in PHL practice.

This objective will identify the criteria on which to base and develop a graduate tuition scholarship or reimbursement program (GTRP), and provide some sample program forms that incorporate these criteria. The Team obtained material needed to develop a standardized GTRP both by surveying active state PHL directors and by adapting materials from a current GTRP developed and operated by the Maryland Laboratories Administration.

Survey questions were developed and used to identify state PHL directors' beliefs concerning employee continuing education and GTRPs. A set of 12 questions was then submitted to the Association of Public Health Laboratories (APHL) to format into an electronic questionnaire (see part D, Appendix 5) that was sent to 50 state public health laboratory directors. This section of the questionnaire was titled: "Section 2: Education Tuition Assistance/Reimbursement Programs". The associated instructions read as follows: "Based on your knowledge and experience as a state public health laboratory director, please rank the following by placing a 1 (important), 2 (useful), or 3 (not needed) before each type of course/program listed below". From May 6, 2006 through June 3, 2006, 40 (80%) of 50 PHL directors responded electronically to this portion of the questionnaire. Responses to each of the 12 single and multi-part items were tallied electronically and then analyzed to prepare the tables in part B, Appendix 5,below.

B. Questionnaire Results:

Table 1. Responses by 40 active state public health laboratory directors in 2006 to survey questions related to employee continuing education and graduate tuition scholarship/reimbursement programs.

Questions	Directors' Answers		
	Important	**Useful**	**Not Needed**
1. Encouraging lab staff to pursue and participate in continuing education	88%	13%	0%
2. Encouraging lab staff to pursue undergraduate and graduate degrees in a lab science	67%	33%	0%
3. Identifying staffing gaps in your laboratory	93%	8%	0%
4. Using staff from within to fill identified staffing gaps after they complete appropriate graduate degrees	73%	28%	0%
5. Availability of tuition reimbursement/assistance/ scholarship program for state employees	73%	28%	0%
5a. State laboratory budgeted	53%	45%	3%
5b. University budgeted	13%	85%	3%
5c. Agency budgeted (e.g., state health dept,. state dept. of the environment)	46%	51%	3%
6. Education programs structured so an employee can earn an advanced degree upon completion of the program	64%	36%	0%
7. [Should be] Limitations to educational programs	42%	50%	8%
7a. Maximum no. of hrs. supported per semester	62%	38%	0%
7b. Max. total no. of hrs. per week supported by laboratory employer	63%	37%	0%
7c. Graduate degree program must be related to a public health laboratory career	77%	21%	3%
7d. Max. length of time an individual has to obtain an advanced degree	49%	46%	5%

Questions	Yes	No
8. Do or should your laboratory employees have access to graduate degree programs?	98%	2%
9. In the previous question you indicated lab employees have or should have access to graduate degree programs. From the list provided please place a check next to the statement that pertains to graduate degree programs that you agree with. (Please check al that apply)		
9a. Lab employees should be allowed "release" time to pursue an advanced degree.		56%
9b. Lab employees should be required to "make up" time away from the laboratory while attending classes (e.g., if they require more than 6 hrs. release time/week).		56%
9c. Lab employees should be required to take paid leave while attending classes.		8%
9d. Lab employees should agree in writing to remain at the laboratory for an established period of time upon completing a degree program (e.g., 6 months for each 15 credits).		82%
9e. Lab employees should be required to repay the cost of the graduate education if they leave the lab prior to fulfilling the time requirement to repay the cost of graduate education.		69%

Questions	Yes	No
10. Should laboratory employees receive funding for advanced education?	83%	17%
11. In the previous question you indicated that your lab employees have or should receive funding for graduate-level education. Please place a check next to the following statement that indicates who you believe should provide funding for this program. (Please check all that apply.)		
11a. Provided by the state laboratory?		50%
11b. Provided by a local university?		32%
11c. Provided by the state agency that employs the laboratory employee?		76%
11d. Provided by a state-wide educational program for state employees?		71%
11e. Provided through a public or private granting agency?		50%
11f. Provided through a formal contract between the employee and the state?		47%
12. From the list provided, please select the group you think should provide oversight for lab graduate tuition reimbursement/scholarship programs? (Please check all that apply.)		
12a. Provided by laboratory		45%
12b. Provided by a university		27%
12c. Provided by employee's state agency		67%
12d. Provided by a statewide educational program		45%

C. Discussion:

A review of the data in Table 1 reveals that state PHL directors believe it is important to encourage their staff to pursue continuing education (88%), to encourage laboratory staff to pursue undergraduate and graduate degrees in a laboratory science (67%) and to fill staffing gaps using current employees with appropriate graduate degrees (73%).

In addition, directors believe laboratory employees should receive funding to support the pursuit of graduate degrees (83%), that the funding support should come from a state agency (71%), preferably the laboratory employee's own state agency (76 % and 67%), and that the graduate degree being funded should be related to a future PHL career (77%). The advantage of having the funding come from the state laboratory's own state agency, as opposed to a coming from a state university or a statewide educational program, is that with the latter funding sources there would be no guarantee that funding would be set aside for a state laboratory's employees or that the state laboratory would have any control over a program needed to provide a pipeline for future PHL scientist-managers and directors.

Directors are also in favor of placing limitations on the employee-students ranging from a maximum number of credit hours that may be funded per semester (62%) to a requirement that employee-students agree to remain working in the laboratory for a designated period after receiving a terminal degree (82%), and that under certain circumstances employees who fail to meet program commitments be required to reimburse the program for funding received.

The Team incorporated those GTRP criteria desired by state PHL directors into a sample GTRP that incorporated other operational criteria being proposed by Team Members (e.g., employee eligibility, acceptable degrees, student selection for funding, tuition and scholarship funding limits and periods) to develop a comprehensive description of a sample GTRP (see Section D, below).

Some important GTRP criteria developed and being proposed by the Team include having the state PHL retain control of all but the funding. This includes the employee selection process and approval of acceptable degree programs, based on laboratory staffing gaps and future succession requirements.

D. GTRP Sample Forms (from the Maryland Laboratories Administration):

1. Sample GTRP Program Description:

Description of Graduate Tuition Reimbursement Program

Beginning Spring Semester 2006

Eligibility:

1) Open to permanent, full-time, current, merit-system Public Health Laboratory Scientists in the Laboratories Administration with an earned bachelor's degree in a science;
2) An applicant shall:
    a. Possess at least one year service in the Administration, completed prior to applying as a candidate for acceptance into the GTRP;
    b. Possess sufficient years available to remain in State service; and
    c. Be accepted into a degree program and field of study acceptable to the Laboratories Administration.

Acceptable Degrees:

Graduate degrees (M.S., M.P.H., M.S.P.H., Ph.D., Dr.P.H., and Sc.D.) in a field of study needed by **and** approved by the Laboratories Administration.

Student Selection:

A committee consisting of managers from the Laboratories Administration and DHMH will make the selection. The number of students accepted into the GTRP will be based on available funding.

GTRP Limitations:

1. A student will normally be limited to a maximum of six credit hours a semester or 15 credit hours a calendar year, dependent on available funding.

2. Continued funding of a student is dependent upon the student's meeting the graduate school's academic standards or other graduate school requirements.

3. The maximum number of students in the program at one time will be based on available funding.

4. No student will be funded more than four academic years for a master's degree, or eight academic years for a doctoral degree, with the time commencing on the date of acceptance into the GTRP.

5. Pursuit of an acceptable graduate degree will usually be on a part-time basis while the employee continues to work full-time (less up to six hours release time) in his/her regular position.

6. Prepayment will be available for tuition (conditional upon signed agreement). Prepayment does not apply to books, fees, or other related expenses.

7. Books, fees, or other graduate degree related expenses might be reimbursed, depending on available funding.

8. Maximum reimbursement per credit hour will be up to the rate per graduate credit hour charged by the University of Maryland (as of 11/9/05, $393/graduate credit hour).

9. Upon manager approval and documented need, a student may receive up to six hours of release time per week without any future service obligation to the Laboratories Administration.

Student Requirements:

1. Barring unforeseen emergencies, a student shall enroll in each regular academic semester until all degree requirements are met;

2. At the time of applying for GTRP funding, the employee shall sign a written contract whereby the employee agrees to:
   (1) work full-time for the Laboratories Administration at the rate of six months of work for each 15 credit hours or part thereof for which tuition was paid by the Laboratories Administration; and
   (2) commence carrying out this service obligation immediately upon completion of the graduate program or failure to progress satisfactorily in the program.

Please contact Jane Doe at jdoe@xxxx.yyy.zzz **or tel. 410-xxx-yyyy with any questions.**

2. Sample GTRP Tuition Reimbursement Agreement:

Agreement to Participate in the
DHMH Laboratories Administration
Graduate Tuition Reimbursement Program

Tuition Reimbursement / Tuition Prepayment

Applicant Agreement and Authorization

I am a requesting:

- ❒ Reimbursement of Graduate Tuition
- ❒ Reimbursement of Graduate Program Expenses (fees, books, etc.)
- ❒ Prepayment of Graduate Tuition

As a condition of being considered for or awarded the above as requested:

1. I will successfully complete in full the following semesters (please check appropriate boxes):

   ❒ Spring 2006 ❒ Summer 2006 ❒ Fall 2006
   ❒ Spring 2007 ❒ Fall 2007

2. I hereby authorize the Program Coordinator of the Laboratories Administration Graduate Tuition Reimbursement Program to verify my enrollment status with my college/university.

3. I accept the following consequences if I do not satisfactorily complete or withdraw from my course(s) or receive a grade below "B":

   a. If I fail to complete or withdraw from an approved course(s) at any time, I agree to repay the Maryland Department of Health and Mental Hygiene, all costs prepaid by DHMH associated with the course(s) (i.e., tuition, fees, books, etc.).

   b. If I receive a grade below a "B" for any course(s) in my graduate degree program, I agree to repay the Maryland Department of Health and Mental Hygiene 50% of all costs prepaid by DHMH (i.e., tuition, fees, books) associated with the course(s) in which the grade below a B was received.

4. I agree that amounts, which become due to DHMH as a result of my failure to meet the terms of this agreement, may be withheld from any moneys due me from the State of Maryland.

______________________________ ____________________

Signature of Employee Date

3. Sample GTRP Obligated Service Agreement:

State of Maryland
Department of Health and Mental Hygiene
LABORATORIES ADMINISTRATION
Obligated Service Agreement

This Obligated Service Agreement, hereafter referred to as "agreement," is entered into between the below named employee and the Department of Health and Mental Hygiene (DHMH).

In consideration of job assignments and benefits, which may accrue hereafter, the employee agrees to the following:

1. I am interested in receiving GraduateTuition Reimbursement as indicated on the attached Application for Out-Service Training (Training Services Division form # 4575).

2. If Graduate Tuition Reimbursement is approved, I will:
(a) participate in and complete the courses to the best of my ability unless my withdrawal is required by or acceptable to the Director of the Laboratories Administration, and
(b) remain an employee of the Laboratories Administration following completion of or withdrawal from the graduate program for a period equal to six months for each 15 credit hours or part thereof for which tuition was paid.

3. I agree that the obligated service period shall be computed by the Training Services Division from appropriate records, and that the period of obligated service shall commence on the first work day following either confirmation of a graduate degree, failure to complete the degree or withdrawal from the graduate program.

4. If I am approved for release from full-time work responsibilities by the Laboratories Administration Director so as to perform off-site work required by the graduate program, I agree that any salary, pay or compensation paid me by the State of Maryland covering the time of any such release from full-time work shall be considered a debt and shall be exonerated at the rate of one month's pay for each three months of employment after confirmation of the terminal degree, failure to complete the degree, or withdrawal from the graduate program. This is in addition to the obligated service due as described in item #2 above.

5. If I fail to remain an employee of the Laboratories Administration for the full period of obligated service under the Graduate Tuition Reimbursement Program, I agree to repay DHMH at the stated rate of one month of my salary for every three months of obligated service that I have not worked. If a separation from State Service is necessitated by adverse, unforeseen and extenuating circumstances, I understand that the Secretary of the Department of Health and Mental Hygiene, in the Secretary’s sole discretion, may release me from the terms of this agreement.

6. I agree that amounts which become due to DHMH as a result of my failure to meet the terms of this agreement may be withheld from any moneys due me from the State of Maryland.

Date	Signature of employee
Date	Secretary, DHMH

Appendix 6

Objective 5: Make available and foster use of a set of minimum competencies that every state should look for when recruiting a state PHL director.

A. Introduction:

When attempting to meet this objective the Team realized that the nature of a PHL director's position required two types of competencies (scientific/technical competencies and leadership competencies), and that both types needed to be evaluated by interview boards seeking to hire a PHL director. The Team also realized that there was no single set of standardized competencies required for every position. Competencies vary somewhat depending on the mission of each PHL and where the PHL sits within its state bureaucracy. Nonetheless, the Team identified a general, or sample, list of scientific and technical competency areas that are likely to apply to most or all state PHL directors.
The Team also reviewed and adopted an APHL-developed list of six broad leadership competencies. Both of these lists are depicted in the following sections.

B. List of Scientific and Technical Competency Areas Needed by a State PHL Director:

1. Laboratory quality assurance, safety and security, and training (including implementation, enforcement, documentation, monitoring, and corrective action);
2. Federal and state laws and regulations pertaining to medical and public health laboratories;
3. Developing, implementing, and monitoring population-based analytical laboratory services;
4. Public health laboratory management (including budgeting, procurement, grant writing, staffing, supervising, and disciplining);
5. Public health and medical bacteriology and immunology;
6. Public health and medical virology;
7. Molecular biology and molecular diagnostics;
8. Epidemiology of infectious disease;
9. Laboratory emergency preparedness and response;
10. Environmental health, environmental protection, and environmental law;
11. Environmental microbiology involving food, dairy, and water;
12. Surveillance systems in public health;
13. Laboratory information management systems;
14. Technical writing (including grant proposals, scientific publications, legislative testimony on bills, standard analytical procedures);
15. Public health laboratory facility design and workflow;
16. Applied research and technology transfer (including developing and validating new analytical tests); and
17. Assessing interactions between state executive agencies, state legislatures, and state PH Laboratories.

C. List of Leadership Competencies Needed by a State PHL Director:

LEADERSHIP COMPETENCIES	❑	❑	Comment
A. DEVELOPING SELF & OTHERS Directors guide and sustain the organization. They must communicate with employees and encourage high performance. Strong leaders personally participate in the development of future leaders	**Developing Skills**	**Competent**	
1. TECHNICAL SKILLS			
· Sets and communicates the organizations vision, values, and a focus on customers and accomplishing organizations objectives.	❑	❑	
2. INTERPERSONAL SKILLS			
· Models behavior consistent with organizational vision and values.	❑	❑	
· Creates an environment for empowerment, agility, and learning.	❑	❑	
· Facilitates critical thinking/concept linking in others throughout organization.	❑	❑	
· Facilitates independent resource seeking and self appraisal in others.	❑	❑	
· Facilitates the alignment of public health outcomes with laboratory/organization goals (Sees the big picture).	❑	❑	
· Facilitates negotiation, managing interpersonal conflicts and inspiring cooperation.	❑	❑	
· Coaches, mentors and supports staff during transition through change and transition.	❑	❑	
3. CRITICAL THINKING SKILLS			
· Strong orientation to the future and a commitment to both improvement and innovation.	❑	❑	
· Demonstrates the ability to assess and integrate technical, interpersonal and critical thinking components of performance and applies appropriate development strategies.	❑	❑	
· Incorporates customer needs and expectations into decision-making.	❑	❑	
Explanation:			
B. STRATEGIC THINKING/PLANNING Recognizes the key aspects of strategic development, including the ability to execute the strategic plan.			
1. TECHNICAL SKILLS	**Developing Skills**	**Competent**	**Comment**
· Recognizes how various components of strategic planning are interconnected and affect the organization and its operations as a whole.	❑	❑	
· Integrates strategic thinking/planning into day-to-day operations/decisions and long term planning such as preparedness activities.	❑	❑	

2. INTERPERSONAL SKILLS			
· Identifies and communicates the individual and team's role in achieving desired outcomes.	❑	❑	
· Assures that project/plan is supported by reinforcing project goals and objectives (Promotes motivation).	❑	❑	
· Develops succession plan for their laboratory and public health labs in general.	❑	❑	
· Collaborates with others to meet team and organizational needs and goals.	❑	❑	
3. CRITICAL THINKING SKILLS			
· Plans and implements projects, programs, and activities in a multi-disciplinary, team-based environment involving appropriate human, financial and material resources.	❑	❑	
· Analyzes the nature of a problem and clearly describes desired outcomes.	❑	❑	
· Conceptualizes problems and investigates solutions.	❑	❑	
· Assesses the interrelated steps within a plan to anticipate changes in time lines.	❑	❑	
· Demonstrates ability to complete all steps of a strategic/business plan for a patient population or a program (Assures assessment such as SWOT analysis, plan development, implementation, reassessment, and evaluation).	❑	❑	
· Analyzes and makes adjustments to project plans as necessary.	❑	❑	

C. MANAGING RESOURCES The day to day operations must support the strategic plan and minimize costs. Good stewardship of resources requires financial and operational planning as well as continuity of operations in case of an emergency.	**Developing Skills**	**Competent**	**Comment**
1. TECHNICAL SKILLS			
· Gathers data and uses technology to convert data into meaningful information.	❑	❑	
· Accesses organizational and community resources to facilitate performance which produces desired outcomes.	❑	❑	
2. INTERPERSONAL SKILLS			
· Demonstrates effective communication skills conducive to collaborative management of resources (Develops consensus and is an enabler to collaboration) (Listens to all stakeholders and treats their opinions as valid).	❑	❑	
· Establishes an environment which supports effective resource management.	❑	❑	
· Teaches and coaches others the technical, interpersonal and critical thinking skills to manage resources at the advanced beginner level.	❑	❑	

3. CRITICAL THINKING SKILLS			
· Analyzes and utilizes appropriate data to make effective decisions and to monitor or forecast outcomes.	❑	❑	
· Considers impact of decision options and implementation on others before reaching a conclusion (Predicts perception and grieving responses).	❑	❑	
· Aligns appropriate financial, human, and material resources to accomplish organizational goals and objectives.	❑	❑	
· Proactively plans support for organization based on the resource needs.	❑	❑	

D. INFORMATION MANAGEMENT Senior leadership must be an effective spokesman for the organization and within the organization.	**Developing Skills**	**Competent**	**Comment**
1. TECHNICAL SKILLS			
· Communicates with the media.	❑	❑	
· Advocates for the laboratory with other local, state and federal agencies and organizations.	❑	❑	
· Assures the organization establishes and maintains an effective communication system without reliance on rumor mill.	❑	❑	
· Outlines organizational data collection or analysis needs to statistical experts.	❑	❑	
· Establishes an environment for effective communication management.	❑	❑	
· Focuses on data throughout the organization.	❑	❑	
2. INTERPERSONAL SKILLS			
· Leads laboratory to maintain a customer focus.	❑	❑	
· Fosters an environment conducive to a free sharing of information and ideas.	❑	❑	
3. CRITICAL THINKING SKILLS			
· Analyzes data through advanced statistical means.	❑	❑	
· Utilizes data to plan, monitor and evaluate.	❑	❑	
· Assists others to adapt guidelines.	❑	❑	

E. LEADERSHIP OF QUALITY IMPROVEMENT/ORGANIZATIONAL PERFORMANCE IMPROVEMENT ACTIVITIES Leadership must analyze the performance of the organization and make strategic decisions for improvements to achieve high performance.	**Developing Skills**	**Competent**	**Comment**
1. TECHNICAL SKILLS			
· Oversees and leads quality improvement activities, maintaining standards of outside agencies, and internal standards with the goal of advancing the quality of laboratory testing.	❑	❑	

· Serves as a resource and facilitates staff involvement in monitoring and follow-up.	❑	❑	
· Oversees multi-disciplinary quality improvement projects within the laboratory.	❑	❑	
· Converts data and information for use in planning, using advanced organizational performance improvement methods such as, six sigma, Continuous Quality Improvement	❑	❑	
2. INTERPERSONAL SKILLS			
· Provides opportunities to increase the knowledge of staff relative to the QI/PI process.	❑	❑	
· Provides an environment conducive to the QI/PI process.	❑	❑	
3. CRITICAL THINKING SKILLS			
· Effectively leads initiative to reevaluate processes and structure to improve quality while reducing costs.	❑	❑	
· Develops solutions based on data and expected results.	❑	❑	
· Identifies and analyzes emerging trends.	❑	❑	
· Serves as a resource and facilitates staff in problem-solving and plan development.	❑	❑	
· Integrates all components of QA/QI program including value added analysis into laboratory's decision making process, PI processes, and strategic planning.	❑	❑	

F. PROCESS MANAGEMENT Leaders must design processes to meet key requirements of the organization including incorporation of new technology and organizational knowledge.	**Developing Skills**	**Competent**	**Comment**
1. TECHNICAL SKILLS			
· Oversees compliance with ethical, legal or regulatory requirements.	❑	❑	
· Develops operational plan to ensure availability of services and finances to meet daily demand and emergency situations.	❑	❑	
· Provides structure and environment for practice of professional and support staff groups including dealing with unions.	❑	❑	
2. INTERPERSONAL SKILLS			
· Seeks out staff concerns.	❑	❑	
· Communicates underlying principles and rationale to broaden staff perspective and understanding.	❑	❑	
· Mentors and develops advanced beginner and competent leaders (supervisors and managers).	❑	❑	
· Promotes the integration of the unique perspectives of a professionally, culturally, racially and gender diverse staff.	❑	❑	

· Establishes plans to overcome negativity.	❑	❑	
3. CRITICAL THINKING SKILLS			
· Assists staff to establish priorities and develop negotiation skills.	❑	❑	
· Maintains unbiased approach to problem solving.	❑	❑	
· Looks at whole picture when problem solving.	❑	❑	
· Administers Human Resource management processes.	❑	❑	

D. Discussion:

The basic list of scientific and technical competency areas reveals just how broad the range of duties and knowledge is for a state PHL director, and how technical competencies fall into both the scientific and managerial fields. This is because a state PHL director must not only be a competent scientist who holds the respect of physicians, legislators, other scientists and the public, but also a competent manager and executive officer to direct the mission and operations of a very complex and continually evolving organization.

Therefore, when interviewing PHL director candidates, it is important that interview boards contain interviewers (e.g., several PHL scientist-managers, a physician, an epidemiologist, a laboratory customer, and specialists in local health, budgeting, procurement, and/or human resources) able to effectively evaluate the wide range of desirable competencies. It is also very important that interviewers have a good knowledge of what the state PHL is, what it should be, and all that the position entails, including current challenges, past and potential problems, and known disincentives. One or two interviewers who interview separately over an hour or two cannot adequately evaluate the competency of a potential state PHL director. The interview process should employ a board whose members hear the interview questions and answers at the same time, who employ a pre-developed, approved, and pre-reviewed set of interview questions, and who know in advance what constitutes good versus poor answers.

Appendix 7

Objective 6: Identify recruiting strategies for PH laboratories to use in recruiting potential PHL scientists on the college campus and in retaining experienced PHL scientist-employees.

A. Introduction.

This appendix will discuss several recruitment and retention strategies presented on page eight of the main report. It will then discuss secondary strategies based on generational differences associated with the current laboratory workforce.

B. Recruitment Strategies.

1. <u>College career fair participation</u>.

Recruiting new PHL scientists on college and university campuses is an excellent strategy to identify potential laboratory scientists at all degree levels. The most efficient way to reach large numbers of potential employees is to actively and officially participate in campus career fairs. This should be done officially through a college or university's career or job placement office. A PH laboratory's training coordinator should develop a network of school placement officers so that the training coordinator routinely receives notices of each school's upcoming career fairs.

Once a PH laboratory decides to participate, it must then make adequate preparations to conduct a professional recruitment that is not only effective for the PH laboratory, both for recruitment and public relations, but also useful to students. This should be based on having good recruiters, good communications, and goods handout materials.

Recruiters that a laboratory sends to the college campus should be able to effectively communicate with the students and be able to answer both scientific and personnel questions. This usually requires sending a recruitment team of at least two laboratory scientists. The most effective recruiter for college students and salesman for the PH laboratory is a PH laboratory scientist just a year or two out of college who can still speak the students' language and emphasize generational points of importance to this age group (see section C.3., below). The second member of the team should be the laboratory's training coordinator or a senior supervisor who can answer the more technical personnel questions. In addition, it is important that all recruiters give the same answers to the same questions, or refer certain questions to be answered by the same recruiter. As part of recruiter preparation, it is important to outline a general game plan that includes a message palate of what recruiters should emphasize to potential recruits. This is where the generational knowledge of the young recruiter is especially valuable.

Just as important as having the right recruiters saying the right things is having a professional, eye-catching booth. The easiest way to accomplish this is to purchase a mobile, re-usable, folding booth frame. This frame can provide a backdrop for a masthead, laboratory photographs and recent laboratory publications, or other items of interest to attract students. The booth can also include one or two antique or new laboratory instruments to draw attention to the booth.

Handouts should be of two types. One should consist of an inexpensive laboratory brochure and/or one-page handouts for "walk-bys" and for use in public relations. The second should consist of a more comprehensive recruitment packet, perhaps inside a glossy folder with the PH laboratory or health department's logo on the front. This folder should contain a laboratory brochure, a short history and organization chart of the PH laboratory, any current vacancy(ies), sample job description(s), names and phone numbers of laboratory contacts, and job application forms.

2. Advertising and marketing vacant positions.

In addition to publishing vacant positions in commercial newspapers, on the Internet (e.g., Monster.com) and in journals of professional associations, there are many other ways to market and recruit vacant PH laboratory positions. These include:

a. Participating in college career fairs;
b. Campus radio spots and ads and stories in campus newspapers;
c. Distributing position literature at local professional meetings, science fairs;
d. Holding laboratory tours for college science students;
e. Sending copies of laboratory newsletters listing vacancies to college career offices and college science departments.

C. Retention Strategies.

In this section the Team will address three retention strategies of the eight identified on page eight of the text and not covered in other appendices. These three are "workplace resources," "laboratory facilities" and "generational understanding". Each deals with the work environment but various components of each are more important to one employee than another, depending on the PHL scientist's age, experience, education level and point in his or her career.

1. Workplace resources.

The Team defines operational resources as those that depend on the vision of the director, the mission of the laboratory and types of support provided to employees within the PH laboratory by the laboratory and the state personnel system. These may include:

a. Number of PH laboratory scientists and support staff;
b. Budget size and budgetary flexibility;
c. Mission range and depth;
d. Mission evolution and mission flexibility;
e. Administrative infrastructure that supports rather than hinders employees;
f. Management that fosters employees who take chances and make decisions, and accepts mistakes as part of personal growth and career development;
g. Opportunities for applied research and special projects that provide professional development;
h. Opportunities for lateral transfers among laboratory sections and divisions;
i. University partnerships that support obtaining advanced degrees by fulltime employees;
j. Laboratory and state administrative and financial support for education programs;
k. Opportunities to work with and teach students;
l. Employee mentoring and managerial support for career development;
m. Health and dental insurance, sick-leave bank;
n. Length of vacations;

o. 401k and 503b plans.

2. Laboratory facilities.

The Team defines strategies involving laboratory facilities as brick and mortar issues that positively or negatively affect the ability of a PHG laboratory to recruit doctorate-level scientist-managers and directors, and to retain experienced PHL scientists at all levels. These may include:

a. Age and size of facility(ies);
b. Parking for employees and/or access to public transportation;
c. Open, flexible laboratory spaces with natural light;
d. Sufficient numbers of offices and specialty technical spaces (e.g., instrument rooms, cold rooms, biosafety-level three laboratories, all-hazards receipt facility,);
e. Quality of life areas (e.g., conference rooms, lunch and break rooms, locker rooms);
f. Technical support (IT equipment/LIMS capabilities and availability; on-site training and continuing education facilities (e.g., training laboratory, library, video conferencing, seminar/lecture/meeting space; animal facilities);
g. Safety and Security (facility location, video cameras, electronic locks and key-card system, guard posts, security fencing, intercom system, instrument alarms, etc.)

3. Generational understanding.

Today's PH laboratory workforce includes four different generations working along side one another. Their differences provide many managerial challenges to working effectively with individuals in each generation. Currently the PH laboratory workforce consists of the:

- "Silents" born from 1933-1945;
- "Boomers" born from 1946-1964;
- "Generation X" born 1965-1976; and
- "Millennials" born 1977-1998.

Each of these age groups, or generations, views their world and their jobs from a different viewpoint. When these viewpoints are understood, acknowledged, and properly channeled, the PH laboratory will not only exhibit much less stress between and among the generations but will also have higher retention rates in all age groups.

a. Silents

The Silent Generation dealt with growing up in the aftermath of the Great Depression by being disciplined and self-sacrificing. They built success on hard work and postponement of material rewards. Giving back and contributing to the collective good is an emblem of this generation. At work members of this generation look for due process and fair play. When they find it they are loyal to the laboratory and work within the system. Many Silents are still very interested in their futures and in trying new things at work. They possess a huge knowledge legacy to share and embody a traditional work ethic. They want to know that their supervisors and managers value their work and they are making an important contribution to the overall mission.

b. Boomers

Many baby boomers grew up with idealistic longings and created a place for themselves in history as rebels who initiated many social causes. When they entered the workforce they took their priorities for change with them and made their organizations the new causes. Baby boomers are known for being process-oriented and relationship-focused at work. They dislike conformity and rules but are hard workers who put in long hours, strive to do their best and are willing to take risks. Boomers tend to be optimistic, competitive and focus on personal accomplishment. The boomer generation grew up in a competitive environment, believe in career and job and getting ahead. This generation has ruled the laboratory and is comfortable in the culture it has created. They often view change as painful but inevitable. Many laboratories experience their biggest generational conflict when Boomer scientist-managers are confronted with younger employees who don't "fit the mold" that the Boomers themselves created. More than any other generation the workplace is often a place to find personal fulfillment and purpose. They need personal satisfaction from their jobs. They need praise and recognition and opportunities to balance family and work responsibilities.

c. Generation X'ers

Generation X'ers entered the workforce during volatile economic times and watched their parents cope with large corporate layoffs and job insecurity. When they went to work there wasn't a corporate welcome mat waiting for them and they react to the work world as they found it. Many tend to be output-focused and outcome-oriented. They are seeking balance in their lives and are not workaholics. Generation X'ers place more emphasis and importance on family and time spent outside of work than on the job. Generation X'ers express a pragmatic approach to getting things done. They express traits of independence, resilience and adaptability. Generation X'ers feel strongly that they don't need someone looking over their shoulder. They want to know they can remain widely employable while pursuing a career with a single organization. They also want learning and development opportunities to increase their sense of employability, and work that allows work-life balance and opportunities where they can try new things. However, for this generation there is a career lattice rather than a career ladder. They can move laterally, stop and start. Their career is more fluid. Generation X'ers expect immediate and on-going feedback, including feedback on their job performance, and uniquely comfortable giving feedback to others. They also need to know how the laboratory is performing, work well in multicultural settings, and desire some fun in the workplace.

d. Millennials

Millennials are being raised in the most child-centric time in U.S. history. So they are entering the workforce as the best educated, most technically literate and most doted upon of any generation at work. Perhaps it's due to the showers of attention and high expectations from parents that they display a great deal of self-confidence to the point of appearing cocky. Millennials grew up routinely using computers and fully embracing electronic devices. They depend on electronics as no other generations and often question those who are not as technically savvy. They bring the "can do" ethic of the Silents, the teamwork approach of the Boomers, and an even greater tech savvy than the Generation X'ers. They may be the first generation in some time that readily accepts older leadership and are looking for careers and stability. They acknowledge and respect positions and titles, structure, and want a relationship with their supervisor or manager. This doesn't always mesh with Generation X's love of independence and hands-off style. To attract and keep Millennials, supervisors must be clear about managerial goals and expectations, communicate frequently, provide supervision and structure, establish mentoring programs, honor their optimism and welcome and nurture them. Millennials are typically team-oriented and band together to socialize. They are at ease in teams and prefer working in groups to individual endeavors. They are used to tackling multiple tasks with equal energy and expect to work hard. Millennials want to be happy at work and are seeking PH laboratories that are friendly in nature.

e. Generational conflicts

These different generational views can result in many forms of stress between the generations. For example, we often hear complaints by boomer supervisors that Millennials spend too much time using personal electronic equipment and don't dress properly for the workplace. Another occurs when Silents complain that their experience and longtime loyalty are not sufficiently appreciated. Millennials may view Generation X supervisors as pseudo-parents who hold their parents' views and prejudices. Millennials generally place much more importance on friendships with peers their own age than on family relationships or their current job. Younger workers between the ages of 18 and 38 will average 10.2 jobs. Ten percent of college graduates leave their first jobs within a year of starting. Within five years this number climbs to 25%. The coming battle will be to retain Millennials between the age of 25 and 30. Generation X'ers and Millennials are also extremely interested in career development that includes both continuing education and promotion. However, Millennials have yet to live through hardships and view themselves as capable of doing anything. They often feel they are ready for much more responsibility than Boomers and Generation X'ers believe they are ready to handle. Boomers, on the other hand, are used to being in control and often find it difficult to devolve responsibility and decision making to younger supervisors and managers.

Managers and supervisors who understand the strengths and needs of each generation will be in a much better position to support each group and make them feel more at home in their laboratory environment. For example, when recruiting new scientists it would be worthwhile to ask if a candidate has a close friend that might also be interested in a position in the PH laboratory. A Millennial who has a close friend at the same worksite is much more likely to be retainable. Generation X'ers and Millennials are hungry for more training, education and responsibility. Wise supervisors will give them plenty of opportunities for professional development through special projects and cross-training. Boomers need encouragement and opportunities to start preparing themselves for retirement by working shorter hours and by actively mentoring possible replacements for themselves. Generation X'ers need to know that management doesn't disapprove when they need to take off to care for an ill child or visit their child's teacher on a weekday. Silents are often viewed as pseudo-grandparents by Millennials. This often allows Millennials to work more smoothly and with Silents than with Boomers or Generation X'ers who often fall into the Millennials' parents' generation.

Appendix 8

Objective 7: Use standard job titles, and available salary benchmarks to identify and propose competitive salary ranges for public health laboratory scientists.

A. Introduction:

A survey of state PHL directors revealed that salary is the cornerstone of recruiting and retaining PHL scientist-managers and directors. Unfortunately, salaries for state PHL scientists, scientist-managers and directors are much lower than salaries paid for equivalent positions in both the federal government and the private sector. The only national benchmark salaries the Team could identify are federal salaries. These are presented using this report's proposed, standard job titles listed in Section B, below.

In states where PHL scientists already receive salaries at or above federal salaries, the Team suggests that state PHL directors develop local or regional salary benchmarks based on salaries paid by the private sector (e.g., university laboratories, research laboratories, medical laboratories, and pharmaceutical laboratories). The Team developed sample regional salary benchmarks for five regions of the country: Pacific, Mountain, Central, Northeast and Southeast. These regions were chosen as the laboratory industry's longest running salary survey (the annual *Medical Laboratory Observer* [MLO] salary survey) has utilized this regional paradigm for many years. Of note, we did not rely solely on the MLO data for our salary benchmarks. Instead, we independently surveyed private sector clinical laboratories in 21 cities (108 laboratories total) within these five "MLO regions" and created an average salary for each city by utilizing this data as well as data from national salary estimators (salary.com, monster.com, salaryexpert.com).

These benchmark salaries, being obtained from the private sector, do not fit neatly into our proposed "standard classifications and job titles" matrix. To help "translate" these private sector benchmarks into our proposed job titles we recommend the following:

Private Sector*	**SPH Lab***	**Private Sector**	**SPH Lab**
Med Tech ACSP	= PHLS II	Med Lab Tech	= PHL Tech III
Med Tech ASCP-Chief	= PHLS Lead	Med Lab Tech SR	= PHL Tech Lead
Microbiologist I	=PHLS I	Chemist I	= PHLS I
Microbiologist II	= PHLS II	Chemist II	= PHLS II
Microbiologist III	= PHLS III	Chemist III	= PHLS III
Microbiologist IV	= PHLS Lead	Chemist Sup	= PHLS Sup
Microbiologist Sup	= PHLS Sup		

*For example – an ASCP certified Medical Technologist's job title at the SPH Laboratory would be a PHLS II

These regional salary benchmarks are listed in Section C, below.

B. Federal Salary Benchmarks for Calendar Year 2006:

Table 1. Benchmark Salaries for Public Health Laboratory Aides, Technicians, Scientists, Supervisors, Scientist-Managers and Directors based on Salaries of Equivalent Federal Positions in the NorthernVirginia-D.C.-Baltimore Region as of January 2006.

Standard Classifications and Job Titles	Federal Salary ($)Ranges[a]	Federal Job Titles	Series Number Federal Job	Federal Salary Grade
Public Health Laboratory Aide/Assistant Classification				
PHL[b] Aide/Assistant I	19,214-24,029	Medical Lab Aid	GS-0645	1
PHL Aide/Assistant II	21,602-27,182	Medical Lab Aid		2
PHL Aide/Assistant III	23,571-30,645	Medical Lab Aid		3
PHL Aide/Asst. Lead	26,460-34,402	N/A		
Public Health Laboratory Technician Classification				
PHL Technician 1	26,460-34,402	Medical Technician	GS-0645	4
PHL Technician 2	29,604-38,487	Medical Technician		5
PHL Technician 3	33,000-42,898	Medical Technician		6
PHL Technician Lead	36,671-47,669	Medical Technician		7
Public Health Laboratory Scientist Classification				
PHLS 1	29,604-38,487	Microbiologist, Chemist	GS-0403, GS-1320	5
PHLS 2	36,671-47,669	Microbiologist, Chemist		7
PHLS 3	44,856-58,318	Microbiologist, Chemist		9
PHLS Lead and PHLS Developmental 1	54,272-70,558	Microbiologist, Chemist		11
PHLS Supervisor 1 and PHLS Developmental 2	65,048-84559	Microbiologist, Chemist		12
PHLS Supervisor 2	77,353-100,554	Microbiologist, Chemist		13
Public Health Lab Scientist-Manager Classification				
PHLS Manager 1[c]	91,407-118,828	Doctoral Microbiologist/Chemist Supervisor		14
PHLS Manager 2	91,407-118-828	Doctoral Microbiologist/Chemist Supervisor		14
PHLS Manager 3	107,521-139,774	Doctoral Microbiologist/Chemist Supervisor		15
PHLS Manager	107,521-139,774	Doctoral Microbiologist/Chemist Supervisor		15
PHL Director	109,808-143,000	Doctoral Scientist/Professional		Senior Level

[a]Federal Salary Table 2006-DCB (January 2006)
[b]PHL = Public Health Laboratory; PHLS = PHL Scientist
[c]This benchmark salary range is also recommended for doctoral-level Developmental Scientists

C. Sample Regional Salary Benchmarks:

Benchmark Salaries for Public Health Laboratory Technicians, Technologists, Chemists, and Microbiologists based on Salaries of Private Sector Positions in various regions of the United States, Summer/Fall 2006. (See explanatory note in Appendix 8, Objective 7 above.)

Table 2 – Pacific Region

PACIFIC	**LOS ANGELES CA**	**SAN FRANCISCO CA**	**PORTLAND OR**
MED TECH ASCP	$ 59,153.00	$ 61,812.00	$ 54,466.00
MED TECH ASCP - CHIEF	$ 68,299.00	$ 71,370.00	$ 62,888.00
MED LAB TECH (MLT)	$ 41,249.00	$ 43,103.00	$ 37,981.00
MED LAB TECH (MLT) -SR	$ 43,622.00	$ 45,583.00	$ 40,165.00
MICROBIOLOGIST I	$ 46,171.00	$ 48,247.00	$ 42,513.00
MICROBIOLOGIST II	$ 53,700.00	$ 56,114.00	$ 49,445.00
MICROBIOLOGIST III	$ 65,851.00	$ 68,812.00	$ 60,633.00
MICROBIOLOGIST IV	$ 79,565.00	$ 83,142.00	$ 73,260.00
MICROBIOLOGIST SUPERVISOR	$ 87,936.00	$ 91,889.00	$ 80,968.00
CHEMIST I	$ 49,416.00	$ 51,638.00	$ 45,501.00
CHEMIST II	$ 59,735.00	$ 62,420.00	$ 55,002.00
CHEMIST III	$ 73,878.00	$ 77,199.00	$ 68,024.00
CHEMIST SUPERVISOR	$ 88,559.00	$ 92,541.00	$ 81,542.00

Table 3 – Mountain Region

MOUNTAIN	**BOISE ID**	**PHOENIX AZ**	**SALT LAKE CITY UT**	**RENO NV**
MED TECH ASCP	$ 50,277.00	$ 52,306.00	$ 50,918.00	$ 54,621.00
MED TECH ASCP - CHIEF	$ 58,051.00	$ 60,394.00	$ 58,791.00	$ 63,067.00
MED LAB TECH (MLT)	$ 35,060.00	$ 36,475.00	$ 35,507.00	$ 38,089.00
MED LAB TECH (MLT) -SR	$ 37,076.00	$ 38,573.00	$ 37,549.00	$ 40,280.00
MICROBIOLOGIST I	$ 39,243.00	$ 40,827.00	$ 39,744.00	$ 42,634.00
MICROBIOLOGIST II	$ 45,642.00	$ 47,485.00	$ 46,224.00	$ 49,586.00
MICROBIOLOGIST III	$ 55,970.00	$ 58,229.00	$ 56,684.00	$ 60,807.00
MICROBIOLOGIST IV	$ 67,626.00	$ 70,356.00	$ 68,488.00	$ 73,470.00
MICRO SUPERVISOR	$ 74,741.00	$ 77,758.00	$ 75,694.00	$ 81,200.00
CHEMIST I	$ 42,001.00	$ 43,697.00	$ 42,537.00	$ 45,631.00
CHEMIST II	$ 50,772.00	$ 52,821.00	$ 51,419.00	$ 55,159.00
CHEMIST III	$ 62,793.00	$ 65,327.00	$ 63,593.00	$ 68,219.00
CHEMIST SUPERVISOR	$75,271.00	$ 78,309.00	$76,231.00	$ 81,775.00

Table 4 – Central Region

CENTRAL	DALLAS TX	CHICAGO IL	ST LOUIS MO	MINN/ST PAUL MN
MED TECH ASCP	$ 53,440.00	$ 56,514.00	$ 53,227.00	$ 55,373.00
MED TECH ASCP - CHIEF	$ 61,703.00	$ 65,253.00	$ 61,457.00	$ 63,935.00
MED LAB TECH (MLT)	$ 37,266.00	$ 39,409.00	$ 37,117.00	$ 38,613.00
MED LAB TECH (MLT) -SR	$ 39,409.00	$ 41,676.00	$ 39,252.00	$ 40,834.00
MICROBIOLOGIST I	$ 41,712.00	$ 44,112.00	$ 41,546.00	$ 43,221.00
MICROBIOLOGIST II	$ 48,514.00	$ 51,305.00	$ 48,320.00	$ 50,269.00
MICROBIOLOGIST III	$ 59,492.00	$ 62,914.00	$ 59,254.00	$ 61,643.00
MICROBIOLOGIST IV	$ 71,881.00	$ 76,016.00	$ 71,594.00	$ 74,480.00
MICRO SUPERVISOR	$ 79,444.00	$ 84,014.00	$ 79,127.00	$ 82,317.00
CHEMIST I	$ 44,644.00	$ 47,212.00	$ 44,466.00	$ 46,259.00
CHEMIST II	$ 53,966.00	$ 57,070.00	$ 53,751.00	$ 55,918.00
CHEMIST III	$ 66,743.00	$ 70,582.00	$ 66,477.00	$ 69,157.00
CHEMIST SUPERVISOR	$ 80,007.00	$ 84,609.00	$ 79,688.00	$ 82,901.00

Table 5 – Northeast Region

NORTHEAST	DETROIT MI	COLUMBUS OH	PHILADELPHIA PA	NEW YORK NY	BOSTON MA
MED TECH ASCP	$ 57,972.00	$ 52,152.00	$ 55,626.00	$ 61,933.00	$ 58,518.00
MED TECH ASCP - CHIEF	$ 66,937.00	$ 60,216.00	$ 64,227.00	$ 71,510.00	$ 67,567.00
MED LAB TECH (MLT)	$ 40,426.00	$ 36,367.00	$ 38,790.00	$ 43,188.00	$ 40,807.00
MED LAB TECH (MLT) -SR	$ 42,751.00	$ 38,459.00	$ 41,021.00	$ 45,672.00	$ 43,154.00
MICROBIOLOGIST I	$ 45,250.00	$ 40,707.00	$ 43,419.00	$ 48,342.00	$ 45,676.00
MICROBIOLOGIST II	$ 52,629.00	$ 47,345.00	$ 50,499.00	$ 56,224.00	$ 53,124.00
MICROBIOLOGIST III	$ 64,537.00	$ 58,058.00	$ 61,925.00	$ 68,947.00	$ 65,145.00
MICROBIOLOGIST IV	$ 77,977.00	$ 70,148.00	$ 74,821.00	$ 83,305.00	$ 78,712.00
MICRO SUPERVISOR	$ 86,182.00	$ 77,529.00	$ 82,693.00	$ 92,070.00	$ 86,993.00
CHEMIST I	$ 48,430.00	$ 43,568.00	$ 46,470.00	$ 51,739.00	$ 48,886.00
CHEMIST II	$ 58,543.00	$ 52,665.00	$ 56,174.00	$ 62,543.00	$ 59,094.00
CHEMIST III	$ 72,404.00	$ 65,135.00	$ 69,473.00	$ 77,351.00	$ 73,086.00
CHEMIST SUPERVISOR	$ 86,792.00	$ 78,079.00	$ 83,280.00	$ 92,723.00	$ 87,610.00

Table 6 – Southeast Region

SOUTHEAST	NASHVILLE TN	ATLANTA GA	BIRMING-HAM AL	MIAMI FL	JACKSON-VILLE FL
MED TECH ASCP	$ 50,172.00	$ 52,558.00	$ 50,588.00	$ 52,408.00	$ 50,681.00
MED TECH ASCP-CHIEF	$ 57,930.00	$ 60,685.00	$ 58,410.00	$ 60,512.00	$ 58,517.00
MED LAB TECH (MLT)	$ 34,987.00	$ 36,650.00	$ 35,276.00	$ 36,546.00	$ 35,341.00
MED LAB TECH (MLT) -SR	$ 36,999.00	$ 38,758.00	$ 37,305.00	$ 38,648.00	$ 37,374.00
MICROBIOLOGIST I	$ 39,161.00	$ 41,024.00	$ 39,486.00	$ 40,907.00	$ 39,558.00
MICROBIOLOGIST II	$ 45,547.00	$ 47,713.00	$ 45,925.00	$ 47,577.00	$ 46,809.00
MICROBIOLOGIST III	$ 55,854.00	$ 58,510.00	$ 53,316.00	$ 58,343.00	$ 56,420.00
MICROBIOLOGIST IV	$ 67,485.00	$ 70,694.00	$ 68,044.00	$ 70,493.00	$ 68,169.00
MICRO SUPERVISOR	$ 74,586.00	$ 78,132.00	$ 75,204.00	$ 77,910.00	$ 75,342.00
CHEMIST I	$ 41,914.00	$ 43,907.00	$ 42,261.00	$ 43,782.00	$ 42,339.00
CHEMIST II	$ 50,666.00	$ 53,075.00	$ 51,086.00	$ 52,924.00	$ 51,179.00
CHEMIST III	$ 62,662.00	$ 65,641.00	$ 63,181.00	$ 65,455.00	$ 63,297.00
CHEMIST SUPERVISOR	$ 75,114.00	$ 78,686.00	$ 75,737.00	$ 78,462.00	$ 75,876.00

Appendix 9

VII. Leadership Development

A. Overview.

In some of our application essays for acceptance as a PHLI Scholar we mentioned that it had been a number of years since we had the opportunity to participate in a leadership institute. Therefore we looked forward to an opportunity that would allow us to update and retool our leadership skills as well as learn newer terminology and techniques applicable to teamwork and systems-based management. As year-15 Scholars we have not been disappointed. The PHLI has provided us with opportunities to both update and expand our knowledge and skills in these and other areas.

The older members of our Team first entered the management ranks as public health laboratory scientist-supervisors in mid-1970's. Back then leadership was still being taught with emphases on a leader mastering a style and being able to effectively motivate, communicate, delegate, conduct effective meetings, mediate conflict, and direct change, mostly with and for subordinates. Much of this was built around the then-current 3-M management gurus of MacGregor, Maslow, and Mintzberg. Around that same time or later, while in graduate school, we were introduced to the concept of the "systems approach" to project management that, in turn, was derived from the "systems dynamics" approach developed for engineering and scientific purposes.

In the latter eighties and nineties, when we were able to obtain additional leadership education and training, the main emphases had shifted to "participative management" and the use of teams to solve problems and effect change. This shift was associated with the continuing growth in the complexity of organizations (too much for any one person to master) coupled with the Japanese acceptance and experience with Deming's ground-breaking use of teams to effect major continuing quality improvements (CQI) in an organization's operations and products.

Over the past year we have come to realize that today's latest leadership tools and techniques (e.g., "action learning", "negotiating", "learning organizations", "systems thinking", "human network management", and "meta-leadership") have built upon and evolved from the earlier tools and techniques (e.g., networking, teamwork and continuing quality improvement) we learned back in the 1980's. Over the past year we have come to realize that the many leadership tools we have learned and used during the last 30 years provided us with a good working, as well as historical, background for retooling as leaders in the present. We have also came to understand and appreciate how each of the past and more recent leadership techniques served as inter-related stepping stones or pieces to a broader puzzle. The completed puzzle (see Appendix 9a) now provides us with a comprehensive model for leadership in today's complex laboratory work environment. All of these puzzle pieces remain usable tools. Some are more appropriate in certain circumstances than others and some are narrower in focus than others, but all have come together to provide us with a broad and flexible supply of leadership tools and techniques.

B. Leadership Skills.

There are many individual leadership skills and materials that we have either learned about in more detail or that were new to us. However, several stand out. These are “action learning,” “systems thinking,” “negotiation,, “human networking management,” and “meta-leadership.”

1. Action Learning.

Although this term was new to us, several Team Members first became familiar with much of what it entailed in the late 1980’s and early 1990’s under the guise of “teams” and “team management”. We have used teams and the team approach for many years to help effect “continuing quality improvement” (CQI) under “total quality management” (TQM). The main difference is that under CQI, teams were used to help wide cross-sections of staff network and develop team skills by solving problems identified by management as needing solutions. One of us has established 70 CQI teams over the past 10 years to solve complex organizational problems, help individuals learn to communicate in and use teams, and help support participative management. However, the “action learning team” as established and used in the PHLI places much stronger emphasis on acquiring individual learning and identifying system-wide solutions to problems.

As with most teams, two of the most difficult issues facing the PHLI-APHL year-15 action-learning team involved identifying an appropriate problem and then narrowing or focusing down to identify a limited number of objectives needed to affect an overall goal. However, unlike most CQI teams, our PHLI Team consisted of individuals all having the same level of competence. This made it much easier to accept one another’s perspectives, foster innovation and creativity, and greatly reduce the usual willingness, need, or expectation to control. The Team’s project-problem was very difficult and any solution would be complex. Having a team of equals made it easier to accept one another’s inputs as possible stepping stones as we brain-stormed and then negotiated among ourselves to improve content and push the entire project forward. At the same time, because several Team Members were basically introverted, the Team also allowed each team member to take the lead on several objectives. This served the dual purpose of meeting individual Team Members’ need to learn on their own and of pushing the project forward by assigning project components and individual responsibilities. The Team worked extremely well at taking, reviewing, probing and suggesting improvements to each Team Member’s preliminary project products. Each successive product-draft was then repeatedly subjected to this same process. This approach also fit well with the action learning formula: Leaning = Programmed Instruction (available/obtainable knowledge) + Questioning (seeking fresh insights) + Reflection (thinking about and pulling apart before reassembling).

2. Systems Thinking.

For some Team Members the initial introduction to systems thinking occurred 30 years ago as an approach to use when planning how to tackle a complex project or problem. At that time the terminology was pretty much limited to causes, inputs, actions, outputs, and effects using a limited number of boxes to depict these interacting items and to determine what needed to be done to obtain desirable effects. This depiction also provided a simplified form of logic model and could be used in conjunction with flow diagramming and Critical Path Analysis.

Our past experience with using the systems approach and teams to solve problems and carry out projects led us, as APHL-PHLI Team Member, to automatically approach our Team's PHLI project from a systems approach. The newer term, "systems thinking", still employs such tools as logic models, but they now range from those that employ free-hand box drawing to complex, commercially computerized critical path and systems dynamics software. However, even without using specialized software, "systems thinking" was absolutely necessary because the Team's project involved:

1) A complex problem with many stakeholders who needed to see the "big picture";
2) A recurring problem that has not been solved to date;
3) Actions that would be affected by an external environment containing other related and overlapping issues; and
4) Some strategies or objectives that may not be obvious at the start of the project.

The project (problem) that our Team decided to undertake was very complex and piecemeal attempts to solve it locally and to date only created discouragement in the stakeholders about the prospects of effectively addressing it. This forced the Team to raise its thinking to the level needed to create a range of strategies (i.e., the 10 objectives) that, taken together, would provide the complexity of interactions necessary to effect an overall and continuing solution.

The Team spent nearly 10 weeks identifying and refining the project's 10 objectives. These included as many causes, inputs, stakeholders, and desired effects needed to identify a comprehensive system that defined the project. The use of an outcome approach logic model also proved useful not only to keep the various objectives on track but also to serve as an analytical means that allowed an analysis of each objective's processes with respect to the overall project's resources, timeframe, and overall goal.

The logic model used also provided the Team with needed feedback and reinforcing loops that supported a continuous assessment process. For example, the Team came to realize that Objective 3, entitled, Academic Institutions/Programs, when considered along with other objectives, was found to be much less important to the overall goal and detracted from the efficient use of available project resources. The result of this assessment was that the objective was modified to greatly limit its scope. This modification represents an example of organization learning where an original vision or mental model had to be adjusted to current reality.

3. Human Networking Management and Meta-Leadership.

Networking is a leadership tool that has been given much lip service for many years. We have routinely used it to develop and maintain our lists of possible contacts identified over the years through work and attending professional meetings. However, until undertaking this PHLI project we never really worked to create and effectively use networking to undertake and carry out a project from start to finish. We have been members of many teams but the APHL-PHLI year-15 Team is the first long-distance "core" network in which we have participated. We emphasize the word, "core", because this is the first team in which we have been able to truly get to know the personal as well as the technical sides of team members. This Team of four core members also served as the base from which our network was able to expand to form a secondary network that included important contacts and participants in other organizations (e.g., PHLI, APHL, CDC, universities). This network expansion, both by the Team as a whole and by individual Team Members, proved not only important to the Team's project but also to our meta-leadership development and confidence.

An example of one Team Member's meta-leadership development related to the PHLI team project was the impetus the project gave the Member to contact and meet with deans and professors in local schools of public health (before gaining the approval of the Deputy Secretary for Public Health Services). These meetings allowed the Member to develop working partnerships under which were developed programs for the Member's employees to access graduate coursework and programs in public health laboratory practice, and for the universities' graduate students to conduct practica and capstone projects within my state public health laboratory. We emphasize the meta-leadership aspect of this example because the partnerships that were undertaken were needed by and useful to all parties, but fell completely outside the scope of the Member's job description.

4. Project Leadership Challenges and Associated Leadership Tools

a. Researching and developing project products within a distance-learning, team environment that supports individual professional growth (action learning and systems thinking);
b. Effectively reaching out to and partnering with various professional organizations (systems thinking and human networking)
c. Negotiating acceptability of project products with partners in professional organizations, government agencies, and universities (action learning, systems thinking, negotiation, and human networking management);
d. Effectively contacting and interacting with potential academic partners and negotiating partnerships with academic institutions (human networking management and meta-leadership);
e. Marketing project products to partners in the nation's PHL community and state health department offices of human resources (Human networking management and meta-leadership).

Evolution of Team Members. Leadership Knowledge and Experience over the past Thirty Years