

Survey Report

Data Modernization in Public Health Laboratories



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Executive Summary

While data modernization has been the key focus of public health departments since the US Centers for Disease Control and Prevention (CDC) unveiled the Data Modernization Initiative (DMI) in 2019, progress within the public health laboratory system remains poorly understood. When the APHL Data Modernization Subcommittee launched in January 2025, it conducted a nationwide survey of chief informatics officers, interoperability coordinators and informatics program managers, revealing both persistent challenges and emerging opportunities in data modernization.

Public health laboratories nationwide face similar challenges and share remarkably similar priorities centered on integration and interoperability: developing fully integrated data ecosystems, creating interoperable networks for laboratory instruments and laboratory information management systems (LIMS), and establishing robust electronic test order and result (ETOR) intermediaries. While most laboratories are making progress, they face significant barriers in funding, staffing and aging infrastructure. Survey results underscore the critical need for sustained investment, collaborative solutions and peer-to-peer knowledge sharing. Laboratories consistently expressed their desire to learn from peers and benefit from templates for data modernization roadmaps, LIMS assessments and playbooks for implementing emerging technologies like fast healthcare interoperability resources (FHIR), the Trusted Exchange Framework and Common Agreement (TEFCA) and artificial intelligence (AI).

These commonalities give the APHL Data Modernization Subcommittee clear direction for supporting laboratories.

Overview

The Data Modernization Survey was conducted by the APHL Data Modernization Subcommittee in fall 2025, targeting chief informatics officers, interoperability coordinators, informatics program managers and laboratory directors at local, state and territorial public health laboratories. The survey remained open for approximately one month.

The survey collected 62 responses from 45 jurisdictions, representing broad geographic distribution across the United States and providing a comprehensive national perspective on data modernization efforts.

Planning for Data Modernization

Laboratories are at various stages of their data modernization journeys, starting from different places with differing priorities and approaches. The survey revealed many commonalities in ultimate goals, frequent projects and roadblocks. APHL is aware that this survey was fielded during a tumultuous period of funding recessions and programmatic uncertainties, and that the landscape may have degraded in the ensuing quarters.

Laboratories have approached planning in many ways: 39% conducted strategic planning exercises and about 25% produced recommendation reports. However, only a third of respondents have a formal data modernization roadmap in place, another third reported having no formal data modernization roadmap and the final third were unsure whether

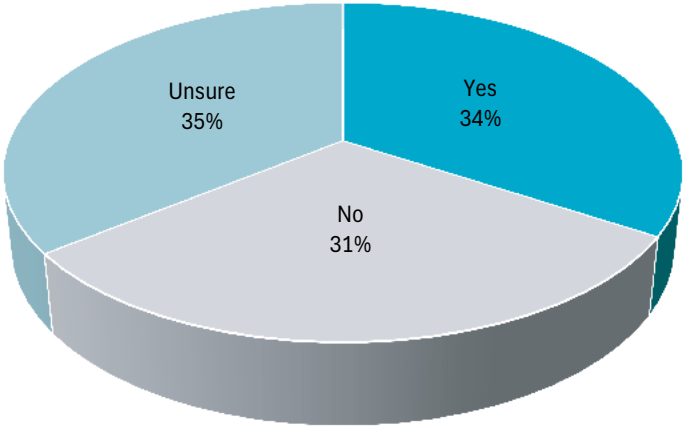


Figure 1. Labs having data modernization roadmaps

their organization has one. Across all these metrics, only a minority of laboratories have a professed roadmap or strategy.

Laboratories need to learn from their public health partners rather than recreate the wheel. Some agencies are generously sharing their work and methodologies. For example, the Utah Department of Health has presented to various workgroups on their extensive efforts to conduct an enterprise-wide infrastructure assessment using internal resources, then develop recommendations for overcoming identified gaps. Critically, Utah incorporated the public health laboratory into the assessment and data modernization governance structure. Utah’s work provides a useful starting place for laboratories and agencies eager to perform a similar assessment. Utah’s willingness to share their methodology is essential when resources are limited and when the objectives of data modernization so often overlap across laboratories.

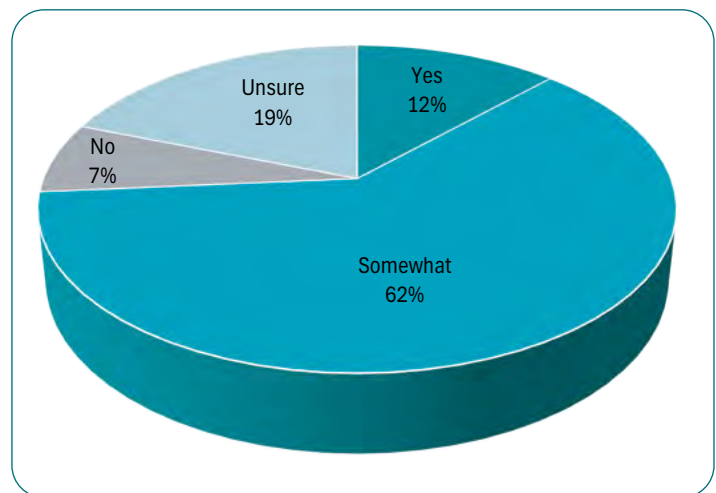
A roadmap allows an organization to put forward a consensus vision of modernization that guides priorities and justifies projects and procurements. Laboratories without clear roadmaps may struggle to prioritize initiatives, allocate resources effectively or measure progress. Some public health agencies might have a roadmap that the laboratory does not know about or that does not include laboratory-specific priorities.

Progress and Roadblocks

Progress Toward Goals

When asked whether their laboratory is currently on track to meet data modernization goals, 73% report being on track or at least somewhat on track. However, the high percentage in the “somewhat” category suggests that progress is often incremental and faces ongoing challenges.

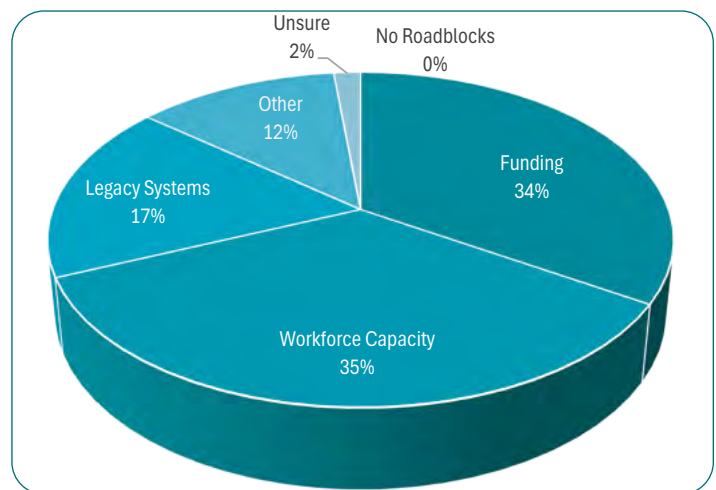
Figure 2. Progress towards goals



Major Roadblocks

Laboratories face significant barriers to achieving their data modernization goals. When asked to select up to three primary challenges, responses overwhelmingly cited workforce capacity, funding and legacy systems.

Figure 3. Roadblocks impeding data modernization goals



Workforce capacity constraints reflect insufficient staffing levels to manage complex modernization projects, difficulty acquiring qualified information technology (IT) and informatics staff, competing priorities and limited bandwidth alongside operational demands, and reliance on contractors due to hiring challenges. Many non-government organizations and public health associations are working on workforce capacity development. This survey highlights the importance of this work and the need to focus on laboratory informatics as a particular area of vulnerability.

Funding challenges impact nearly every aspect of data modernization: uncertainty about sustained funding for multi-year projects, insufficient resources for comprehensive system replacements, inability to hire dedicated staff and dependence on time-limited grant funding. These challenges have only intensified, with laboratories uncertain about moving forward with projects that have not started, redirecting funding from critical infrastructure to maintain current staff or daily operations, and hesitating on major system implementations due to concerns about sustainable long-term funding. Furthermore, new capabilities require people with new skillsets, such as cloud architects and AI specialists, creating additional workforce pressure. These concerns are real and threaten data modernization goals.

APHL offers extensive training programs and workforce development resources for all laboratory staff including informaticians. Most recently, the APHL Informatics Committee is developing a white paper providing guidance and best practices for rightsizing an informatics workforce. For two decades, APHL has also offered technical assistance—specialized support in areas requiring niche subject matter expertise. APHL will continue exploring opportunities to provide these services to support member laboratories' data modernization goals.

Legacy systems such as LIMS that cannot support modern interoperability standards, instruments with limited connectivity options, incompatible data formats requiring complex workarounds, and high costs and risks associated with replacement create barriers to modernization. True modernization is impossible when systems lack needed capabilities. Application programming interfaces (APIs), data governance, AI workflows and other improvements require systems that are ready for these technologies and approaches. System replacement requires substantial investment in time and resources and can take 12-18 months minimum, circling back to funding constraints.

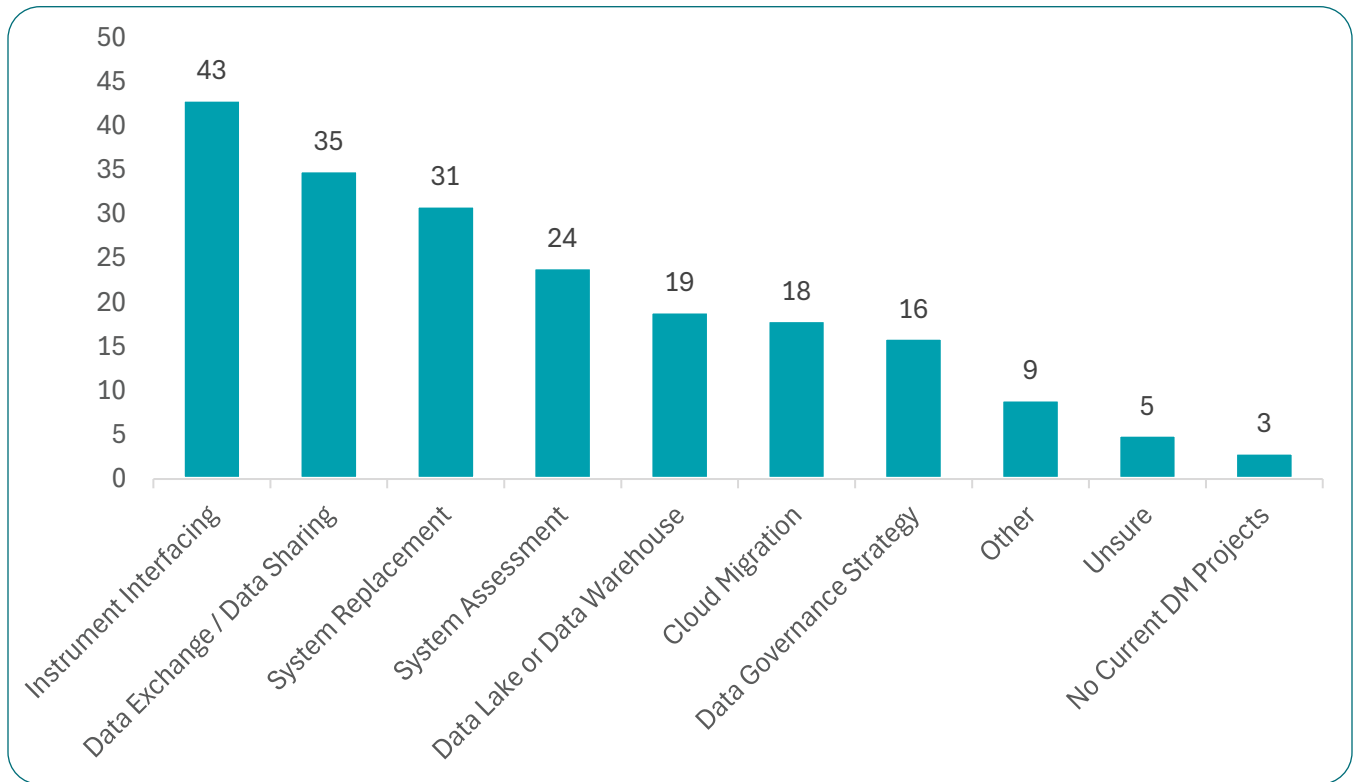
These findings underscore that data modernization is not simply a technical challenge but requires sustained investment in technology and people. Additional roadblocks reported in the survey responses include compliance with state infrastructure and security oversight requirements, organizational IT coordination and approval processes, state IT security policies preventing instrument networking, change management challenges, time constraints and slow procurement processes, fragmented technical oversight and lack of system architect support and IT expertise.

Data Modernization Projects

Data modernization means different things to different people and touches everything in the laboratory. Two key findings emerged from the survey results:

- Many data modernization projects are agency-wide initiatives, not restricted to the laboratory.
- Most laboratories are managing multiple data modernization projects simultaneously. Importantly, there was substantial commonality across project types, with many laboratories engaged in similar efforts.

Figure 4. Data modernization projects in process at public health laboratories.



Instrument Interfacing

Instrument interfacing emerged as the most prevalent modernization activity, with 69% of laboratories actively working on these projects. This ubiquity may be because instrument interfacing is an instrument-by-instrument endeavor that never truly ends—every new instrument or upgrade requires starting over. Laboratories described ongoing efforts including interfacing critical instrumentation with LIMS for automated result transmission, working through IT architectural and security reviews for network connectivity, interfacing new instruments alongside existing equipment, and implementing direct and data capture unit interfaces.

One laboratory noted, “We are working toward direct interfacing for all instrumentation, starting with new instruments.” Another highlighted the challenge of interfacing vendor-specific instruments with another vendor’s LIMS as a particular pain point.

Data Exchange and Interoperability

Data exchange and sharing projects represent another major focus area, with 56% of laboratories engaged in these initiatives. This focus makes sense, since laboratories are fundamentally data producers. Being able to exchange data meaningfully is critical to their core mission.

Common activities include implementing HL7 interfaces for electronic laboratory reporting (ELR), establishing bi-directional interfaces with state programs and CDC, developing ETOR capabilities, upgrading HL7 messaging standards, integrating with health information exchanges (HIEs), and expanding reporting capabilities to public health partners.

Notably, laboratories reported many data exchange projects that utilize HL7 2.5.1—not FHIR. As discussed below,

the Assistant Secretary for Technology Policy’s (ASTP’s) assertion that it is time for FHIR APIs is premature without sustained and meaningful funding for public health. Many laboratory systems cannot yet support it, laboratories lack in-house expertise, and the Helios Accelerator project is still developing standards to support public health FHIR use cases.

System Replacement and Assessment

System assessments and replacements are the next most common data modernization projects, a finding which aligns with what laboratories have described to CDC through Epidemiology and Laboratory Capacity (ELC) Program reporting. Many laboratories are updating outdated legacy systems, which requires extensive planning and many years of effort. In 2025, numerous jurisdictions issued requests for proposals (RFPs), with more expected in 2026 as these efforts continue. Member laboratories have long requested updated LIMS requirements and more tools for system assessment and implementation. APHL’s LIMS Subcommittee is addressing this need and building a library of RFPs and templates that laboratories can use as starting points.

Half of survey respondents (50%) are conducting system replacement projects, often involving LIMS upgrades or complete replacements. These represent significant multi-year investments requiring careful planning and execution, as well as new workforce roles. Some projects were practically heroic, influenced by shifting priorities and funding:

“We successfully migrated our LIMS system to the Cloud. It normally takes around 6-8 months but due to funding cuts, we had to do it in three months. We were able to meet that deadline and were live by July 1.”

One respondent noted that replacing their LIMS “would open the doors for modernization in other areas.” For another, their dream infrastructure started with LIMS replacement and extended to an entirely modernized ecosystem:

- New LIMS for both Microbiology and newborn screening that meets the needs of the laboratory and is compliant with state cybersecurity policies;
- A robust, secure network for laboratory instruments;
- Scalable cloud-based infrastructure;
- Advanced data analytics and visualization tools;
- A dedicated LIS team to support the laboratory.

These improvements are only possible starting with a LIMS that has the requisite capabilities.

Recognizing current system gaps is key to determining whether to upgrade or replace—and if replacing, what to seek. Laboratories often conduct system assessments as a first step to identify gaps, redundancies and opportunities for automation and modernization, allowing leadership to make informed decisions about replacing or upgrading systems, know the requirements and desired functionalities when selecting new systems, and measure the impact of these new systems. These assessments are another area where the public health laboratory community would benefit from shared templates and best practice documentation.

Data Infrastructure Development

Laboratories are increasingly building sophisticated data infrastructure. Many infrastructure efforts are agency-wide, not laboratory-specific. Cloud migration projects focus on moving critical systems to cloud environments offering near-limitless storage, cost savings and enhanced cybersecurity. The scalability and flexibility of cloud solutions enable laboratories to handle higher data throughput as demands grow.

Simultaneously, laboratories are developing centralized data environments such as data warehouses and data lakes to consolidate results, surveillance data and quality metrics from multiple systems. These centralized repositories

enable comprehensive analytics across programs, facilitate data-driven decision-making and support interoperability by providing unified access points for data consumers.

But technology alone is insufficient. A critical component of large, shared data repositories is a robust data governance strategy. Data governance establishes clear rules for data ownership, access, quality and usage, ensuring data integrity and compliance while enabling appropriate sharing across programs and partners. However, implementing effective governance is challenging.

Development of data governance strategies involves establishing frameworks to standardize data sharing and retention, defining ownership and metadata standards, creating policies and procedures for data management, developing roadmaps identifying data governance deliverables and establishing data governance committees and teams. All these goals take time, expertise and vision, as well as long-term commitment to implement and enforce this governance.

Funding and Sustainability

As of fall 2025, laboratories reported relying on multiple funding sources for data modernization work. Most notable were the ELC Program and the Public Health Infrastructure Grant (PHIG), both awarded to jurisdictions through CDC. Additional funding sources include program-specific funding such as newborn screening, locally funded efforts through agency budgets, state agency funding via program revenue, ELC DMI awards and American Rescue Plan Act (ARPA) grants.

As of fall 2025, funding uncertainty had significantly affected data modernization projects, with 66% of laboratories reporting moderate to heavy impact, demonstrating the critical need for sustained, predictable funding streams.

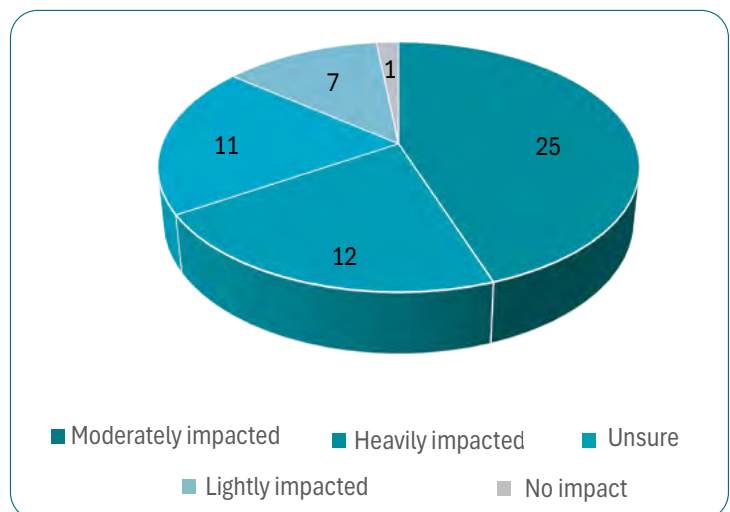
Only 16% of laboratories (n=9) reported having a strategy to sustain data modernization projects given uncertain funding. The majority (35%, n=19) did not have such a strategy, while 49% (n=27) were unsure. Laboratories with sustainability strategies described various approaches:

- Working at reduced speed
- Implementing phased approaches and prioritizing sections with greatest need
- Asking legislatures for increased funding
- Adjusting scope and timeline to work on one project at a time
- Future-proofing systems using currently available funding.

Figure 5. Funding sources



Figure 6. Impact of funding uncertainty



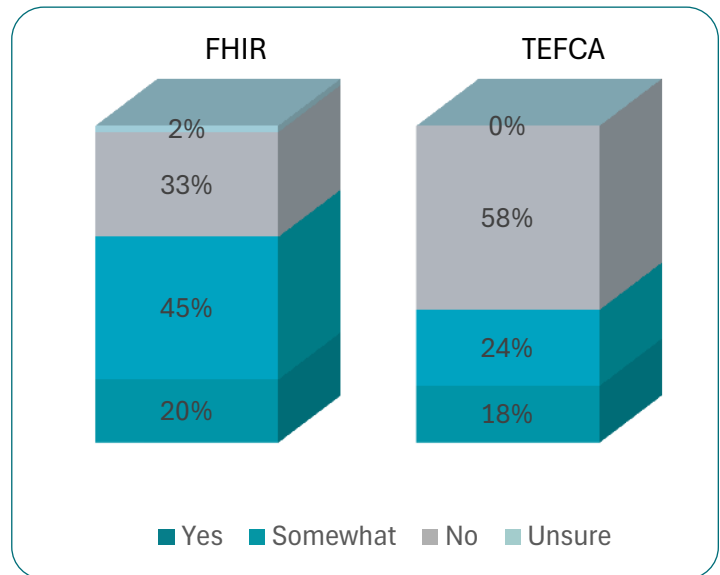
The widespread lack of formal sustainability strategies highlights a critical vulnerability in long-term modernization planning.

Emerging Technologies and Preparedness

Keeping pace with evolving technologies, frameworks and trends is essential. Without this adoption, public health risks falling behind. APHL maintains a presence at federal policy tables—whether with the US Department of Health and Human Services (HHS), ASTP, CDC or the Center for Medicare and Medicaid Services (CMS)—through its public policy team and membership in the Joint Public Health Informatics Taskforce (JPHIT). APHL recognizes the need for sustainable funding and R&D resources to advance public health in the right direction, adopt new innovations and meet new opportunities. Public health must also ensure that healthcare IT understands public health’s specific needs.

Few laboratories feel prepared for emerging technologies like FHIR, AI or new data sharing models like TEFCA. Without adequate preparation, public health laboratories risk falling behind as these innovations reshape the field. Labs need training, expertise, systems capable of handling new technologies and investment to pilot innovations.

Figure 7. Familiarity with emerging technologies



Trusted Exchange Framework and Common Agreement (TEFCA)

TEFCA is an initiative to enable secure health information exchange. Survey responses indicate limited awareness of this initiative: 58% answered no, 24% somewhat, and 18% yes. Among those familiar with TEFCA, perspectives on potential impact varied. Responses included: improved interoperability and enhanced public health data sharing, potential pathway for ETOR to certain partners (especially multi-state operators), standardized framework for data exchange between public health and clinical and commercial partners, reduced reporting redundancies, and uncertainty about implementation timeline and state-level adoption. Several laboratories noted they are still evaluating TEFCA’s applicability or that their jurisdiction has not yet developed adoption plans.

While laboratories may still be evaluating TEFCA’s impact, APHL is ready to lead in this area. The APHL Informatics Messaging Services (AIMS) Platform is one of few instances of a public health standard operating procedure (SOP) that is in production over TEFCA, with 2.5 million documents flowing monthly for electronic case reporting (eCR). AIMS is a participant in the eHealth Exchange QHIN. APHL is prepared to do the same for ETOR or ELR as laboratories and their partners are ready. We are also lobbying ASTP to develop more granular SOPs for public health. Currently, ASTP has only released subexchange purposes for eCR and ELR. While data exchange partners can use the public health SOP to set up any relevant use case, the lack of specificity may explain the community’s hesitation to move forward. Furthermore, while CDC is supporting healthcare organizations to onboard to AIMS to send eCR, there is also a notable lack of funding to support public health onboarding to TEFCA.

Fast Healthcare Interoperability Resources (FHIR)

FHIR is a standard for exchanging healthcare information electronically. Familiarity levels among respondents were: 45% somewhat, 33% no, 20% yes, and 2% unsure. Several noted that FHIR has not reached laboratory reporting yet, their vendors do not currently support FHIR, or they are waiting to see if FHIR becomes a requirement before investing in preparation. No laboratory is in production with FHIR for a public health laboratory use case. Part of this lack of awareness and preparation is that FHIR implementation guides have concentrated on use cases outside public health laboratories. Pilots in Washington, Virginia and Minnesota, for example, have involved vital records reporting but impact on laboratory data exchange remains uncertain, and public health laboratories do not know where to start.

Artificial Intelligence (AI)

Regarding AI policies and implementation, 27% of respondents (n=15) reported having a policy regarding AI use, 49% (n=27) do not, and 24% (n=13) are unsure. Among laboratories, only 5% (n=3) are actively incorporating AI, while 64% (n=35) are not and 31% (n=17) are unsure.

Limited AI adoption reflects the early stage of AI integration in public health laboratories and the need for clear policies and guidance. This represents an opportunity for community of practice ideas. APHL could partner with the Public Health AI Collaborative Network, for example, to showcase innovative approaches to incorporating AI into public health workflows.

The APHL Knowledge Management Committee recently released a report on a more detailed survey of [AI usage in public health laboratories](#).

Future Aspirations

When asked if they had a dream data modernization project that they would implement if roadblocks were removed, 51% of respondents (n=28) answered yes, while 36% (n=20) were unsure and 13% (n=7) answered no.

Many “dream projects” imagined comprehensive, integrated data ecosystems connecting all laboratory programs, instruments and surveillance units through unified cloud-based platforms with real-time analytics, automated ELR reporting and data visualization dashboards. Other aspirations included enhanced ETOR capabilities, robust data exchanges with all instruments, HIEs and CDC, auditing and monitoring dashboards and mature data governance with all laboratory data organized and cataloged with designated data owners and stewards.

Learning and Development Needs

Responses to the survey revealed strong interest in collaborative learning and knowledge sharing. Rather than developing solutions in isolation, respondents want collaborative answers like shared software platforms, common data standards or hands-on technical assistance. They want trainings, tools, templates and help; if their peer laboratories have gone through something similar, they want to avoid having to start from scratch or go it alone.

Laboratories also identified specific tools and resources that would benefit their modernization journeys. As one respondent put it, “I’ll take all the tools!”

Some resources do not have to be laboratory-specific; in many cases, they have already been developed by other NGOs and associations to support data modernization at public health agencies. These tools need broader

socialization so laboratories know about them. Others should be developed by the Data Modernization Subcommittee, APHL, or recommended for development by others. The Data Modernization Initiative Toolkit, published by the Public Health Informatics Institute, is a good example of a set of resources that could apply to data modernization work across public health program areas.

Figure 8. Peer Education Resources Needed

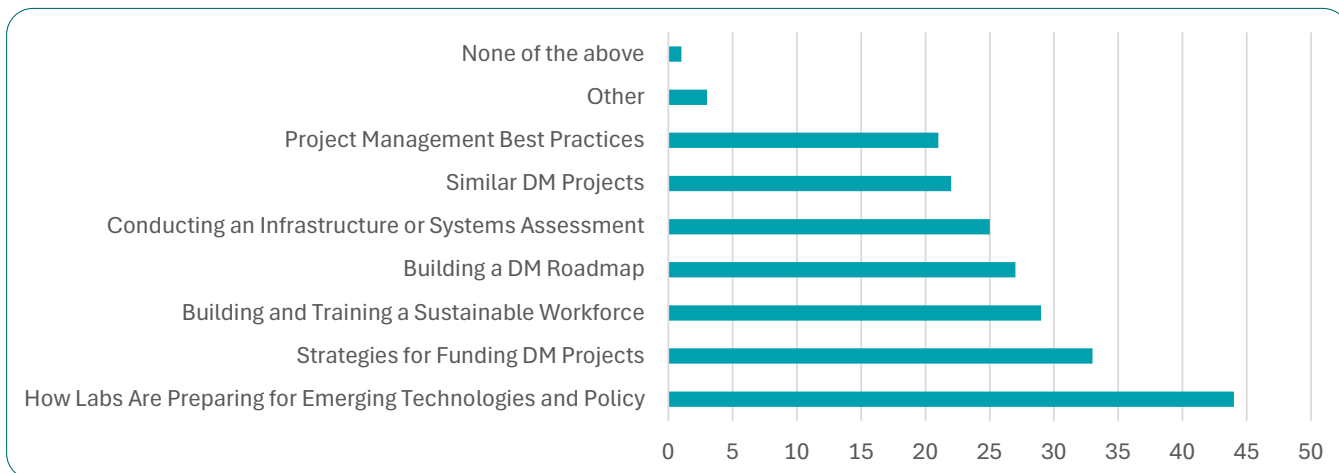
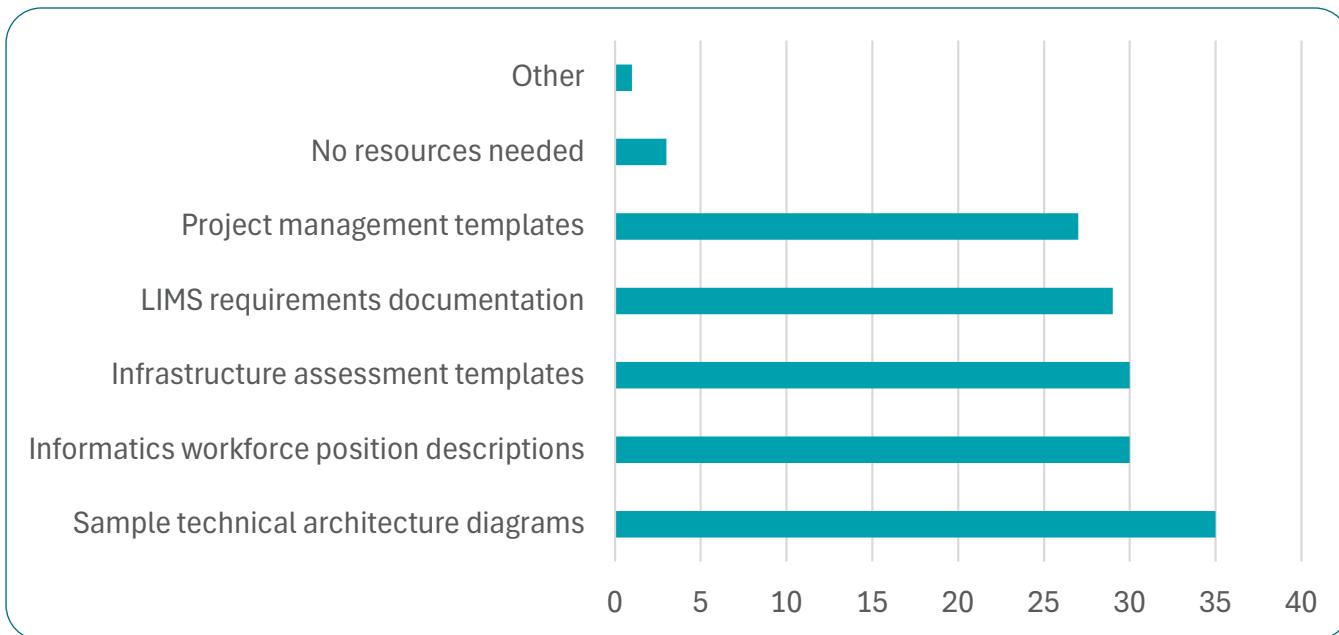


Figure 9. Tools and Resources Needed



Conclusions and Recommendations

The 2025 Data Modernization Survey reveals a public health laboratory system in transition. While progress is being made, laboratories face substantial challenges requiring coordinated action and sustained support.

Key Findings Summary

- Data modernization efforts are widespread but fragmented, with only one-third of laboratories having formal roadmaps.
- Workforce capacity and funding are the primary roadblocks, affecting two-thirds of all laboratories.
- Instrument interfacing, data exchange, and system replacement are the most common active projects.
- Funding uncertainty has moderately or heavily impacted 66% of laboratories.
- Laboratories have limited familiarity with emerging technologies like FHIR, TEFCA, and AI.
- Strong interest exists in peer learning, collaboration, and shared resources.

Moving Forward

Survey results make clear that public health laboratories are not modernizing in isolation. Rather, they share common challenges, pursue similar initiatives and would benefit greatly from collaborative approaches. The APHL Data Modernization Subcommittee is positioned to facilitate this collaboration by serving as a clearinghouse for resources, tools and best practices; creating opportunities for peer-to-peer learning and knowledge exchange; advocating for sustained funding and supportive policies; supporting laboratories in preparing for emerging technologies; and facilitating collective approaches to shared challenges.

As a first step, the Subcommittee will point to resources that already exist. Excellent work by the Council of State and Territorial Epidemiologists (CSTE), the Public Health Informatics Institute (PHII), the Association of State and Territorial Health Officials (ASTHO) and others deserves broader socialization and accessibility. Resources mentioned by survey respondents include committee working groups through partnerships with the National Association of City and County Health Officials (NACCHO), CSTE and vendors, and it is encouraging that laboratories are familiar with and engaging with these groups.

Second, the Subcommittee will work with APHL and CDC to create additional laboratory-specific resources. Roadmap templates, LIMS assessment tools and partnerships with the vendor community on innovative solutions are priorities. Instrument interfacing, for example, remains a persistent challenge. Making data exports non-proprietary and solutions easier to implement would help significantly.

On the standards front, APHL will continue working with the Food and Drug Administration's Systemic Harmonization and Interoperability Enhancement for Laboratory Data (SHIELD) Program to make standardized LOINC's available out of the box. APHL will look for guidance and input from its Informatics Committee and Data Modernization Subcommittee for how to advocate for member laboratories in this space.

The public health laboratory community would benefit from guidance and examples on developing effective data modernization roadmaps, including their format, priorities, function and practical use. In some cases, laboratories may be unaware of existing agency-wide roadmaps, or those roadmaps may not adequately reflect laboratory-specific projects and priorities. The Data Modernization Subcommittee can help by developing practical guidance, templates, and frameworks ensuring laboratory needs are integrated into both laboratory-specific and broader organizational planning processes.

With 80% interested in emerging technologies, the strong interest in learning from peers supports regular webinars and workshops on priority topics, development of communities of practice around specific modernization activities, creation of a repository of shared resources and best practices and facilitated connections between laboratories at similar stages. APHL already offers quarterly Interoperability Forums and monthly user groups for popular LIMS and integration engines. Respondents clearly want more of these communities-of-practice.

Based on high demand for tools and resources, the Subcommittee will work with APHL to create sample technical architecture diagrams (63% of respondents want this), develop LIMS requirements documentation (52% of respondents want this), provide infrastructure assessment templates (54% of respondents want this) and share project management templates (49% of respondents want this).

With 34% of respondents citing legacy systems as roadblocks and 50% of respondents actively conducting replacement projects, the Subcommittee will work with APHL to develop guidance for system selection and implementation, share lessons learned from successful replacements, create vendor comparison resources and facilitate group purchasing or shared procurement when possible.

Data modernization is not simply a technical upgrade; it is a fundamental transformation in how public health laboratories operate, share information and serve the public. While the journey is challenging, the survey demonstrates that laboratories are committed to this transformation and eager to learn from one another. By working collaboratively and sharing knowledge, the public health laboratory community can accelerate progress and build the modern, interoperable data infrastructure needed to protect and improve population health.

Acknowledgements

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The Data Modernization Subcommittee consists of the following members:

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For More Information

For more information about APHL's Data Modernization Subcommittee or to access resources for laboratory data modernization efforts, please visit www.aphl.org or contact APHL at informatics@aphl.org.



Association of Public Health Laboratories

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

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