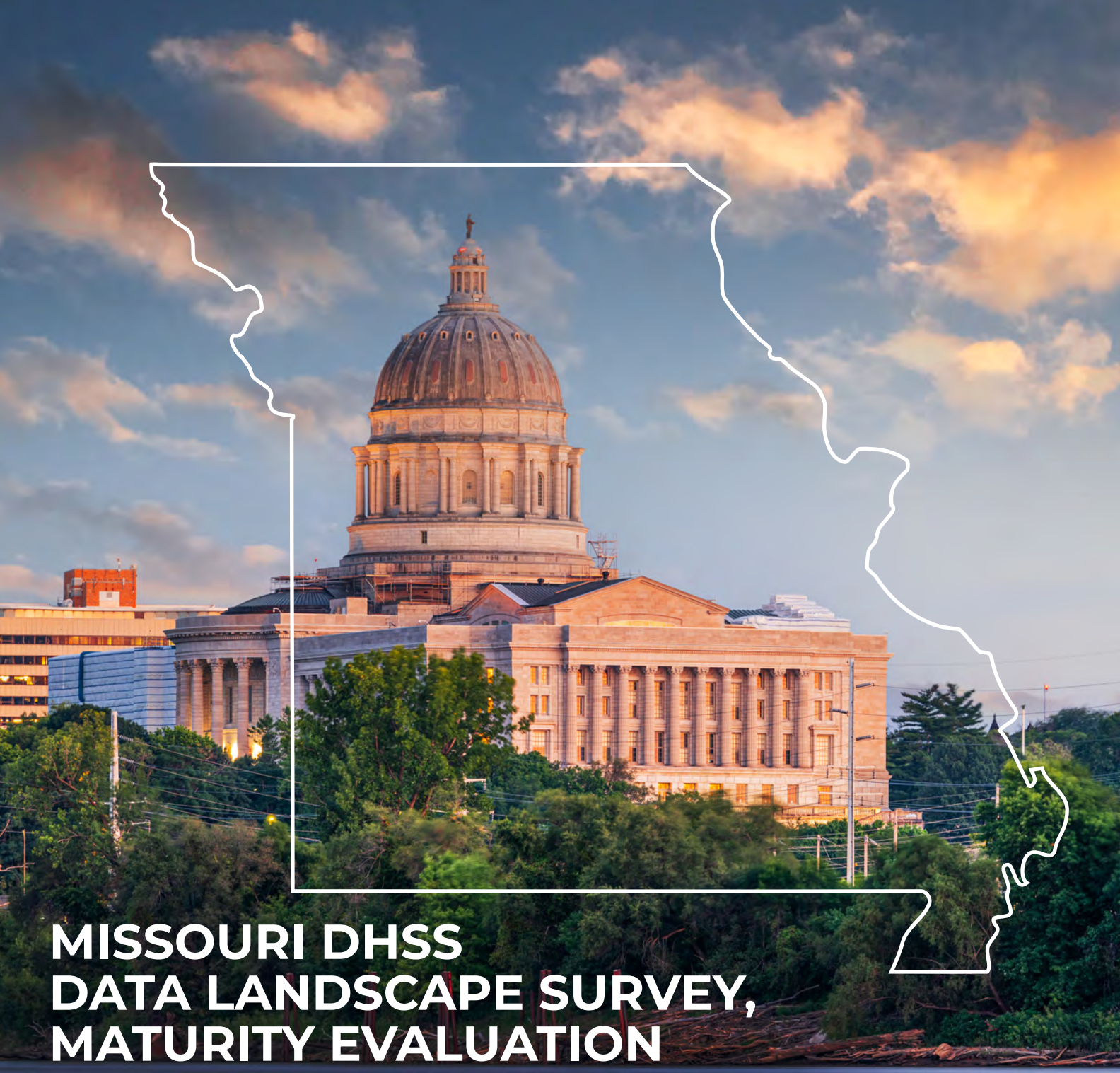

MISSOURI DHSS DATA LANDSCAPE SURVEY, MATURITY EVALUATION AND STRATEGIC ASSESSMENT

Delivered by: **Guidehouse, Inc.**

MISSOURI DEPARTMENT OF HEALTH & SENIOR SERVICES

JANUARY 2025

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ACRONYM	DESCRIPTION
AAA	Area Agencies on Aging
AARP	American Association of Retired Persons
ACOG	American College of Obstetricians and Gynecologists
AMCHP	Association for Maternal and Child Health Programs
ASTHO	Association of State and Territorial Health Officials
BAA	Business Associate Agreement
BHCADD	Bureau of Health Care Analysis and Data Dissemination
BRFSS	Behavioral Risk Factor Surveillance System
CCBHC	Certified Community Behavioral Health Center
CDC	The Centers for Disease Control and Prevention
CLS	County-Level Study
CMS	Centers for Medicare and Medicaid Services
CNP	Community Nutrition Program
CS-CASH	Central States Center for Agricultural Safety and Health
DA	Division of Administration
DCPH	Division of Community and Public Health
DCR	Division of Cannabis Regulation
DHSS	Department of Health and Senior Services
DRL	Division of Regulation and Licensure
DSDS	Division of Senior and Disability Services
EAFEC	Elder Abuse Financial Exploitation Response Coordination
eHARS	Enhanced HIV AIDS Reporting System
EHR	Electronic Health Record
EMR	Electronic Medical Record
EMS	Missouri Emergency Medical Services
EnvSurv	Environmental Surveillance
EPHT	Environmental Public Health Tracking
ESRI	Environmental Systems Research Institute
ESSENCE	Electronic Surveillance System for the Early Notification of Community-Based Epidemics
ETL	Extract, Transform, Load

ACRONYM	DESCRIPTION
FDA	Food and Drug Administration
FEMA	Federal Emergency Management Agency
FHIR	Fast Healthcare Interoperability Resources
FQHC	Federally Qualified Health Center
HAI	Healthcare Associated Infection
HAN	Health Alert Network
HESS	Hospital Electronic Syndromic Surveillance
HHS	Health and Human Services
HIPAA	Health Insurance Portability and Accountability Act
HL7	Health Level Seven
IHN	St. Louis Integrated Health Network
IT	Information Technology
ITSD	Information Technology Services Division
LACIE	Lewis and Clark Information Exchange
LIMS	Laboratory Information Management System
LPHA	Local Public Health Agency
MA4	Missouri Association of Area Agencies on Aging
MARS	Missouri Ambulance Reporting System
MHD	Missouri HealthNet Division
MICA	Missouri Information for Community Assessment
MoALPHA	Missouri Association of Local Public Health Agencies
MOCIL	Missouri Centers for Independent Living
MOEVR	Missouri Electronic Vital Records
MOHSAIC	Missouri Health Strategic Architectures and Information Cooperative
MOPHIMS	Missouri Public Health Information Management System
MOU	Memorandum of Understanding
MOWINS	Missouri WIC Information Network System
MPCA	Missouri Primary Care Association
MPHI	Missouri Public Health Institute
NCEZID	National Center for Emerging and Zoonotic Infectious Diseases

ACRONYM	DESCRIPTION
NPP	Notice of Privacy Practices
OEC	Office of Emergency Coordination
OA	Office of Administration
OpenELIS	Open Enterprise Lab Information System
OPHDST	Office for Public Health Data, Surveillance, and Technology
OPHI	Ozarks Public Health Institute
PASRA	Patient Abstract System Reporting Application
PPMP	Physician Prescribing Monitoring Program
REDCap	Research Electronic Data Capture
ROTA-R	Rural Opioid Technical Assistance Regional Center
SDOH	Social Drivers of Health
SHINE	Show-Me Health Information Network of Missouri
SLACO	St. Louis Association of Community Organizations
STL-BHC	St. Louis Area Business Health Coalition
SPHL	State Public Health Laboratory
WebSurv	Disease Surveillance System
WIC	Special Supplemental Nutrition Program for Women, Infants, and Children

Dear Fellow Missourians,

We are excited to present the "Missouri Public Health Data Landscape Survey, Transformation Maturity and Strategic Assessment Report." This comprehensive report is divided into three key sections: the Landscape Survey, the Transformation Maturity Score and the Strategic Assessment. Together, these sections offer a detailed overview of our data usage, systems interoperability and the strengths and opportunities within our public health data infrastructure.

DHSS extends heartfelt gratitude to our local public health and health care partners, area agencies on aging, the wide range of community participants and our internal team who generously contributed their time and insights on topics such as governance and workforce, interoperability and predictive analytics. This report is the result of robust and collaborative efforts that have highlighted the status of data modernization in Missouri.

This report will guide our work in the years ahead as we continue to enhance and modernize Missouri's data infrastructure. Recent years have underscored the critical importance of a robust public health data ecosystem, and this report serves as a foundation for future strategies and areas of focus to achieve better health for all Missourians.

Modernizing our data ecosystem will benefit from enhanced collaboration across Missouri's communities, public health ecosystem and partnerships with key contributors and organizations. We look forward to working together to advance public health and better serve Missouri.

Sincerely,

Paula F. Nickelson

Paula F. Nickelson
Director

EXECUTIVE SUMMARY

Executive Summary

The Missouri Department of Health and Senior Services (DHSS, "the department") sought to achieve a comprehensive understanding of the public health data landscape across the department in its divisions, offices, bureaus and programs as well as with their community partners. The department desired a strategic assessment of their public health data, analytics and technology to provide a foundation for future improvement initiatives. The department contracted with Guidehouse, Inc. ("study team") and its strategic partner, the Healthcare Information and Management Systems Society (HIMSS), to undertake a statewide effort to identify, describe, map and visualize the current state of public health information practices and technology in the context of departmental operations, external relationships and the statewide public health information ecosystem. Collectively, these efforts made up the Data Landscape Survey, Maturity Evaluation and Strategic Assessment Project ("the project," "strategic assessment").

Project Components and Methodology

The project was designed to address the increasing need to navigate complex data flows and structures in DHSS' various divisions and develop an understanding of current practices, processes and tools. The project utilized relationships and collaboration with various public health entities across Missouri and within the department to gather and refine information. With a focus on a best-in-class interdisciplinary collaboration, the project aimed to identify and make recommendations towards improving the methods by which individuals, programs, bureaus and divisions access, analyze and leverage data effectively and efficiently in decision-making processes to better serve the citizens of Missouri.

This report is the culmination of a three-phased project including a department-wide, data systems mapping exercise, data systems maturity evaluation (including a transformation maturity score) and comprehensive, statewide participant engagements. Seven recommendations were developed and finalized from all three phases, heavily influenced by the department data systems maturity evaluation, identified later is this report as Opportunities for Advancing Digital Transformation for DHSS, and from a best-in-class stakeholder engagement process, described in detail later in this report. The objectives of the report include the following:

- Outline best practice recommendations for enhancing public health data, analytics and technology.
- Determine opportunities for additional data-sharing and collection.
- Identify opportunities for local partner integration, technology and digital maturation exploration at all levels of public health.

Transformation Journey Report

The digital maturity of the Missouri Department of Health and Senior Services divisions, offices, bureaus and programs was measured by the study team with data collected through the HIMSS Digital Health Indicator (DHI) assessment tool. This decision to deploy the DHI tool by DHSS, which was adapted specifically for this public health project, is the first application of the DHI tool at a state public health agency to conduct an assessment of digital maturity. The decision by DHSS to use the DHI tool is representative of the visionary approach to this project. The digital health assessment of the Missouri Department of Health and Senior Services is provided in the Transformation Journey Report, the results from which underpin the final recommendations provided to DHSS. The department continues to seek opportunities to cooperatively assess the digital maturity in the local public health agencies and plans to reassess DHSS' digital maturity at an appropriate time in the future to measure progress based on opportunities identified in the report.

The objectives of the Transformation Journey Report were:

- Map data flows within and across divisions.
- Evaluate data-driven decision-making processes.
- Identify patterns of data sharing between public health entities and external organizations.
- Assess digital capacity and needs for modernization.

OPPORTUNITIES FOR ADVANCING DIGITAL TRANSFORMATION FOR DHSS

The strategic assessment conducted by the study team and HIMSS has culminated in a set of identified opportunities aimed at enhancing Missouri's public health data infrastructure. These opportunities are designed to address critical areas for improving and strengthening data-driven decision-making and ensuring that the public health information ecosystem is robust, efficient, resilient and capable of meeting the needs of all Missourians. These opportunities provide a roadmap for advancing public health data practices at all levels of the state public health system, promoting collaboration and leveraging technology to optimize data collection, sharing and analysis. Through this strategic assessment and its findings, DHSS aims to build a more integrated and responsive public health system that better serves Missouri's diverse communities.

The assessment synthesizes findings for each of the four DHI analysis objectives and is informed by the results of 59 surveys conducted across DHSS. The results were benchmarked with international DHI results to further inform the design of actionable opportunities to advance digital transformation of DHSS.

Guidehouse Recommendations

1 Enhance Support of Local Public Health and Senior Services Programs and Activities	Augment organizational structures to maximize current capacity at the department level necessary to support local public health and senior services entities and programs. Examples include forming and supporting peer-group learning collaboratives and establishing standardized recurrent trainings.
2 Adopt Information Technology and Data Governance Structures	Design and adopt a DHSS-led operational information technology governance and data governance structure that builds on existing decision-making committees and incorporates other relevant state entities (e.g., ITSD) that adopt and manage technology and data standards, applicable policies and procedures and data quality protocols.
3 Plan and Implement an Enterprise Analytic Environment	Conduct a gap analysis of staff capacity, training needs and develop a data migration plan that culminates in the selection and implementation of an analytic environment to support the ability to efficiently collect, transform, curate, store and analyze currently siloed and disparate data sets.
4 Upgrade and Enhance the Availability of Actionable Web-based Data (MOPHIMS)	Conduct a gap analysis of staff capacity and a technology needs assessment of MOPHIMS. Upgrade and enhance MOPHIMS capabilities to best support the critical data and data analytic needs of DHSS, local public health and senior services entities.
5 Standardize and Expand Departmental Capacity for Training State and Local Staff	Conduct a comprehensive department-wide training needs assessment inclusive of the department and local staff, aimed at quantifying data literacy gaps in DHSS and supported public health and senior services. Develop and publish a training plan incorporating needs assessment results. Design and develop staffing capacity at DHSS to support recurring, statewide training to address gaps identified in the needs assessment.
6 Conduct a Long-Range Technology Strategic Planning Process	Complete a DHSS, enterprise-wide, long-range technology strategic planning process that assesses the current systems portfolio, creates a roadmap for systems replacement, focuses on enhancement and interoperability, prioritizes resource allocation and aligns with department objectives.
7 Assess Current Public Health Statutes and Rules	Analyze current public health statutes, rules, policies and procedures to identify opportunities that inform state public health posture and enhance effectiveness while meeting the health needs of Missouri's residents and improving future response and support during times of disaster and emergency response.

HIMSS DHI Identified Opportunities

- **Advance and standardize digital infrastructure to reduce variability.**
- **Advance citizen engagement and person-centered capabilities.**
- **Advance analytics and predictive modeling to transform data into knowledge and insights to inform decisions.**
- **Build digital capacity within the workforce.**

Final Recommendations

This report provides comprehensive study findings and a prioritized set of recommendations that offer Missouri significant Information Technology (IT) system improvement opportunities and help maximize its data systems' ability to address the needs of all Missourians. The recommendations incorporate the opportunities identified from the Transformation Journey Report and are described at a broad level for statewide impact. Recommendations generated via the study will be considered by the department alongside broader recommendations generated via meetings, participant engagement and public comments.

The Guidehouse recommendations are intended to provide opportunities for Missouri to enhance the public health data infrastructure across Missouri. These recommendations were developed through extensive discussion and guidance provided by DHSS, focused insights shared by focus group participants and partners and analysis of DHSS data systems' relationships. Further details on the recommendations may be found in the Recommendations Section beginning on **page 108**. Please note the recommendations are numbered solely for reference purposes and are not presented in any rank or order.

BACKGROUND

Background

The Need for Data Transformation in Missouri

As Missouri's designated public health agency, DHSS coordinates with 115 local public health agencies and numerous health care partners to deliver essential public health services statewide. The department's extensive reach encompasses approximately 230 programs, supported by over 1,800 public health professionals working throughout Missouri.[i] In 2023, DHSS developed a new strategic plan. The effort was designed to strengthen the public health care system in Missouri from 2023 to 2027.[ii]

The department is tasked with operating the public health system in Missouri and leading its mission to "promote health and safety through prevention, collaboration, education, innovation and response."[iii] Missouri's public health system has been historically under-resourced, and there is acknowledgment from state leaders that this must change to make advances in Missourians' health outcomes.

This visionary initiative undertaken by the Department of Health and Senior Services to comprehensively assess their data systems inventory and better understand the current state of their digital maturity is leading the way for other state public health agencies to follow. The findings and recommendations will position the department to advance digital maturity at both the state and local levels enabling the achievement of an agile, data-driven and high-performing public health system that supports the health of every Missouri citizen.

The State of Missouri's public health is a vital factor in preventing disease and injury, promoting healthy lifestyles and ensuring access to health care services. These systems, when operating at full capacity, address broader factors that influence health at environmental, social and economic levels, and assist in creating safe places to live, work and play for all who reside in Missouri. Targeted and properly designed public health initiatives can lead to longer life expectancies, reduce health care costs and improve the overall quality of life for citizens – from small rural towns to large metropolitan cities and communities.[iv]

Missouri state and local governmental public health is at a critical juncture. Efforts must continue to identify and address complex interconnected factors including Social Drivers of Health (SDOH) defined as "the conditions in the environments where people are born, live, learn, work, play, worship

and age that affect a wide range of health, functioning and quality-of-life outcomes and risks." These are factors such as financial instability, lack of access to healthy food, lack of access to affordable and stable housing and utilities, lack of access to health care and lack of access to transportation.[v] They put individuals at risk for worse health outcomes and increased health care use. Missouri's current health outcomes and trends justify the reasons to evaluate these systems.

Missouri Health Outcomes and Trends

Life Expectancy

Life expectancy in Missouri dropped abruptly between 2019 and 2021, mirroring national trends. COVID-19-related deaths, record high opioid overdose deaths, homicides and suicides all contributed to this significant decline. Missouri's life expectancy is 74.6 years, which is the lowest calculated in about 40 years.[vi]

COVID-19 Pandemic

The impact of the COVID-19 pandemic was apparent in vital statistics collected in 2020 and 2021. COVID-19 was the third-leading cause of death in Missouri for both years, behind heart disease and cancer, which have been the longstanding top two causes of death in Missouri. COVID-19 death counts were higher than unintentional injuries, chronic lower respiratory diseases and stroke (which ranked fourth through sixth respectively). The total number of Missouri resident deaths increased from 62,155 in 2019 to 73,883 in 2020, an increase of almost 19 percent.[vii]

Obesity

According to the 2021 Behavioral Risk Factor Surveillance Survey, an ongoing telephone health survey of adults conducted in all 50 states and coordinated by the Centers for Disease Control and Prevention (CDC), Missouri has an obesity prevalence rate of 37.2 percent in adults and continues to outpace the national average of 33.9 percent. This number jumps to 69.2 percent when including individuals categorized as overweight.[viii]

Maternal Mortality

Missouri experiences high rates of maternal mortality with the 12th highest rate in the United States.[ix] DHSS and state partners are exploring multiple policy and programmatic recommendations that DHSS could potentially implement. They are contained in the report "Multi-Year Look at Maternal Mortality in Missouri: 2017-2019."[x]

Rural Health Disparities

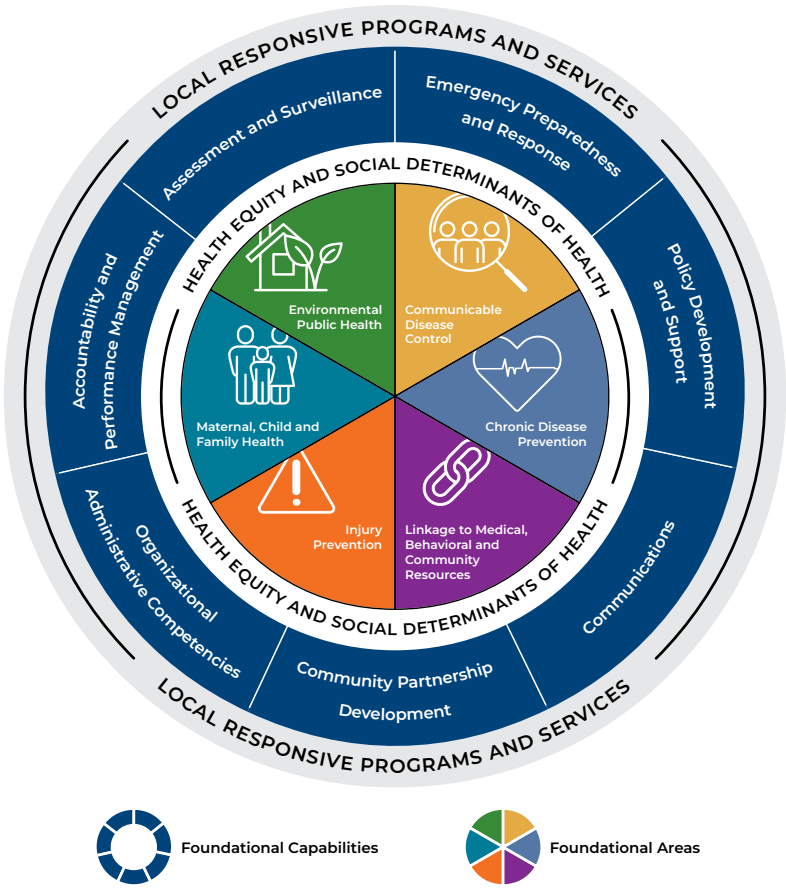
Rural Missourians face higher health disparities than their urban counterparts. These disparities include higher rates of chronic diseases including arthritis, asthma, cardiovascular disease and diabetes.[xi] Rural areas also have higher rates of smoking and limited access to health care services.[xii]

DHSS has recently initiated and adopted a new model of operation that focuses on foundational programs and capabilities that must be available to every Missouri resident and in every community to assure the best opportunity for health. The Foundational Public Health Services (FPHS) model builds on the 10 Essential Services and three Core Public Health Functions.[xiii] The model provides a minimum set of fundamental public health services and capabilities and defines a framework for the consistent application of public health practice in Missouri. Public health agencies can use the model to describe the role of governmental public health in a thriving community, identify capacity gaps, determine the cost for assuring foundational public health capabilities and areas and justify funding requests. The model defines seven cross-cutting foundational capabilities needed to assure the delivery of effective public health services and achieve optimal health outcomes. One the seven foundational capabilities is referred to as Assessment and Surveillance, which includes the ability of practitioners to collect, access, analyze and use data to guide public health planning and decision-making. The recommendations provided in this report fall well within these standards and further work as a result of the recommendations should be guided by the FPHS framework. This model aims to assure six core public health programmatic areas are available through every community, including:[xiv]

1. **Chronic disease prevention**
2. **Communicable disease control**
3. **Environmental public health**
4. **Injury prevention**
5. **Maternal, child and family health**
6. **Linkages to medical, behavioral and community resources**

DATA: A CRITICAL FACTOR

A critical factor of this newly developed model includes the use of data to drive decision-making and to educate, drive and promote public health initiatives for both the department and the public. The health data ecosystem in Missouri is a complex and dynamic landscape. In an era of instant delivery and online access to information, the department is compelled to engage in new ways of doing business to meet these demands. Leadership at DHSS has recognized the need for a comprehensive understanding of this landscape to foster business relationships, inform decisions around modernizing the department's systems to respond to consumer and community needs and increase efficiency within the internal organization.



It was from this perspective the **Data Landscape Survey, Maturity Evaluation and Strategic Assessment,** ("the project," "assessment") initiative was born. While the assessment will not directly solve the identified needs, its goal is to be a cornerstone for future decisions by the department and state leadership. The high-level business needs that the assessment aims to provide insight and guidance toward include the following:

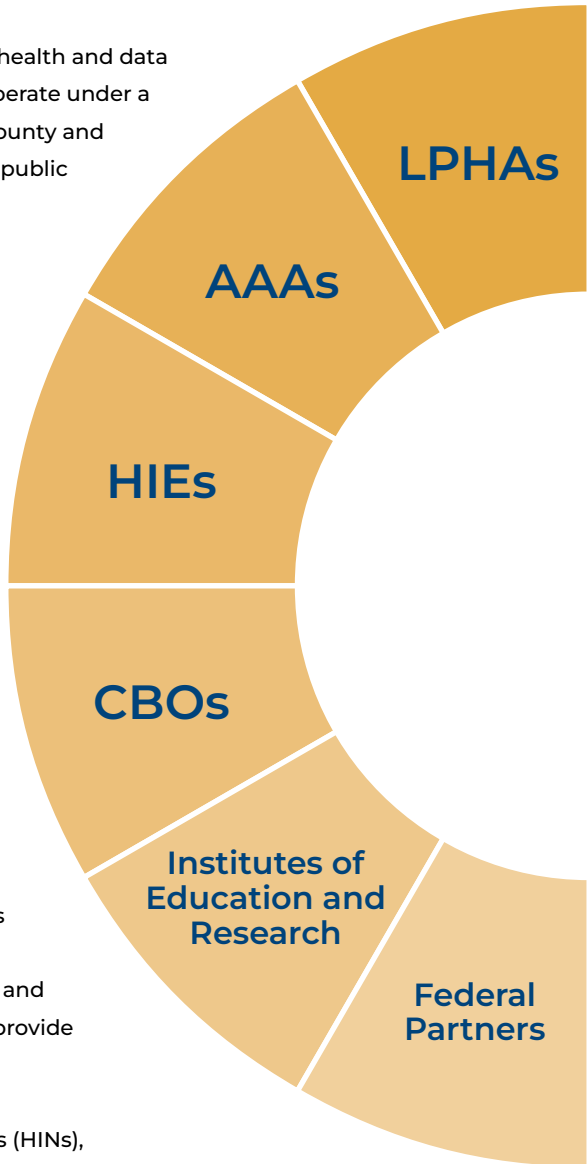
1. Improve regulatory oversight and report generation.
2. Eliminate duplicative data sets, both internally to DHSS and externally to partner organizations, both public and private.
3. Reduce the amount of manual data entry.
4. Standardize functions performed in differing ways across divisions, programs and participants.
5. Modernize heath data systems and eliminate dependencies on antiquated applications.
6. Increase and streamline data exchanges with relevant data partners, both internal and external.
7. Ensure compliance with data security standards.
8. Ensure data quality, integrity and completeness.

DHSS anticipates that this project will address the pressing need to identify the current state and future opportunities across public health data, analytics and visualization capabilities. It is also anticipated that this assessment will identify opportunities to optimize and streamline current operations, leverage existing tools and invest resources in a manner that maximizes state resources while strengthening business and operational alignment with the department's vision, mission and values. The project worked towards achieving the vision of the department, namely "optimal health and safety for all Missourians, in all communities, for life."[xv] The strategic execution and operations of DHSS also align to the CDC Data Modernization Initiative (DMI) goal of creating a posture of robust engagement with health care, effective communication with the public, addressing health disparities and advancing efforts to protect and promote health.

To that end, the study team identified, described, mapped and visualized the current state of the public health information ecosystem across DHSS divisions, offices, bureaus and programs as well as local public health organizations and other state and federal agencies through active engagement with identified participants. All proceedings and findings are incorporated into this comprehensive report outlining Missouri's public health data landscape, transformation maturity score and a prioritized set of recommendations to guide a path towards future improvements in data collection, management and utilization.

LOCAL PUBLIC HEALTH GOVERNANCE

Missouri's local public health agencies (LPHAs) play a critical role in governing public health and data within Missouri by providing essential services to their communities. The 115 LPHAs operate under a decentralized system, where public health responsibilities are divided among state, county and municipal authorities. The LPHAs have been a crucial resource for understanding the public health data flows and barriers in Missouri.[xvi]



LPHAs are responsible for on-the-ground disease prevention and control, environmental health services, health promotion and education and emergency preparedness.[xvii] The public health governance structure in Missouri is primarily rooted in the local control of LPHAs. They are governed by county commissions, city councils or independent boards of health, depending on the jurisdiction. The LPHAs receive funding from local taxes, state allocations, federal grants and fees for services. Therefore, the level of resources varies widely among agencies, which was a notable theme throughout the statewide participant engagements.

OTHER COMMUNITY PARTNER GOVERNANCE

The Area Agencies on Aging (AAAs) in Missouri play a critical role in supporting older adults and adults with disabilities across Missouri. The AAAs are the local experts regarding programs and services in their local areas, intended to promote adult independence and a high quality of life. Some examples include meal programs, transportation, in-home care, health and wellness programs and caregiver support. AAAs also serve as advocates for older adults and provide information and guidance on health care, housing and legal rights. AAAs work alongside local communities to identify and address the specific needs of older adults in the various regions of Missouri. The Missouri Association of Area Agencies on Aging (MA4) is the statewide association that represents the AAAs. MA4 helps to coordinate and streamline efforts across Missouri, advocate for policies that benefit older adults and provide training and support to the individual agencies.[xviii]

Health Information Exchanges (HIEs), also referred to as Heath Information Networks (HINs), are systems that allow the electronic sharing of health-related information among health care organizations. HIEs are designed to improve the quality, safety and efficiency of health care delivery by ensuring that health care providers have access to accurate and timely patient information. For example, HIEs reduce medical errors and help providers avoid ordering duplicate testing and procedures by providing patient records that enhance care coordination and decision-making.[xix]

Missouri has four HIEs: Lewis and Clark Information Exchange (LACIE), Velatura, Show-Me Health Information Network of Missouri (SHINE of Missouri) and Tiger Institute for Health Innovation. These HIEs interact with provider networks in Missouri and other states, including provider locations in Illinois, Kansas and Arkansas.[xx] Some of the HIEs provide gathered data to DHSS for public health surveillance purposes. This data exchange supports the department's efforts to enhance data sharing and utilization and assists the department in evaluating the effectiveness of public health interventions and policies.

Community-Based Organizations (CBOs) include non-profit groups that operate locally to provide services for the health and well-being of the community. CBOs are typically rooted in the community and have deep knowledge and understanding of local needs, and therefore can tailor their services accordingly. Some examples of CBO programs include health education, disease prevention, social support and advocacy. CBOs often work in partnership with other organizations including government agencies, health care providers and other non-profits, to enhance their impact.[xxi] The CBOs in Missouri are vital for bridging gaps in health care access and addressing broader Social Drivers of Health (SDOH). Due to the high collaboration and community-focus, CBOs are key players in Missouri's health landscape.

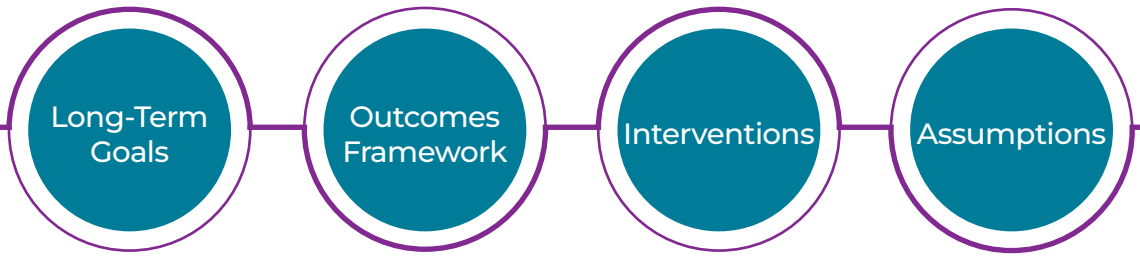
Institutes of Higher Education and Research work to advance knowledge, foster innovation and address societal challenges. They provide advanced education and training to students to prepare the next generation of professionals and researchers. The institutions conduct cutting-edge epidemiological research, contributing to scientific advancements and technological innovations. Institutes of higher education and research also play a major role in public health by developing new treatments or interventions, training public health professionals and helping to shape public health policies and effective health strategies. Missouri is home to several prominent institutions that significantly contribute to public health, including the Ozarks Public Health Institute at Missouri State University, University of Missouri, Washington University in St. Louis and Saint Louis University. These institutions collaborate with local, state and national health agencies to address public health challenges and improve health outcomes in Missouri.[xxii, xxiii]

Federal Agencies play a critical role in supporting public health initiatives across the United States, including in Missouri. These agencies provide funding, technical assistance and policy guidance to state and local health departments, ensuring a coordinated and effective public health response. The CDC is a primary federal agency responsible for protecting public health by controlling and preventing disease, injury and disability. It provides funding and technical support to Missouri and its LPHAs for various public health programs.[xxiv]

Guiding Principles

The study team has used the Theory of Change[xxv] as a guidance for developing the project's approach. This methodology, which helps understand how and why a desired change is expected to happen in a particular context, has three key benefits. First, it improves planning by clearly linking recommendations to outcomes. Second, it allows for more effective monitoring and evaluation through continuous progress tracking. Finally, it increases transparency and accountability, as the project's logic is thoroughly detailed and thought out. The Theory of Change is widely used in program planning, implementation and evaluation for the purpose of identifying desired outcomes and then working backward to determine the necessary steps to achieve these outcomes.[xxvi] Transparency and community partner involvement were main priorities of DHSS in this project, and the Theory of Change helped achieve those goals.

The key components of any Theory of Change include:



The primary, **long-term goal** for DHSS with this Data Modernization Initiative is to make the right data available at the right time to improve the health and well-being of Missourians. The **outcomes framework** includes improving data flows within Missouri to allow more timely access to usable data, so that all members of the public health system may improve their analytic capabilities and quality of care. The **interventions** can be found in the recommendations section of this report. Finally, the **assumptions** include the information that the study team gleaned from the Participant Engagement series, which can be found in the Phase 3 section of this report.

The study team developed the project's guiding principles, which are rooted in the Theory of Change. The Guiding Principles were presented throughout the assessment, including to community partners, to introduce the project's purpose prior to initiating a dialogue. The Guiding Principles are as follows:

If we know that...

Public health data is **fragmented and siloed** and does not currently allow for efficient access to extend, upgrade and preserve available data; this ultimately limits the interactions DHSS has with the people they serve.

Then we must modernize by...

Improving efficiencies and capabilities to withstand operational interruptions, fluctuation in funding, changing data needs and the effects of rapidly evolving technology.

So that...

Data and public health systems can be utilized to make the **right health information accessible at the right place and time** to improve the health and welfare of all Missourians.

APPROACH

Approach

Project Management Approach

Throughout the project, the study team provided comprehensive project management in close collaboration with DHSS. This included developing the project structure, establishing clear communication channels and continuously monitoring and reporting progress. The study team facilitated information transfers between DHSS and its community partners, formulated a detailed Communication Plan **(Appendix C)** and held bi-weekly meetings with DHSS to discuss project status and priorities. These meetings were documented with detailed minutes and shared via an Executive Dashboard **(Appendix D)**, which was updated weekly. Additionally, the study team held weekly sessions with HIMSS to review interview progress and the development of the HIMSS Transformation Journey Report.

Methods: Program Evaluation Phases

DHSS and the study team utilized a phased approach to complete the Data Landscape Survey, Maturity Evaluation and Strategic Assessment. Although most of the phases occurred concurrently, each phase had discrete purposes, goals and activities. The phases are summarized in **Figure 1**, and details of each phase, any dependencies and relevant outcomes are described in detail below.

Figure 1: Program Evaluation Phases

Purpose

To identify, describe, map and visualize the current state of public health information practices, data and tools across departmental operations and the statewide public health information ecosystem.

Key Activities

- Conduct comprehensive reviews.
- Develop initial mappings.
- Establish baseline data visualizations and workflow optimizations.

Purpose

To evaluate and score public health information practices using an industry-accepted digital health transformation and maturity framework.

This work was done in collaboration with HIMSS.

Key Activities

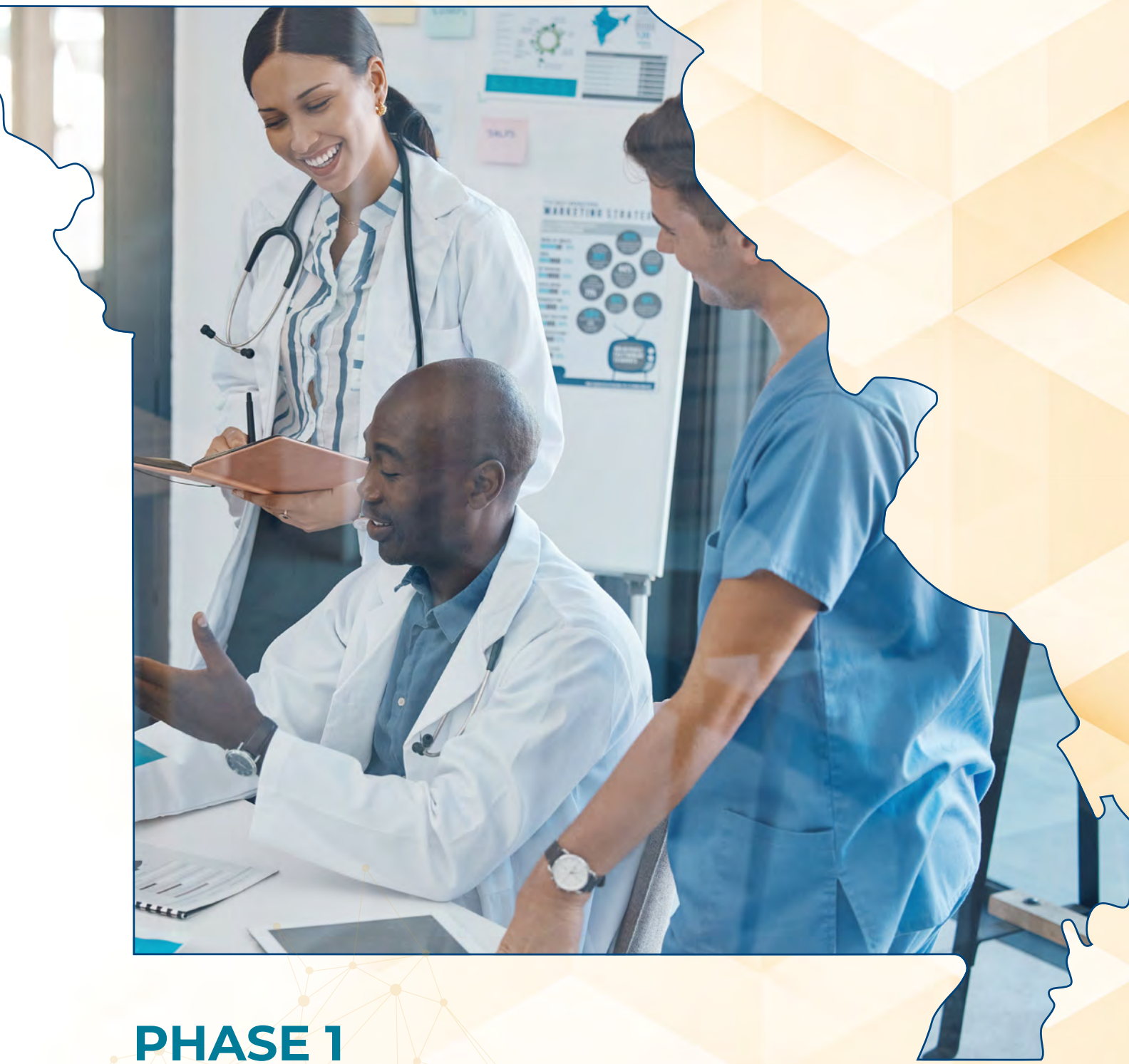
- Implement assessments and scoring systems.
- Begin the transformation based on identified opportunities and strategic considerations.

Purpose

Harness the detailed analyses and evaluations conducted in the previous phases to develop actionable and forward-looking strategies by integrating data insights with stakeholder inputs. Strategies address current inefficiencies and anticipate future public health needs.

Key Activities

- Develop comprehensive strategies.
- Conduct deep dives into public health data utilization.
- Engage with stakeholders to refine strategic initiatives.



PHASE 1

Phase 1

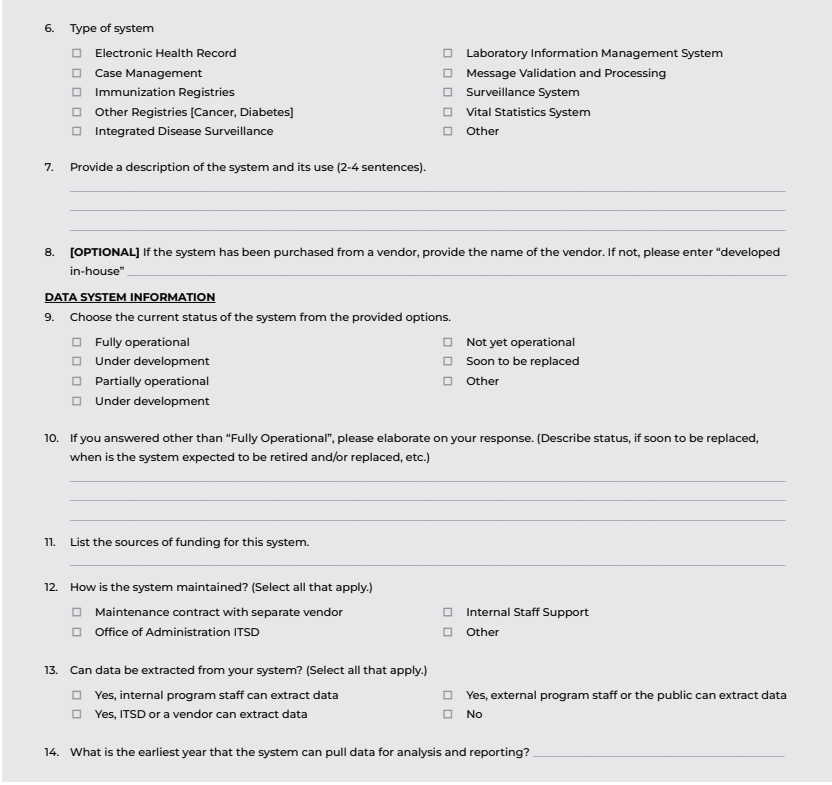
PUBLIC HEALTH DATA LANDSCAPE SURVEY

Purpose: To identify, describe, map and visualize the current state of public health information practices, data and tools across departmental operations and the statewide public health information ecosystem.

For Phase 1 of the project, the study team conducted a thorough evaluation of the existing DHSS public health information systems, data and tools. By using existing survey data, administering a new department-wide survey and collaborating with the DHSS Data Modernization Leadership Advisory Group, the study team produced a final data map of DHSS systems in Missouri. The results of this assessment of departmental systems sets the foundation for further evaluation of the department's current systems inventory, external relationships and the broader statewide public health information ecosystem in later phases of this project.

DATA COLLECTION: QUANTITATIVE DATA SOURCES

The study team began Phase 1 by extracting information from existing department documents and information. An application inventory was provided by the Information Technology Service Division (ITSD) that served as the foundation for data systems. The study team was provided the opportunity to add questions to an Electronic Data Exchange Interest and Readiness Survey being conducted by Missouri State Public Health Laboratory (SPHL) of all local public health agencies (LPHAs), various clinics, hospitals, birthing centers, laboratories and university clinics. The lab survey provided the team with a list of the data systems that interact with DHSS and information about their Electronic Health System (EHR). The study team developed an additional data collection tool built off the lab survey called the "Public Health Systems Inventory Tool" via Microsoft Forms. With the help of DHSS, the study team identified a comprehensive list of individuals who work with or have knowledge of DHSS data systems in Missouri. Respondents were asked to complete the questionnaire, which assisted the study team



6. Type of system
   - ☐ Electronic Health Record
   - ☐ Case Management
   - ☐ Immunization Registries
   - ☐ Other Registries [Cancer, Diabetes]
   - ☐ Integrated Disease Surveillance
   - ☐ Laboratory Information Management System
   - ☐ Message Validation and Processing
   - ☐ Surveillance System
   - ☐ Vital Statistics System
   - ☐ Other
7. Provide a description of the system and its use (2-4 sentences).
8. **[OPTIONAL]** If the system has been purchased from a vendor, provide the name of the vendor. If not, please enter "developed in-house"

DATA SYSTEM INFORMATION

9. Choose the current status of the system from the provided options.
   - ☐ Fully operational
   - ☐ Under development
   - ☐ Partially operational
   - ☐ Under development
   - ☐ Not yet operational
   - ☐ Soon to be replaced
   - ☐ Other
10. If you answered other than "Fully Operational", please elaborate on your response. (Describe status, if soon to be replaced, when is the system expected to be retired and/or replaced, etc.)
11. List the sources of funding for this system.
12. How is the system maintained? (Select all that apply.)
    - ☐ Maintenance contract with separate vendor
    - ☐ Office of Administration ITSD
    - ☐ Internal Staff Support
    - ☐ Other
13. Can data be extracted from your system? (Select all that apply.)
    - ☐ Yes, internal program staff can extract data
    - ☐ Yes, ITSD or a vendor can extract data
    - ☐ Yes, external program staff or the public can extract data
    - ☐ No
14. What is the earliest year that the system can pull data for analysis and reporting?

in mapping Missouri's current DHSS data systems. The term "data systems" could mean a variety of different types of database systems that perform a singular or multiple functions. These data systems also included Microsoft Excel spreadsheets, Microsoft Access databases, REDCap web applications for building and managing online surveys and databases and other data environments. DHSS allowed 21 days for participants to submit responses about their data systems.

For a full list of the questions and answer choices, please see **Appendix E**.

DATA RELATIONSHIP MAPS

Methodology

The system information was collected from various DHSS partners through a survey. In coordination with DHSS leadership, Guidehouse presented multiple mock-ups describing different data relationships. After review, the team decided that a simpler representation of the relationship between business data, the systems that store and process that data and the functions performed with that data would best serve the agency. Additionally, DHSS leadership expressed interest in a summary view showing all the systems that perform a given function.

System Mapping Goals

DHSS' goal of the mapping exercise was to help support the department in achieving the following long-range objectives:

- Enterprise-level information resource and management roadmaps.
- Capability assessment and mapping.
- Strategic planning.
- Moving the department along a digital transformation journey.

The aim of the mapping exercise was to represent a complete list of all department systems, the divisions, offices, bureaus and programs that owned them, the system type, the business data they interacted clearly and accurately with and the functions they performed with the data. The team then refined the survey data to trace these relationships and created mapping prototypes that included a summary view of systems by function and a detailed view of each system, organized by system type. **Table 1** below is an example of the data relationships crosswalk developed of each system, with columns including function, function owners, business and programmatic impact purpose area, subsystem, parent system, system owners and system type. The crosswalk was the final source of information for creating the data map. Prototypes were reviewed by DHSS subject matter experts and refined in collaborative sessions with the Guidehouse team. Each map was reviewed, adjusted and approved following this process.

Table 1: Example of the Data Relationships Crosswalk

FUNCTION	FUNCTION OWNERS	BUSINESS AND PROGRAMMATIC IMPACT PURPOSE AREA	SUBSYSTEM	PARENT SYSTEM	SYSTEM OWNERS
Surveillance System for HIV/AIDS	BDMI	eHARS is a secure, browser-based, CDC-developed application that assists health departments with reporting, data management, analysis, and transfer of data to CDC.	eHARS - Enhanced HIV AIDS Reporting System	BDMI	Surveillance
Surveillance for communicable diseases	BDMI	WebSurv is a homegrown communicable disease surveillance system which houses over 100 communicable diseases. WebSurv was implemented in 2007 and has been used for disease surveillance tracking, investigations reporting, analysis, and case management.	WebSurv	BDMI	Surveillance
Surveillance system for Syndromic data	BHCADD	ESSENCE is a surveillance system that allows public health to detect and monitor health threats by tracking symptoms of patients in EDs and other healthcare settings.	ESSENCE	BHCADD	Surveillance
Data used to assist with community assessments	BHCADD	The Missouri Information for Community Assessment (MICA) is an interactive system that was developed to make health data accessible at the local level through an easy-to-use format. It allows users to summarize data, calculate rates, and prepare information in a graphic format.	MICA	BHCADD	Data Portal
Immunization Registries	Bureau of Data Modernization and Interoperability	ShowMeVax is Missouri's Immunization Information System (IIS). As such, it is a web-based database that maintains complete, accurate, and secure immunizations records for Missouri residents.	ShowMeVax - WebIZ	Bureau of Data Modernization and Interoperability	Registry
Surveillance System	Bureau of Environmental Epidemiology	Sewershed surveillance provides data on the presence and amount of viral, bacterial, or other pathogenic agents in wastewater systems. It is a cost-effective and comprehensive way to monitor the health of entire communities and potentially detect disease outbreaks earlier than traditional clinical methods.	Sewershed Surveillance - COVID	Bureau of Environmental Epidemiology	Surveillance
Provides platform for viewing/editing inspection data and attachments for child care facilities	Environmental Health Services	State and LPHA environmental health inspectors electronically collect child care facility inspection data. System assigns work automatically using spatial technology and generates inspection reports. Provides platform for viewing/editing inspection data and attachments.	Environmental Child Care (ECC) System	Bureau of Environmental Health Services	Electronic Inspection System; Surveillance

Department Systems Statistics

A total of 56 unique systems were identified through this mapping exercise. A breakdown of the total number of systems by division and by function is identified below. The MOHSAIC System was mapped but not included in this count as it is an enterprise-wide system used by all divisions, offices, bureaus and programs across DHSS. ***Please Note:*** of the systems identified in the mapping exercise, most serve two or more functions.

Table 2: Breakdown of the Total Number of Systems by Division and by Function

FUNCTION	DCPH		DSDS		DRL		DO		SPHL		TOTAL	
	COUNT	%	COUNT	%	COUNT	%	COUNT	%	COUNT	%	COUNT	%
Records Management	8	31%	5	83%	7	100%	1	14%	9	90%	30	54%
Case Management	14	54%	5	83%	3	43%	7	100%	4	40%	33	59%
Reporting	11	42%	4	67%	6	86%	5	71%	5	50%	31	55%
Data	▪	▪	▪	▪	▪	▪	▪	▪	6	60%	6	11%
Analytics	17	65%	1	17%	4	57%	5	71%	1	10%	28	50%
Unique Systems	**26**		**6**		**7**		**7**		**10**		**56**	

▪ No system reported.

Data Relationship Maps

Phase 1 of the project was born from the growing need for DHSS to visually represent the complex data ecosystem across various department programs and public health and health care systems. Stemming from advancements in data analytics, this project aims to create a comprehensive understanding of the department's data flows and structures as well as foster relationships and collaboration among community partners.

Mapping illustrations identify systems by their type and function, including records management, case management, reporting, data and analytic functions. The future planning objectives include identifying potential system or functional redundancies and opportunities to mitigate operational and sunsetting risks when assessing the need to replace and update legacy systems.

Data Relationship Map Acronyms

ACRONYM	DESCRIPTION
ACTS	Aspen Complaints/Incidents Tracking System
ArcGIS	Arc Geographic Information System
ASPEN	Automated Survey Processing Environment
DB	Data Base
DO	Director's Office
ECCS	Environmental Child Care System
eHARS	Enhanced HIV AIDS Reporting System
EMS	Emergency Medical Services
ESRI	Environmental Systems Research Institute
ESSENCE	Electronic Surveillance System for the Early Notification of Community-Based Epidemics
HCBS	Home and Community-Based Services
LIMSConnect	Laboratory Information Management System
MARS	Missouri Ambulance Reporting System
Mgmt	Management
MICA	Missouri Information for Community Assessment
MoAPSS	Missouri Adult Protective Services System
MoEVR	Missouri Electronic Vital Records
MoHWoRx	Missouri Healthcare Workforce Registry and Exchange
MOHSAIC	Missouri Health Strategic Architectures and Information Cooperative
MOWINS	Missouri WIC Information Network System
Neometrics MSDS IV	Neometrics Material Safety Data Sheets IV
PMSS	Pregnancy Mortality Surveillance System
PPE	Personal Protective Equipment
PRAMS	Pregnancy Risk Assessment Monitoring System
TCD	Time Critical Diagnosis Unit
WIC	Women, Infants, and Children
WIIN	Water Infrastructure Improvements for the Nation
WISEWOMAN	Well Integrated Screening for Women Across the Nation

Legend

FUNCTION TYPES	*PRIMARY SYSTEM FUNCTIONS*
Records Management	Register for business records.
Case Management	Facilitates the management of business processes. This includes, but is not limited to, medical cases, administrative workflows and facilities management.
Reporting	Generates reports for internal or external stakeholders.
Data	Performs digitization or file exchange.
Analytics	Derives analytics from the business data input. This includes, but is not limited to, analytical, quantitative analysis and dashboards.

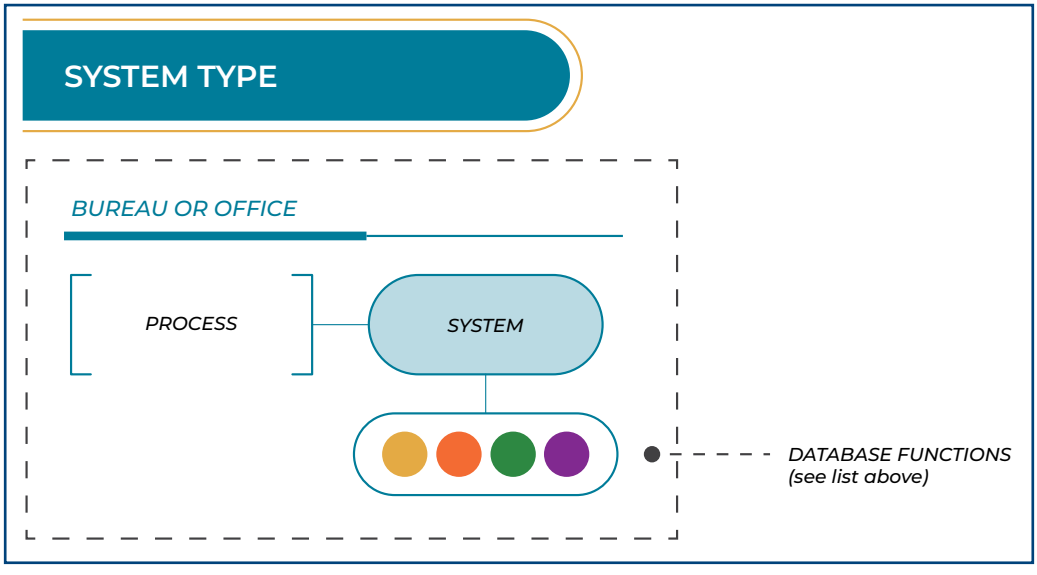


DIAGRAM ELEMENT	*DESCRIPTION*
System Type	Title of each data map. This identifies the primary business function that the database supports.
Business Data	Business process data contained in the database. Also indicates the business functions and intended value.
System	Storage system hosting the business data and performing functions.

PUBLIC HEALTH DATA SYSTEMS

Records Management
Case Management
Reporting
Data
Analytics

Data Modernization and Interoperability

Disease & Condition Surveillance → ShowMe WorldCare

Immunization Information → ShowMeVax

Data Modernization and Interoperability

HIV/Aids Surveillance → eHARS

Environmental Health Services

Legionella Surveillance → Legionella Investigation System

Health Care Analysis and Data Dissemination

Syndromic Data Surveillance → ESSENCE

Community Assessments → MICA

Cancer and Chronic Disease Control

Eligible Program Participants → WISEWOMAN

Eligible Program Participants → Show Me Healthy Women

PUBLIC HEALTH DATA SYSTEMS (continued)

Records Management
Case Management
Reporting
Data
Analytics

Epidemiology

Pregnancy Mortality Surveillance → PMSS

Pregnancy Related Death Information → Maternal Mortality Review

Epidemiology

Pregnancy and MCH Surveillance → PRAMS

Genetics and Healthy Childhood

Child Screening Information → Newborn Screening

Environmental Epidemiology

Wastewater Pathogen Surveillance → Sewershed Surveillance

Vital Records

Birth/Death Registrations → MoEVR

ADMINISTRATIVE SYSTEMS

Environmental Epidemiology

Childcare Facility Funding Requests → WIIN Grant System

Inspection and Permitting Information → Onsite Wastewater and Permitting System

Environmental Epidemiology

Lead Licensing Information → Lead Licensing System

Cancer and Chronic Disease Control

Organ Donors → Donor Registry System

Community Food and Nutrition Assistance

Applications for Funding, Claims and Childcare Facility Monitoring → Community Nutrition Program

Rural Health and Primary Care

Registration Requirements → MoHWoRx

Women, Infants, and Children Nutrition Services

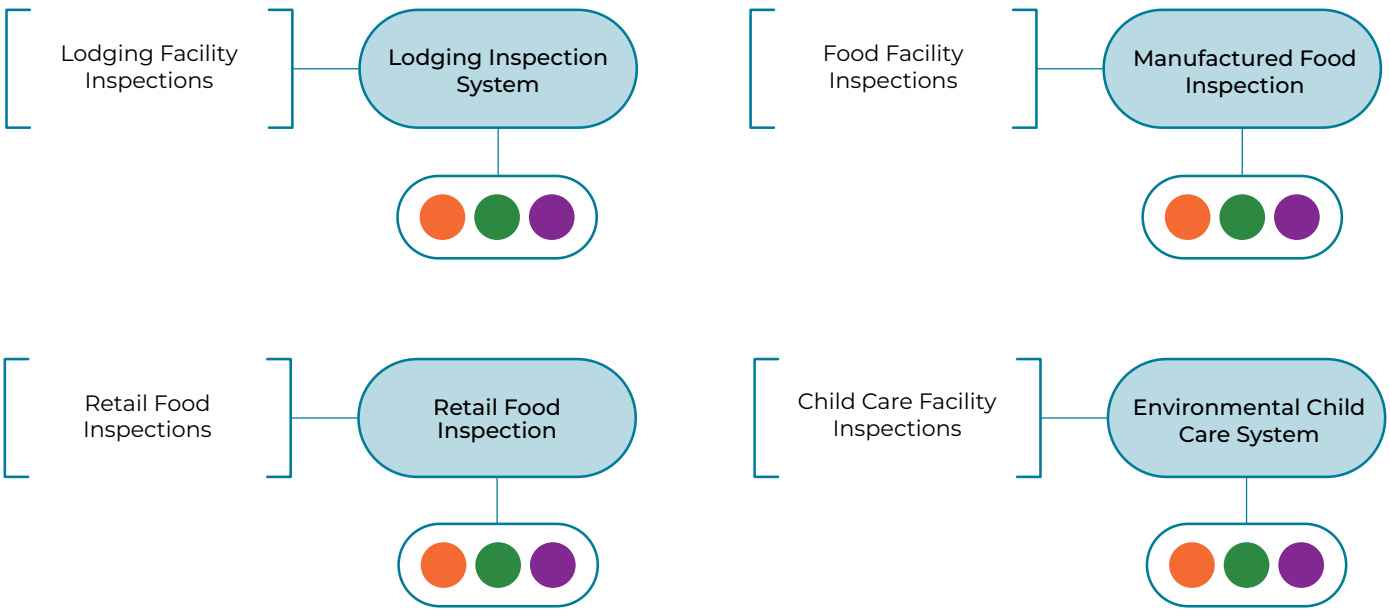
Citizen Benefits → MO WINS

Retail Claims → WIC Direct

INSPECTION/ASSESSMENT SYSTEMS

Records Management
Case Management
Reporting
Data
Analytics

Environmental Health Services

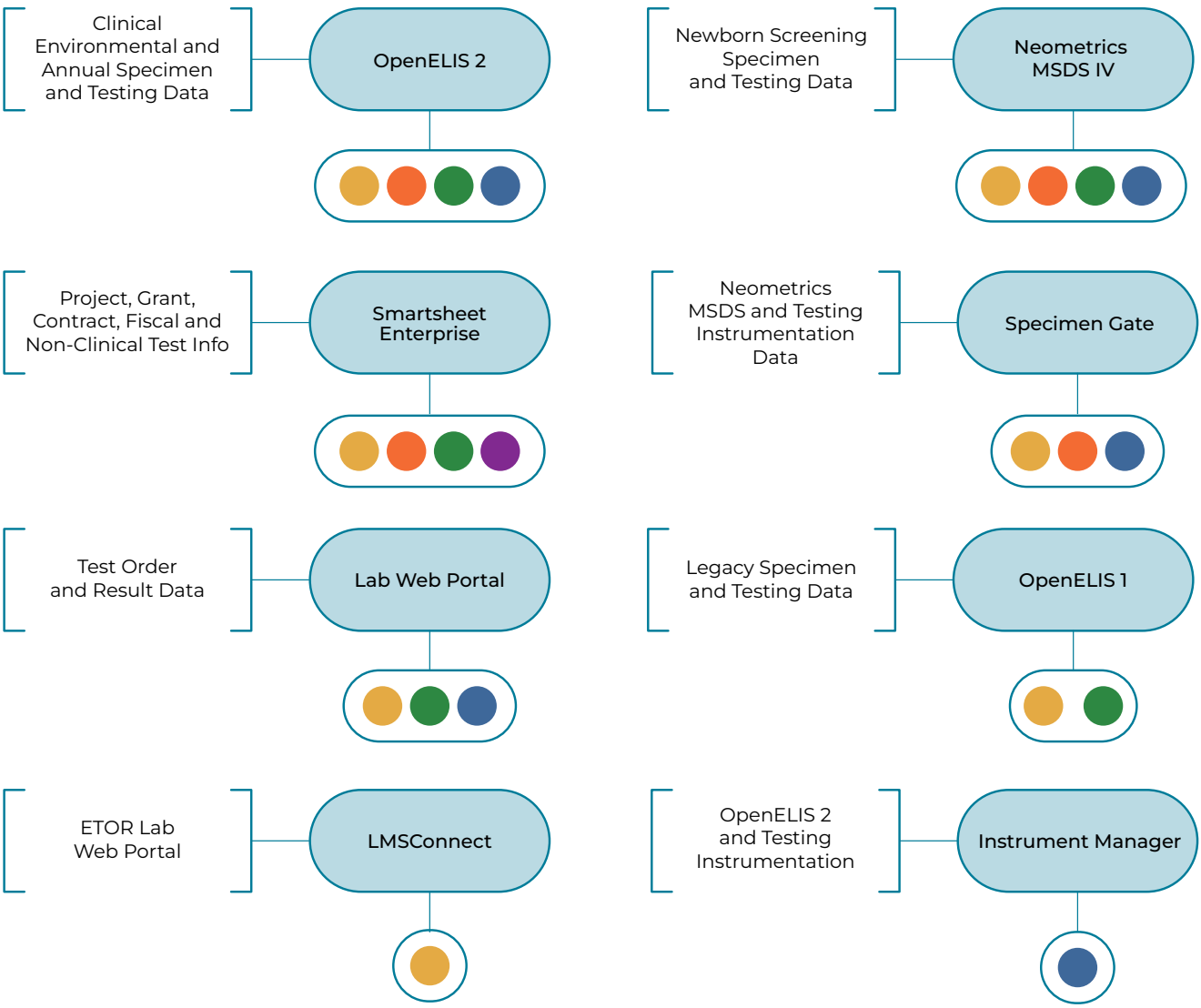


Division of Community and Public Health (DCPH) Systems and Functions Matrix

	Records Management	Case Management	Reporting	Data	Analytics
Public Health Surveillance					
ShowMeVax	✓		✓		✓
ShowMe WorldCare	✓	✓	✓		✓
ESSENCE	✓		✓		✓
Sewershed Surveillance	✓				✓
MoEVR	✓				
eHARS			✓		✓
Legionella Investigation System		✓			
MICA			✓		✓
WISEWOMAN		✓	✓		
Show Me Healthy Women		✓	✓		
Maternal Mortality Review		✓			✓
Newborn Screening		✓			
PMSS					✓
PRAMS					✓
Administrative					
WIIN Grant System		✓			✓
Onsite Wastewater and Permitting System		✓			✓
MO WINS		✓			
MoHWoRx	✓	✓			
Donor Registry System	✓				
Community Nutrition Program	✓				
Lead Licensing System					✓
WIC Direct					✓
Inspection/Assessment					
Lodging Inspection system		✓	✓		✓
Retail Food Inspection		✓	✓		✓
Manufactured Food Inspection		✓	✓		✓
ECCS		✓	✓		✓

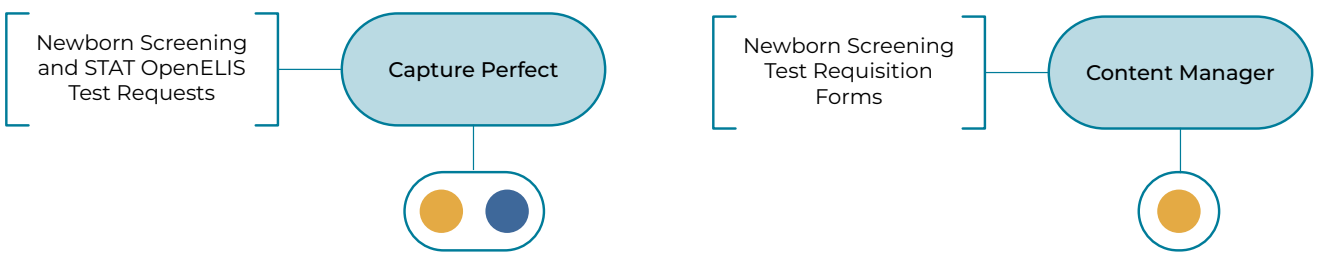
LABORATORY INFORMATION MANAGEMENT SYSTEMS

Missouri State Public Health Lab

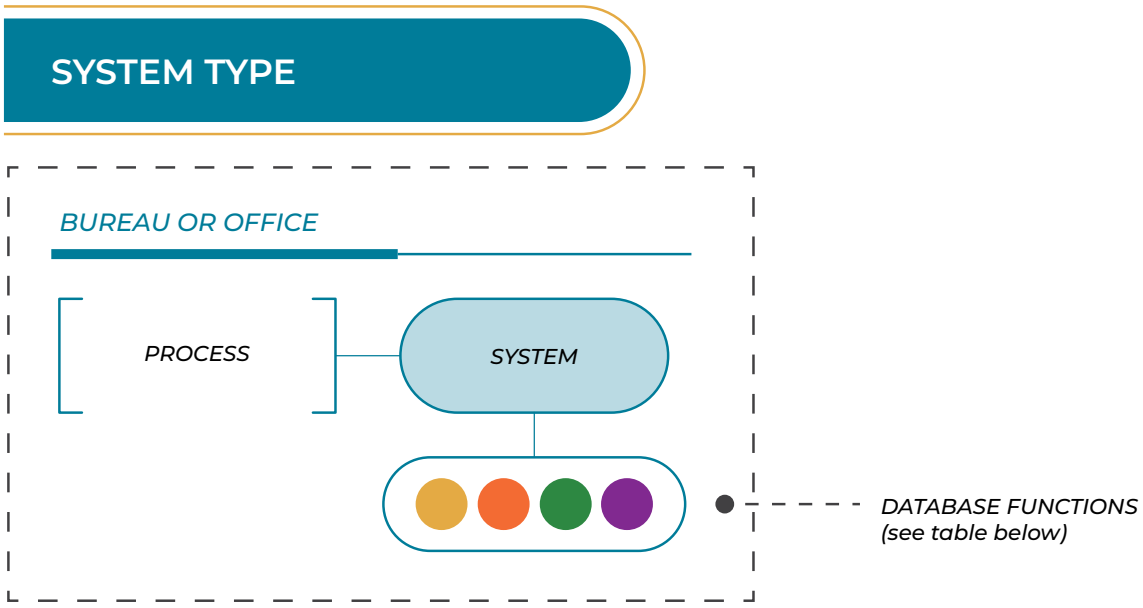


ADMINISTRATIVE SYSTEMS

Missouri State Public Health Lab



DATA LEGEND



State Public Health Labs (SPHL)- Systems and Functions Matrix

	Records Management	Case Management	Reporting	Data	Analytics
Lab Information Management Systems					
OpenELIS 2	✓	✓	✓	✓	
Neometrics MSDS IV	✓	✓	✓	✓	
Smartsheet Enterprise	✓	✓	✓		✓
Specimen Gate	✓	✓		✓	
Lab Web Portal	✓		✓	✓	
OpenELIS 1	✓		✓		
LMSConnect	✓				
Instrument Manager				✓	
Administrative					
Capture Perfect	✓			✓	
Content Manager	✓				

REGULATORY SYSTEMS

- Records Management
- Case Management
- Reporting
- Data
- Analytics

Section for Long-Term Care Regulation

Complaints Against Nursing Homes → ACTS

Nursing Home Survey and Enforcement Activity → ASPEN

Emergency Medical Services

EMS License Tracking and Image Trend License Services → EMS Licensee

Ambulance Patient Care Reports → MARS

Narcotics and Dangerous Drugs

BNDD Registrations and Compliance Inspections → Physician Prescribing Monitoring Program

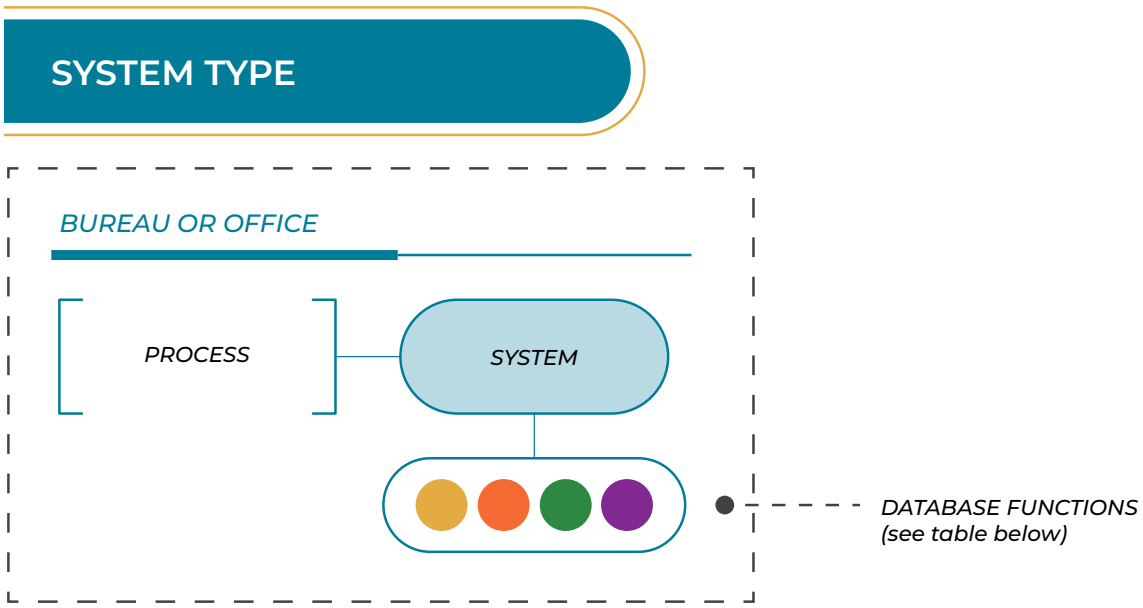
Time Critical Diagnosis

Hospital and Patient Registry Data → TCD Registry

Narcotics and Dangerous Drugs

Nurse Agency Registration Information → ArcGIS (ESRI)

DATA LEGEND



Division of Regulation and Licensure (DRL) Systems and Functions Matrix

	Records Management	Case Management	Reporting	Data	Analytics
ACTS	✓	✓	✓		✓
ASPEN	✓	✓	✓		✓
EMS Licensee	✓		✓		
MARS	✓		✓		
Physician Prescribing Monitoring Program	✓				✓
TCD Registry	✓	✓	✓		
ArcGIS (ESRI)	✓		✓		✓

APPLICATION/REGISTRY SYSTEMS

Records Management
Case Management
Reporting
Data
Analytics

Adult Protective Services

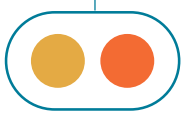
Abuse, Neglect and Exploitation Reports → MoAPSS

Long-Term Care Ombudsman

Bed and Services Self-Report → Long-Term Care Ombudsman Bed and Service Availability Dashboard

Section for Home and Community Based Services

Special Health Care Needs → Service Coordination

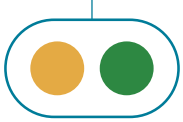


Home and Community Based Services → HCBS Web Tool

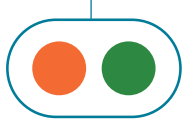
WORK SYSTEMS

Section for Home and Community Based Services

HCBS Provider Enrollment Data → HCBS Provider System



HCBS Work Orders → Field Recorded Evaluation Data



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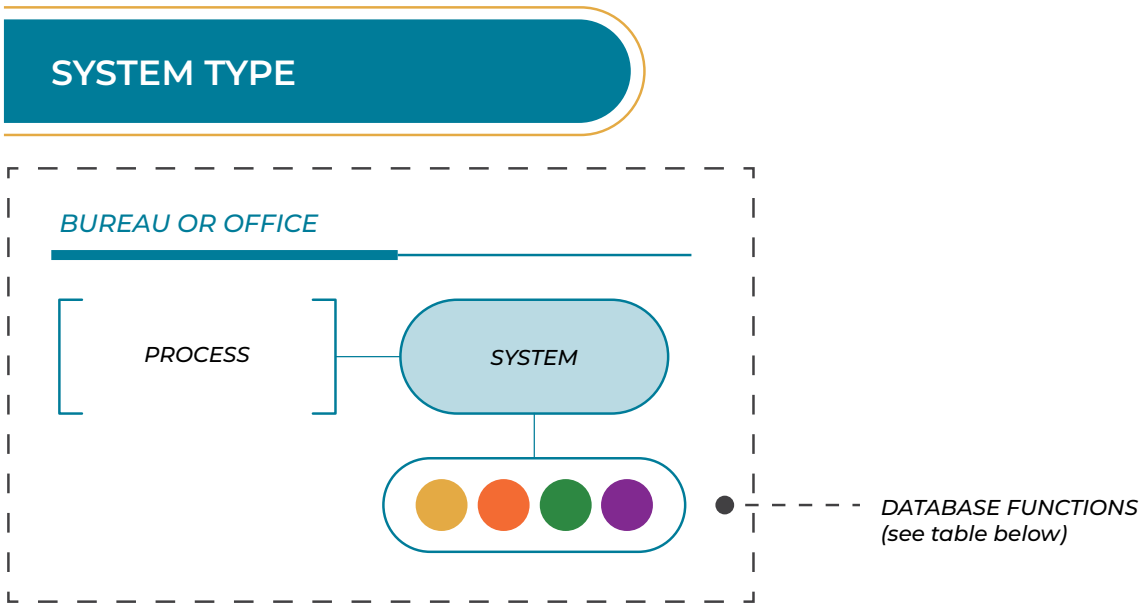


Division of Senior and Disabiity Services (DSDS) Systems and Functions Matrix

	Records Management	Case Management	Reporting	Data	Analytics
Application/Registry					
MoAPSS	✓	✓	✓		
Long-Term Care Ombudsman Bed and Service Availability Dashboard	✓	✓			✓
Service Coordination	✓	✓			
HCBS Web Tool	✓	✓	✓		
Work Systems					
HCBS Provider System	✓		✓		
Field Recorded Evaluation Data		✓	✓		

APPLICATION/REGISTRY SYSTEMS

Records Management
Case Management
Reporting
Data
Analytics

Office of Emergency Coordination

PPE and Antigen Test Orders → PPE and Antigen Test Distribution

Situation Awareness and Response Data → Situational Awareness and Response Monitor

CDC Alerts, Emergency Alert Requests and Notifications → Health Notification System

Respirator Requests → Positive Air Pressure Respirator System

Fit Test Requests → Qualitative Fit Test Distribution

ADMINISTRATIVE SYSTEMS

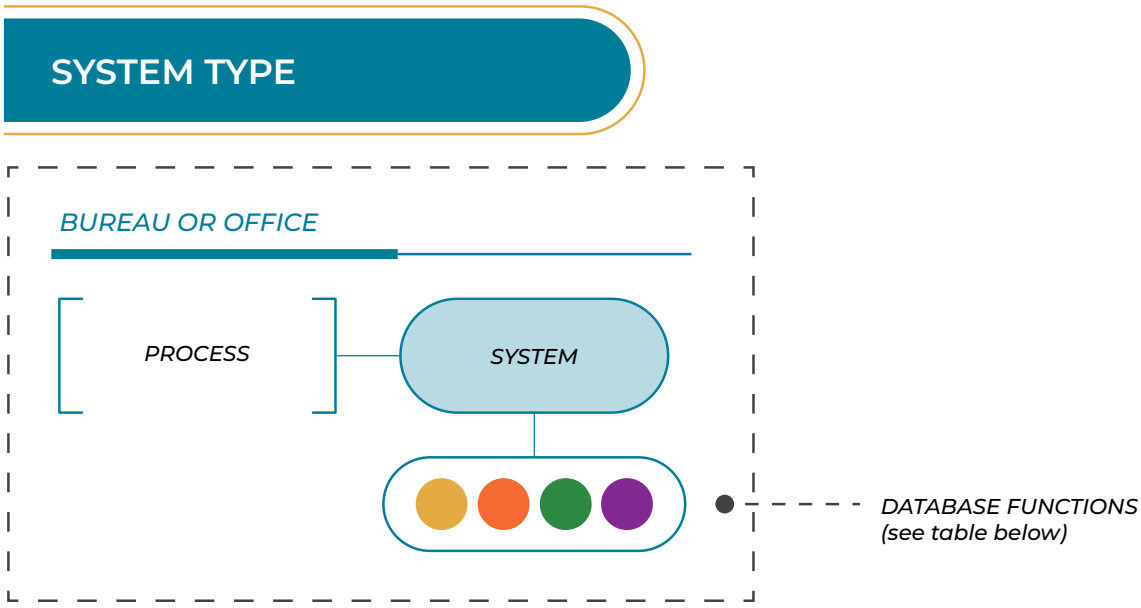
Office of Emergency Coordination

Hospital Diversion Data → Hospital Diversion Tracking

Division of Administration

Contractual Information → DHSS Contract Tracking System

DATA LEGEND



Office of Emergency Coordination (OEC) Systems and Functions Matrix

	Records Management	Case Management	Reporting	Data	Analytics
Application/Registry					
PPE and Antigen Test Distribution		✓	✓		✓
Situational Awareness and Response Monitor		✓	✓		✓
Health Notification System			✓		✓
Positive Air Pressure Respirator System		✓			
Qualitative Fit Test Distribution		✓			
Surveillance					
Hospital Diversion Tracking	✓	✓	✓		✓
Administrative					
DHSS Contract Tracking System		✓	✓		✓

The Missouri Health Strategic Architectures and Information Cooperative (MOHSAIC) is an enterprise-wide integrated information system that was implemented in the 1990s to address the challenge of managing 67 different information systems that operated on disparate platforms and could not communicate with each other. MOHSAIC was included in the data mapping effort to ensure a comprehensive mapping of all systems. The illustration below identifies all the systems MOHSAIC currently integrates with and their associated functions.

Missouri Health Strategic Architectures and Information Cooperative (MOHSAIC) Systems and Functions Matrix

	Records Management	Case Management	Reporting	Data	Analytics
Certificate of Need	✓	✓	✓		✓
Family Care Safety Registry	✓	✓	✓		
Service Coordination	✓	✓			
MoHWoRx	✓	✓			
Public Health Profile	✓				
WISEWOMAN		✓	✓		
ShowMe Healthy Women		✓	✓		
Newborn Screening		✓			

The study team's comprehensive analysis has identified, described, mapped and visualized the current state of public health information processes, data and tools across departmental operations. The visual map of data systems provides several benefits, including:

- Highlights the strengths and weaknesses of the existing data infrastructure to drive future decision-making.
- Provides a high-level inventory of current systems to aid in the implementation of recommendations from this report.
- Helps to improve decision-making by providing a more transparent picture of available data sources.
- Identifies potential gaps in information, optimizing resource allocation, facilitating better surveillance of health trends.
- Enables more targeted interventions based on accurate population data; ultimately leading to more effective public health strategies and improved community health outcomes.

Key insights gleaned from the Data Relationship Mapping exercise include:

1. DHSS systems are fragmented, and many systems perform repetitive functions, indicating an opportunity to consolidate and streamline.
2. DHSS should be intentional with which systems are not consolidated to ensure that the reasons for maintaining multiple systems are accounted for.
3. Deliberate risk identification exercises should be implemented to account for all risks and to help ensure mitigation strategies are considered during planning and implementation of any changes to the current data ecosystem.
4. Clear and straightforward communications with all external partners should be planned and implemented prior to any major changes to systems as these efforts can have far reaching impact at smaller local levels.

PHASE 2

Phase 2

PUBLIC HEALTH DATA TRANSFORMATION SCORE

Purpose: To evaluate and score public health information practices inside DHSS using an industry-accepted digital health transformation and maturity framework.

As part of Missouri's strategic effort to strengthen their public health care system, DHSS initiated a comprehensive digital health assessment through a strategic partnership with Guidehouse and the Healthcare Information and Management Systems Society (HIMSS).

HEALTHCARE INFORMATION AND MANAGEMENT SYSTEMS SOCIETY

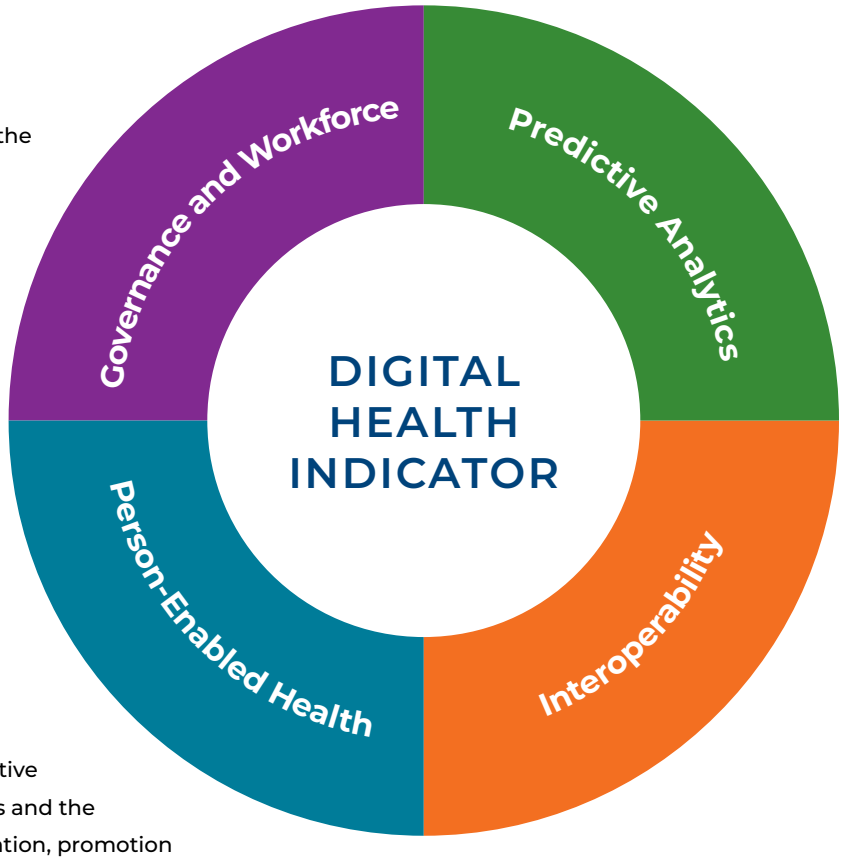
HIMSS is a global advisor, thought leader and member-based society committed to reforming the global health ecosystem through the power of information and technology. As a mission-driven nonprofit, HIMSS offers a unique depth and breadth of expertise in health innovation, public policy, workforce development, research and digital health transformation to advise leaders, partners and influencers across the global health ecosystem on best practices. HIMSS has served the global health community for more than 60 years, with focused operations across the Americas, Europe, the United Kingdom, the Middle East and Asia-Pacific. HIMSS members include more than 125,000 individuals, 430+ provider organizations, 500+ nonprofit partners and 550+ health services organizations.[xxvii]

DIGITAL HEALTH INDICATOR

The HIMSS assessment leveraged the Digital Health Indicator (DHI) tool, an industry-standard evaluation framework, to systematically assess DHSS' digital health capabilities, strengths and opportunities to inform a strategic roadmap to advance digital health transformation of the Missouri public health system.

The DHI tool measures progress toward a digital health ecosystem that connects clinicians and provider teams with people, enabling them to manage their health and wellness using digital tools in a secure and private environment whenever and wherever care is needed. Operational and public health services and processes are measured relative to outcomes that are informed by data and transformed into real-world evidence, to inform decisions and public health services delivery approaches that advance exceptional quality, safety and performance that is sustainable.

The DHI tool is a self-paced, 120-question assessment that evaluates an organization's performance across four dimensions of digital health using a 5-point Likert scale. These dimensions provide a thorough framework to understand and improve the digital capabilities of health organizations, providing data-driven improvements across the spectrum of health services. The dimensions include:



1. **Interoperability:** This dimension examines the flow of data and information, highlighting how well different systems and software platforms exchange and make use of the information within and across organizational boundaries. Assessing interoperability provides insights into data security, automation and the efficiency of collaborations between departments, thereby enhancing service delivery and decision-making processes.
2. **Person-Enabled Health:** Focused on the citizen and community level, this dimension evaluates how effectively data empowers individuals and supports public health services. It looks at the mobilization of data to track health outcomes, the proactive management of public health interventions and the use of digital tools to support health prevention, promotion and self-management.
3. **Predictive Analytics:** This dimension uses data to forecast future needs and outcomes, allowing health organizations to make informed operational and strategic decisions. Analytic tools help identify patterns and trends in health data, which can then be used to improve health services delivery and improve the overall performance of health systems.
4. **Governance and Workforce:** Assessing the governance structures and workforce capabilities in place, this dimension makes certain that there are adequate policies and strategies to support a digitally enabled public health environment. It examines the readiness and competence of the workforce in using digital tools, maintaining data security and achieving equitable health outcomes.

Scored on a scale of 0-400, with higher scores indicating a higher digital health maturity, the tool enables organizations to identify strengths and areas for improvement, benchmark their digital health capabilities against industry standards and develop strategic plans for further digital transformation. Since its introduction in 2018, the DHI has demonstrated significant global impact, having been adopted in 13 countries, generating comprehensive benchmark data and proving its effectiveness in guiding digital transformation initiatives **(Appendix B**). The DHI tool provided an evidence-based approach to evaluating current capabilities of DHSS to inform and guide future investments in digital infrastructure.

It is noteworthy that DHSS is the very first state-level public health organization in the world to deploy a strategy to measure digital capacity and information infrastructure to inform a strategic digital transformation roadmap using the DHI tool. This insight is particularly relevant as globally, jurisdictions are working to strengthen their digital public health data capabilities and competencies to effectively respond to rapidly emerging public health challenges that hold the potential to significantly impact population health.

Understanding the Dimensions

Interoperability

- **Foundational:** Exchange of data accessible across clinical settings.
- **Organizational:** Use of governance tools such as policy, security and privacy.
- **Semantic:** Use of analytics tools and reporting to streamline data access and management.
- **Structural:** Data centralization, automation and integration for seamless data flow.

Person-Enabled Health

- **Personalized:** People set their health and wellness goals and choose the digital tools that enable self management connected to providers when needed.
- **Proactive:** Predictive analytics mobilize citizen-level outcomes data to track progress towards goals.
- **Population Health:** Predictive analytics enable mobilization of data to track population health outcomes to enable proactive health and wellness.

Predictive Analytics

- **Personalized Analytics:** Connection between individuals and their provider teams for outcomes reporting.
- **Predictive Analytics:** Tracking and tracing of outcomes across the journey of care identifying risk and strategy for care quality and safety.
- **Operational Analytics:** Data mobilized to track and improve health system performance.

Governance and Workforce

- **Stewardship:** Leadership strategy informing oversight and accountability policies.
- **Transparency:** Connectivity with people and populations provides indicators of quality, safety and outcomes.
- **Policy and Decision-Making:** Alignment of processes and strategy that support and incentivize performance.
- **Workforce Capacity and Competency:** Transformation of care delivery by advancing digitally enabled care delivery, informed by outcomes data.

Methodology

The Digital Health Indicator is a measurement tool designed for the full spectrum of health care organizations, including acute care, community care and public health. Public health has a unique and critical mandate and role in health systems. Although the DHI tool was designed to be agnostic to the type of health system, the uniqueness of state public health required the HIMSS team to ensure the framing (e.g. wording of indicator statements, examples for each indicator assessed) and the content was reflective of the public health mandate and role in health systems.

The HIMSS team undertook an in-depth review of the DHI indicator statements to ensure the framing and the wording was relevant and reflective of the unique contextual features of state public health systems. The review team included two experts with advanced degrees in public health to review the DHI indicators for terminology and for examples that reflect public health practices and mandate. The outcome of the review resulted in wording changes for approximately 30 percent of the indicators and the introduction of public health examples that reflect the context of public health services and programs, operational and clinical mandate of public health agencies. The new public health version of the DHI tool was subjected to two beta testing phases. The first beta test consisted of a comprehensive review and discussion of each indicator statement with a lead public health expert from the Guidehouse Team. This review examined the wording, relevance and appropriateness of the examples provided for each indicator criteria. The second beta test was a similar in-depth review of the DHI indicators, public health examples and the guided interview strategy with a senior leader of DHSS. This walkthrough offered a second validity check with DHSS leadership on the appropriateness and relevance of the adapted public health version of the DHI tool.

DATA COLLECTION

Participating units whose mandate and roles did not require direct interaction with Missouri residents completed a partial DHI tool that assessed three of the four dimensions, excluding Person-Enabled.

ANALYSIS

The DHI data was subjected to both quantitative and qualitative analyses to provide a more comprehensive understanding of the capacity to flow data, and access to data to inform decisions. The quantitative analysis enabled the identification of direct relationships and statistical patterns, and digital capacity within and between programs. This approach facilitated comparisons between programs and highlighted specific areas of strength and opportunities for advancing digital transformation.

Results of HIMSS Digital Health Indicator Evaluation

HIMSS conducted 59 assessments across DHSS using the DHI tool, conducting both quantitative and qualitative assessments of digital capacity. The findings revealed significant strengths, including a culture that is highly supportive of digital transformation, evidenced by several programs achieving significant advances in digital health. The assessment outcomes revealed several opportunities for advancing digital strengths such as overcoming technological disparities across programs, advancing the capacity for automated data sharing, strengthening workforce capacity and competencies in digitally enabled work environments, advancing citizen engagement and strengthening the analytics strategy. The assessment of DHSS programs was also contrasted with international agencies to examine global benchmarking to further inform additional opportunities to advance modernization of public health infrastructure across its network. The results of the HIMSS assessment provides a foundation for informing the development of a strategic roadmap to advance digital transformation of Missouri's state public health system.

The overall DHI score for the DHSS was 35.6 (Standard Deviation=16.1). This DHI index score is a summative average across all 59 scores, calculated as the percentage (out of 100) achievement for each dimension. Individual division DHI scores are reported in **Table 3**. Division of Community and Public Health (DCPH) achieved the highest average score of 50.8, followed by Division of Regulation and Licensure (DRL) (36.6). The lowest average is 19 for State Public Health Laboratory (SPHL).

In **Table 3** below, a detailed examination of the scores for each of the four dimensions of the DHI tool is provided. The scores are illustrated alongside the North American DHI Average (NA mean).

Table 3: DHI Averages for Each DHSS Division and Each DHI Dimension Compared to the North American Average

DIVISION	DHI SCORE (mean)	GOVERNANCE & WORKFORCE (NA mean=60/100)	INTEROPERABILITY (NA mean=60/100)	PERSON-ENABLED (NA mean=60/100)	PREDICTIVE ANALYTICS (NA mean=60/100)
Mean Scores	**35.6***	52.5	62.2	37.4	24
Range of Scores	7-68	9-95	11-95	6-82	0-85
Community and Public Health (DCPH)	50.8	65.6	84.9	54.9	46.2
Regulation and Licensure (DRL)	36.6	55.8	79.1	▪	12.3
Administration (DA) and Cannabis (DCR)	29.4	43.5	51.0	▪	19.1
Senior and Disability (DSDS)	25.1	45.5	39.6	30.8	4.8
State Public Health Lab (SPHL)	19.0	37.2	32.0	14.4	17.8

* DHSS Mean Score

▪ Teams whose roles did not require interactions with Missouri citizens completed a partial DHI tool that did not include the Person-Enabled dimension.

Transformation Journey Report

Opportunities for Advancing Digital Transformation

The following recommendations were developed based on the results of HIMSS Transformation Journey Report, distinguishing them from the strategic assessment recommendations where qualitative focus group data was collected from LPHAs and other external DHSS partners. These internally-sourced recommendations focus on enhancing digital infrastructure, citizen engagement, analytics and workforce capacity *within* DHSS. They aim to address specific internal challenges and leverage opportunities identified by staff to improve overall efficiency, data sharing and service delivery across the department.

OPPORTUNITY 1: ADVANCE AND STANDARDIZE DIGITAL INFRASTRUCTURE TO REDUCE VARIABILITY AMONG DHSS DIVISIONS, BUREAUS AND TEAMS.

- **Implementing Digital Infrastructure and Standards:** Across divisions, programs are highly varied in their ability to utilize digital tools and provide digital services. Investing in digital infrastructure that offers a standardized, statewide interoperability standard for divisions would insure greater digital capacity and data sharing for all bureaus.
- **Advance Integrated Information Exchange Platforms:** Currently, many of the programs are unable to exchange data in real-time, including bilaterally sharing information across bureaus and teams, or with data repositories such as population data registries.

OPPORTUNITY 2: ADVANCE CITIZEN ENGAGEMENT AND PERSON-CENTERED CARE.

- **Developing Citizen-Centered Care Delivery:** Citizen experience with public health teams is currently limited, with minimal support for digital tools or virtual care options.
- **Strengthen Citizen Data Collection and Citizen Data Flow:** Many programs currently lack systems to record or track health outcomes effectively, leaving patients unable to access or view their own health data such as vaccination records.

OPPORTUNITY 3: ADVANCE ANALYTICS AND PREDICTIVE MODELING TO TRANSFORM DATA INTO KNOWLEDGE AND INSIGHTS TO INFORM DECISIONS.

- **Establish an Analytics Strategy:** Across the programs, there is high variation in the use of analytics and analytic capacity, with many of the programs operating without the ability to access or analyze large data sets for data-informed decisions.
- **Better Identify Potential Risk Through Analytics:** Currently, many programs are not tracking outcomes to proactively identify risk. This leads to more reactive public health interventions where programs are developed once negative population outcomes are identified.

OPPORTUNITY 4: BUILD DIGITAL CAPACITY WITHIN THE WORKFORCE.

- **Foster a Culture of Data-Driven Decision-Making:** Many programs within divisions have demonstrated strong support for advancing digital transformation to support evidence-based decision-making.
- **Build Competency and Capacity for Digitally Enabled Public health services supported by targeted workforce training and development:** Many individuals across programs aspired to advance digital capabilities but were held back from doing so due to lack of adequate digital training for staff. Strengthening resources and opportunities to create a digitally enabled public health workforce would accelerate digital transformation across DHSS.
- **Invest in Automated and Secure Communication Platforms:** Currently, many programs lack efficient, digitally-secure communication platforms to support staff engagement and collaboration.

The comprehensive HIMSS Transformation Journey Report for DHSS can be found in **Appendix B**.

PHASE 3

Phase 3

PUBLIC HEALTH STRATEGIC ASSESSMENT

Purpose: Harness the detailed analyses and evaluation conducted in previous phases to develop actionable and forward-looking strategies by integrating data insights with participant inputs. Strategies address current inefficiencies and anticipate future public health needs.

During the third phase of the project, the study team focused on developing comprehensive strategies to understand and address public health data modernization challenges. The study team conducted deep dives into public health data utilization to identify trends, gaps and opportunities for improvement. The study team engaged participants across Missouri through interviews and focus groups to develop the final recommendations, ensuring alignment with community needs and priorities.

The study team organized and conducted 25 statewide participant events designed to engage a diverse group of partners from across Missouri's public health system. These events included in-person and virtual focus groups, virtual small group interviews and one virtual townhall for all partners to attend.

A regional approach was used to engage with participants to ensure all regions of Missouri, both urban and rural, were provided the opportunity participate. In addition, the study team hosted three virtual meetings and one virtual townhall as part of the participant events to ensure participation by individuals and organizations that were unable to attend in-person meetings.

DEVELOP PARTICIPANT REGISTER

The study team began this phase by developing a participant register. In partnership with DHSS, the study team identified key participants, including state public health departments, local health agencies, health care facilities, academic institutions, nonprofit organizations and community-based organizations. The participant register identified organizations across ten participant channels:

1. DHSS Divisions, Offices, Bureaus and Programs.
2. State-Level Agencies.
3. Health Information Exchange and Community Information Exchange.
4. Hospitals and Health Systems.
5. Institutes of Higher Education and Research.
6. Clinic and Independent Providers.
7. Local Public Health Agencies.
8. Federally Qualified Health Centers.
9. Community-Based Organizations.
10. Federal Agencies.

The study team considered participants and organizations based on their expertise, relationship with DHSS and involvement in public health initiatives.

Throughout the engagement, additional participants were added to the participant register as they were identified by the study team or by other participants.

PARTICIPANT COMMUNICATIONS PLAN

The study team developed a communications plan to ensure consistent and timely communication with both internal and external participants. The communications plan included invitation emails, reminder emails and other outreach directed toward participants. The goal was to provide participants with a thorough understanding of the project's goals, how the information gathered will be utilized and other logistical details about each engagement event.

Table 4 includes a general outline of the communications plan's elements and the intended audience for each correspondence. The full email templates can be found in **Appendix C**.

Table 4: Communications Plan Outline

#	OUTREACH EMAIL	INTENDED AUDIENCE
1	DHSS Director's Email for Initial Participant Outreach	All internal and external participants
2	DHSS Director's Email for HIMSS Outreach	Internal participants – HIMSS DHI interview participants
3	HIMSS Initial Outreach	Internal participants – HIMSS DHI interview participants
4	DHSS Director's Email of Thanks for Participation in DHI Interview	Internal participants – HIMSS DHI interview participants
5	Strategic Assessment Overview and Invitation to Participate	External participants
6	Reminder Email for DHSS DMI Meeting	External participants

In addition, DHSS and the study team engaged divisional leaders and staff at multiple meetings, as shown in **Table 5**, to introduce the project purpose and underscore the importance of the engagement.

Table 5: Introductory Project Meetings with DHSS

#	MEETING NAME	DATE	KEY ATTENDEES
1	Senior Staff Meeting	June 20, 2024	DHSS Divisional Directors
2	DHSS Town Hall Meeting	June 20, 2024	All DHSS staff
3	Deputy Director Staff Meeting	June 27, 2024	DHSS Deputy Divisional Directors

In July 2024, DHSS coordinated with the study team and HIMSS to develop and publish social media announcements and a press release to announce Missouri's data modernization effort and new partnerships, introduce the Digital Health Indicator (DHI) tool and intended outcomes – to modernize State data systems and ultimately, improve the health of Missourians.

JULY 15, 2024

Guidehouse and HIMSS Partner with the Missouri DHSS on Digital Health Assessment

WASHINGTON—July 15, 2024—Guidehouse, a leading global provider of strategy and managed services to commercial and public sector clients, today announced a partnership with the Healthcare Information and Management Systems Society (HIMSS) to deploy HIMSS' Digital Health Indicator (DHI) to assess the Missouri Department of Health and Senior Services' (DHSS') progress toward digital health transformation.

The public health data landscape survey and strategic transformation maturity assessment will leverage HIMSS' DHI to measure the current state of Missouri DHSS' public health information across the agency and its bureaus, divisions and local public health authorities. Assessment results will guide improvements in how data are collected, managed and utilized to create efficiencies and improve the health of Missourians. This is the first time the HIMSS DHI will be used to assess a U.S. state public health department.

"Enhancing the health of Missouri communities requires a clear understanding of our current digital health maturity landscape," said Dr. Josh Wymer, chief health information and data strategy officer at the Missouri DHSS. "We look forward to working with Guidehouse and HIMSS to identify strengths and opportunities to inform a comprehensive digital health strategy designed to increase system capacity and improve population health."

In addition to deploying HIMSS' DHI tool, Guidehouse will engage with DHSS leadership and stakeholders statewide to ensure appropriate entities and individuals provide input into the assessment. HIMSS will conduct an analysis of strengths and opportunities to advance digital capacity.

"It's well established that public health data and information systems nationwide require attention in order to improve data availability and systems interoperability and increase surge capacity," said Tamyra Porter, Guidehouse partner and State Health leader. "We're excited to work with Missouri DHSS and HIMSS on this innovative and ambitious evaluation. This is groundbreaking work that will help inform discussions about a standardized framework for assessing data maturity across state and local public health agencies."

Through this initiative, HIMSS will deliver globally standardized digital health scores across the four dimensions of digital health – governance and workforce, interoperability, predictive analytics and person-enabled health – and prepare a transformation framework of systems and workflows. The DHI tool will also provide information necessary to inform evidence-based decision-making and recommendations for improvements as a critical component of a report to be delivered to DHSS upon completion of the project in early 2025.

"This first-of-its-kind project with Guidehouse and the Missouri Public Health team is well-positioned to establish Missouri's leadership in digital transformation across state public health systems," said Dr. Anne Snowdon, chief scientific research officer at HIMSS. "The HIMSS team is honored to work with these leaders to advance digital maturity in public health agencies that has the potential to achieve an agile, data-driven and high performing public health system to support and strengthen the health of every Missouri citizen."

More than 67,000 institutions across 13 countries work with HIMSS' DHI to create tailored, comprehensive strategies to meet specific health system needs and address priorities. Approximately 43 U.S. healthcare organizations have used the DHI for global benchmarking system-wide, jurisdiction-wide and with individual hospitals.

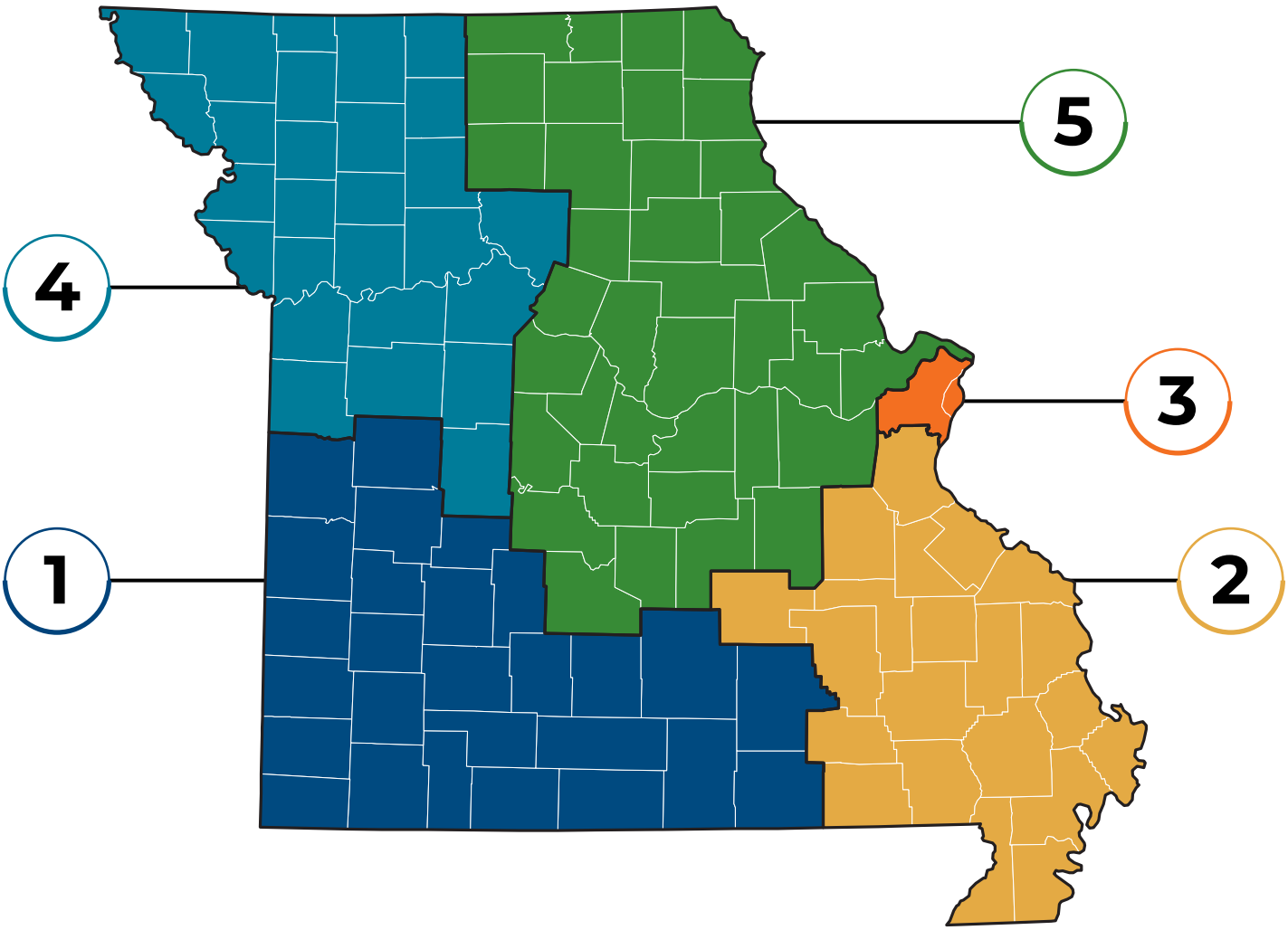
This work is supported by funds made available from the Centers for Disease Control and Prevention (CDC) of the U.S. Department of Health and Human Services (HHS), National Center for State, Tribal, Local and Territorial Public Health Infrastructure and Workforce, through OE22-2203: Strengthening U.S. Public Health Infrastructure, Workforce, and Data Systems grant. The contents are those of the author(s) and do not necessarily represent the official views of, nor an endorsement by, CDC/HHS, or the U.S. Government.

PARTICIPANT MEETING SERIES PLANNING

The study team's regional approach allowed them to meet participants in proximity to their local communities, in a broad selection of localities. Many participants traveled multiple hours to attend a meeting, to ensure their perspective was heard.

Building off regions currently defined and used by DHSS' Division of Senior and Disability Services, the study team broke down the state into five distinct regions, as shown in **Figure 2: Regional Approach to Stakeholder Events**. This structure allowed the study team to conduct five engagement series with five meetings each across the state and ensure that meetings were held where participants could conveniently attend, fostering inclusive and comprehensive stakeholder engagement.

Figure 2: Regional Approach to Stakeholder Events



To capture registrations for each meeting, the study team developed and administered a Microsoft Forms for each meeting series. This provided a user-friendly interface for participants to register and receive reminders about the meetings.

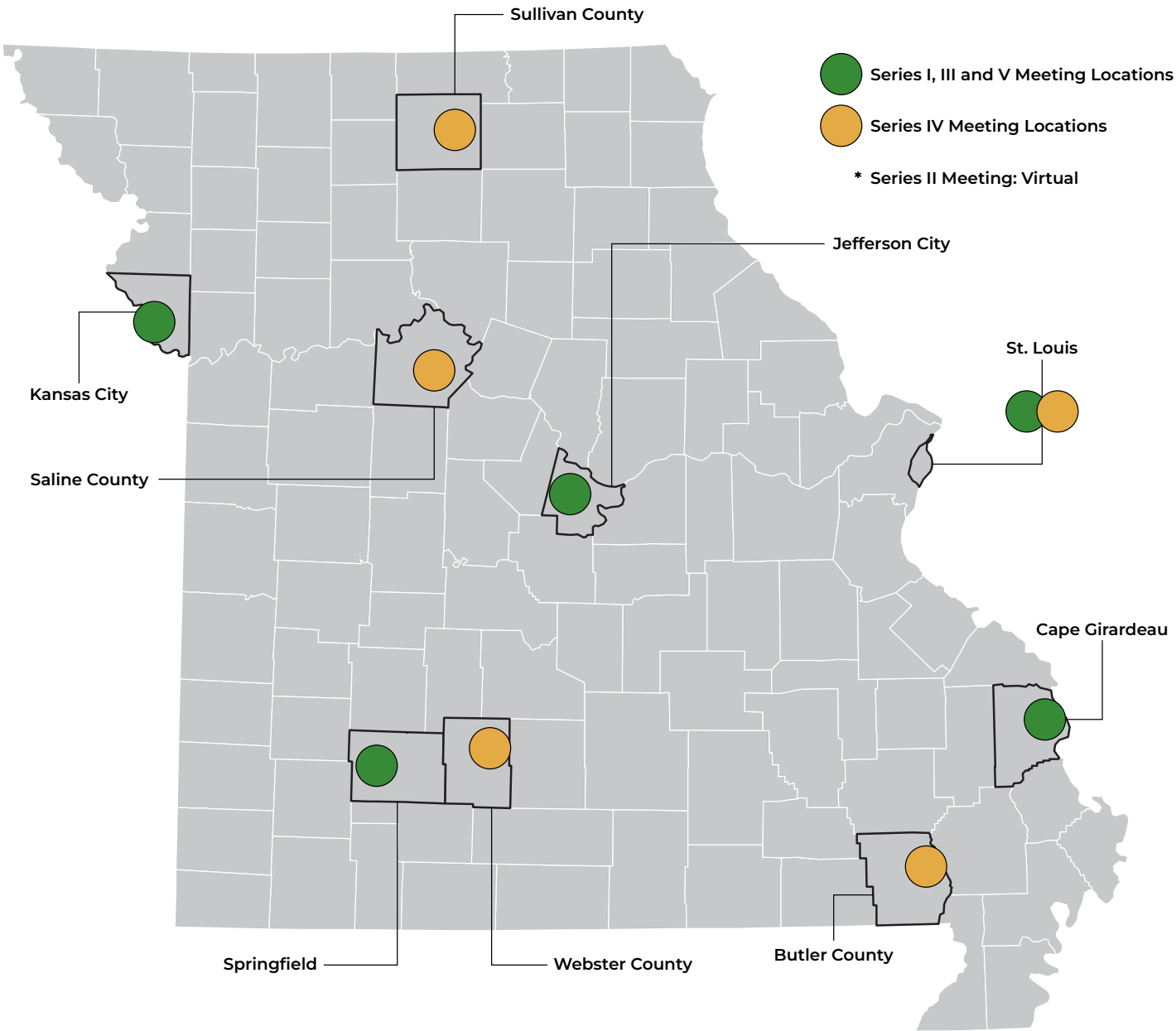
The study team worked with DHSS, particularly the Center for Local Public Health Services, to identify locations to host each meeting. Leveraging DHSS' experience and knowledge, a selection of suitable locations was identified and the respective organizations were contacted to arrange the meetings. See **Table 6** for meeting host locations across all five series.

Table 6: Meeting Host Locations for Participant Engagement Series

MEETING SERIES	HOST LOCATIONS
Meeting Series #1	1. Missouri Foundation for Health, St. Louis 2. Cape Girardeau County Public Health Center, Cape Girardeau 3. The Boat House, Springfield 4. Platte County Health Department, Kansas City 5. DHSS, Jefferson City
Meeting Series #2	1. Virtual via Microsoft Teams
Meeting Series #3	1. Missouri Foundation for Health, St. Louis 2. Cape Girardeau County Public Health Center, Cape Girardeau 3. Springfield-Greene County Health Department, Springfield 4. Platte County Health Department, Kansas City 5. DHSS, Jefferson City
Meeting Series #4	1. Missouri Foundation for Health, St. Louis 2. Webster County Health Unit, Marshfield 3. Saline County Health Department, Marshall 4. Sullivan County Community Center, Milan 5. Butler County Health Center, Poplar Bluff
Meeting Series #5	1. Missouri Foundation for Health, St. Louis 2. Cape Girardeau County Public Health Center, Cape Girardeau 3. Culture C-Street, Springfield 4. Platte County Health Department, Kansas City 5. DHSS, Jefferson City

Figure 3 shows a map of the locations of each meeting.

Figure 3: Missouri Participant Meeting Locations



Based on feedback from participants at the beginning of the assessment and after the first meeting series, the study team conducted Meeting Series #2 virtually to ensure that organizations and individuals who were not able to travel for an in-person session had the opportunity to participate.

PARTICIPANT MEETING FACILITATION

The study team included, at minimum, a two-person team to facilitate each participant meeting. The team was comprised of a meeting facilitator with subject matter expertise and experience in data modernization and a dedicated notetaker to gather all conversations and comments from participants. Each meeting was three hours in duration. Attendance was taken at the beginning of each session, using the meeting RSVP list and the participant register as reference.

Each meeting series focused on a specific theme related to the project's objectives and tied to the topic areas of the HIMSS DHI tool to allow for cross review of findings. At the beginning of each meeting, the study team provided an overview of the project, its Guiding Principles and background information on the series' topic area. Topic areas for each meeting series are outlined in **Table 7**. The facilitators also had questions related to the topic prepared to ask the participants. The round robin discussion allowed participants to answer any question they choose and exchange ideas with one to another.

Table 7: Participant Meeting Series Topic Areas

MEETING SERIES	DATES	TOPIC AREA
Series #1	August 26 - 30, 2024	Current State, Blue Skies and Challenges
Series #2	September 11, 12, & 17, 2024	Governance and Workforce
Series #3	October 15 - 17, 2024	Interoperability
Series #4	October 29 - November 1, 2024	Predictive Analytics
Series #5	November 12 - 15, 2024	Review Participant Themes

PARTICIPANT MEETING PARTICIPATION

The following **Tables 8-12** provide a breakdown of the attendance for each meeting and the organizations represented at each meeting. Overall, the study team engaged 258 participants over twenty in-person meetings, three virtual meetings and two virtual targeted meetings.

Table 8: Participant Meeting Series #1

MEETING LOCATION/DATE	RSVPs	ATTENDANCE	PARTICIPANT REPRESENTATION
St. Louis, August 26th	10	5	• Missouri Public Health Institute • Missouri Hospital Association • St. Louis Business Health Coalition • United Healthcare
Cape Girardeau, August 27th	7	3	• Butler County Health Department • Cape Girardeau County Health Department • Missouri Association of Area Agencies in Aging
Springfield, August 28th	7	6	• Choices Medical Services • Department of Health and Senior Services • Springfield-Greene County Health Department • Taney County Health Department • Webster County Health Unit
Kansas City, August 29th	10	7	• Jackson County Public Health • Kansas City Health Department • Lewis and Clark Information Exchange • Platte County Health Department
Jefferson City, August 30th	14	9	• Cole County Health Department • Community Asset Builders • Cooper County Health Department • Department of Health and Senior Services • Missouri Department of Mental Health • Missouri Department of Social Services • Missouri Primary Care Association

Table 9: Participant Meeting Series #2

MEETING LOCATION/DATE	RSVPs	ATTENDANCE	PARTICIPANT REPRESENTATION
Meeting 1, September 11th	23	14	• Bollinger County Health Center • Butler County Health Department • Dade County Health Department • Dent County Health Center • Healthy Blue Managed Care Organization • Jackson County Public Health • Lawrence County Health Department • Mercy Hospital Washington • Mid-America Regional Council • Ozarks Public Health Institute at Missouri State University • Phelps-Maries County Health Department • United Healthcare • University of Missouri – Kanas City, Institute for Human Development • Webster County Health Department
Meeting 2, September 12th	18	14	• Cape Girardeau County Public Health Center • Clark County Health Department • Cole County Health Department • Joplin Health Department • Kansas City Health Department • Mercer County Health Department • Missouri Department of Mental Health • Missouri Department of Natural Resources • Polk County Health Center • Pulaski County Health Department • Randolph County Health Department • St. Louis Department of Health • University of Missouri Institute of Public Policy • Velatura HIE Corporation

Table 9: Participant Meeting Series #2 (Cont.)

MEETING LOCATION/DATE	RSVPs	ATTENDANCE	PARTICIPANT REPRESENTATION
Meeting 3, September 17th	35	22	• Cooper County Health Department • Institute for Public Health, Washington University • Kansas City Health Department • Lewis and Clark Information Exchange • Miller County Health Center • Missouri Public Health Institute • Missouri Department of Mental Health • Missouri Hospital Association • Missouri Primary Care Association • Missouri State Emergency Management Agency • Northeast Missouri Area Agency on Aging • Pike County Health Department • Saline County Health Department • SeniorAge Area Agency on Aging • State Technical Assistance Team • Tiger Institute for Health Innovation • Tri-County Health Department • United Healthcare • Webster County Health Unit

Table 10: Participant Meeting Series #3

MEETING LOCATION/DATE	RSVPs	ATTENDANCE	PARTICIPANT REPRESENTATION
St. Louis, October 15th	14	12	• Find Help • Missouri Public Health Institute • Missouri Office of Prosecution Services • St. Charles County Health Department • St. Louis Business Health Coalition • St. Louis Department of Health • Washington University Data Center
Cape Girardeau, October 16th	5	3	• Butler County Health Department • Cape Girardeau County Health Department • Mercy Hospital – Jefferson
Kansas City, October 16th	10	12	• Cabe Consulting • Center for Practical Bioethics • Clay County Health Department • Kansas City Digital Drive • Kansas City Health Department • Platte County Health Department
Jefferson City, October 17th	32	21	• Aging Best Area Agency on Aging • Cooper County Health Department • Department of Health and Senior Services • Missouri Department of Social Services, MO HealthNet • Missouri Hospital Association • Missouri Primary Care Association • Randolph County Health Department • UniteUs
Springfield, October 17th	3	4	• Jasper County Health Department • Springfield-Greene Health Department

Table 11: Participant Meeting Series #4

MEETING LOCATION/DATE	RSVPs	ATTENDANCE	PARTICIPANT REPRESENTATION
Saline County, October 28th	5	5	• Cooper County Health Department • Department of Health and Senior Services • Lafayette County Health Department • Saline County Health Department
Webster County, October 29th	13	11	• Missouri Behavioral Health Council • Missouri Primary Care Association • Ozark County Health Department • Pulaski County Health Department • Springfield-Greene Health Department • Texas County Health Department • Webster County Health Unit
St. Louis, October 30th	18	15	• Institute for Public Health, Washington University • Kansas City Health Department • Mercy Hospital • Midwest Health Initiative • Missouri Public Health Institute • Missouri Hospital Association • St. Charles County Health Department • St. Louis Department of Health
Sullivan County, October 31st	3	8	• Clay County Health Department • Sullivan County Health Department • Young at Heart
Butler County, November 1st	5	5	• Bollinger County Health Center • Butler County Health Department • Carter County Health Department • Pemiscot County Health Department • Washington County Ambulance District

Table 12: Participant Meeting Series #5

MEETING LOCATION/DATE	RSVPs	ATTENDANCE	PARTICIPANT REPRESENTATION
Cape Girardeau, November 12th	4	4	• Institute for Public Health, Washington University • Missouri Behavioral Health Council • Missouri Hospital Association • St. Louis Area Agency on Aging • St. Louis Department of Health
Kansas City, November 12th	11	12	• Clay County Health Department • Jackson County Public Health • Kansas City Digital Drive • Kansas City Health Department • Lewis and Clark Information Exchange • Platte County Health Department • State Advisory Council on Emergency Medical Services Regional Committee • Young at Heart
Springfield, November 13th	9	5	• Find Help • Hickory County Health Department • Ozarks Public Health Institute • Springfield-Greene Health Department
St. Louis, November 14th	10	10	• Institute for Public Health, Washington University • Missouri Behavioral Health Council • Missouri Hospital Association • St. Louis Area Agency on Aging • St. Louis Department of Health
Jefferson City, November 15th	14	9	• Cooper County Health Department • Department of Health and Senior Services • Mercy Hospital • Missouri Primary Care Association • Pulaski County Health Department • University of Missouri, EMS

In addition, the study team held two targeted, virtual participant meetings; one for Federal partners and one for Health Information Exchanges. **Table 13** shows the attendance for each.

Table 13: Federal Partners Meetings

PARTICIPANT MEETING SERIES	ATTENDANCE	PARTICIPANT REPRESENTATION
Federal Partners	14	• CDC Office of Public Health Data, Surveillance, and Technology • CDC National Center for Emerging and Zoonotic Infectious Diseases • Public Health Infrastructure Grant (PHIG) Data Modernization Workgroup
HIEs	14	• LACIE • KONZA • Velatura • Tiger Institute • MO HealthNet

In looking across all meeting series, both in-person and virtual, 127 unique participants attended. This is further shown in **Table 14**.

Table 14: Total Participant Meeting Representation

PARTICIPANT MEETING SERIES	UNIQUE ATTENDANCE	PARTICIPANT CATEGORY REPRESENTATION
Meeting Series 1	28	• Local Public Health Agencies • Hospital and Health Systems • Community Based Organizations • Health Information Exchanges • State Agencies
Meeting Series 2	50	• Local Public Health Agencies • Hospital and Health System • Institutes of Higher Education and Research • State Agency • Health Information Exchanges • Federally Qualified Health Centers • Public Health Institutes

Table 14: Total Participant Meeting Representation (Cont.)

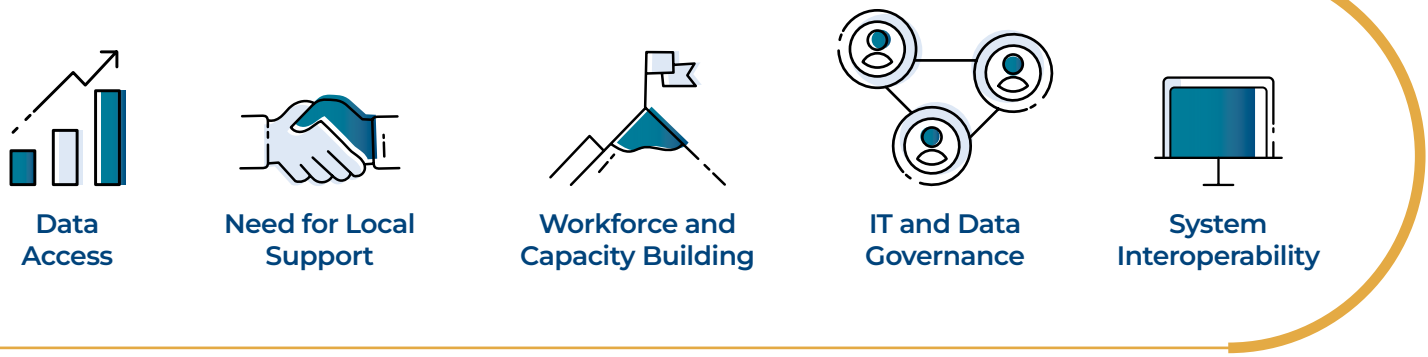
PARTICIPANT MEETING SERIES	UNIQUE ATTENDANCE	PARTICIPANT CATEGORY REPRESENTATION
Meeting Series 3	68	• Local Public Health Agencies • Hospital and Health System • Community Based Organizations • Non-Profit • State Agency • Health Information Exchanges
Meeting Series 4	56	• Local Public Health Agencies • State Agency • Community Based Organizations • Hospital and Health System
Meeting Series 5	40	• Local Public Health Agencies • Community Based Organizations • Institutes of Higher Education and Research • Health Information Exchanges • State Agency
Targeted Meetings	28	• CDC Office of Public Health Data, Surveillance, and Technology • CDC National Center for Emerging and Zoonotic Infectious Diseases • Public Health Infrastructure Grant (PHIG) Data Modernization Workgroup • LACIE • KONZA • Velatura • MO HealthNet
Total	**127**	• **Local Public Health Agencies** • **Hospital and Health System** • **Community Based Organizations** • **Non-Profits** • **Health Information Exchanges** • **State Agencies** • **Centers for Disease Control** • **Institutes of Higher Education and Research** • **Federally Qualified Health Centers** • **Public Health Institutes**

In total, the study team hosted 20 in-person meetings across Missouri, three virtual meetings and two additional targeted meetings. For a full list of all organizations involved in the development of this report, including participant engagement, refer to **Appendix A**.

Themes from Participant Engagement Outcomes

Following the conclusion of the participant meeting series 4, the study team conducted a thematic analysis to analyze the information gathered from the participant meetings. The five core themes are illustrated in **Figure 4** and further detailed below.

Figure 4: Themes from Participant Engagement Outcomes



PARTICIPANT THEME: DATA ACCESS

A key theme identified across participant meetings was data access. Participants discussed and shared the following in relation to data access:

- It is not always clear how to access data when needed.
- One directional data sharing is common.
- There is a need for clarity with state and federal-level requirements around data protection and access rules.
- Trust is a required component of effective data sharing.
- Quality and consistency of data can be improved through managed data hygiene practices.
- Data availability and recency is required for addressing broader public health needs.

PARTICIPANT THEME: NEED FOR LOCAL SUPPORT

Throughout the participant meeting series, participants expressed their need and desire for support at the local level from DHSS and other partners. The study team heard:

- Participants expressed that there is a need for local support because public health services do not stop at a geo-political boundary.
- There is a wide variability in the organization of “regions” across Missouri.
- There is a desire for stronger, consistent communication and increased transparency between state and local entities.

- Participants request state regional support for public health data needs (quality review, analytics, training, etc.).
- Local organizations gather regionally, for example, through Administrators meetings, learning collaboratives and accreditation processes, out of a felt need for collaboration.
- Participants expressed interest in a state-supported and centralized information platform.

PARTICIPANT THEME: WORKFORCE AND CAPACITY BUILDING

Underlying the information and examples heard by the study team from participants, was the theme of workforce and capacity building. This covered both the need for additional workforce and the need for training and ongoing education of the existing workforce.

- There are gaps in workforce capabilities, training and staff for managing data and for data analytics.
- There may be non-traditional ways to address workforce gaps in resource limited regions, for example, reoccurring structured training and peer support.
- Workforce capabilities in different regions are inconsistent based on resources.
- There is an appetite for data literacy among staff for evidence-based decision-making.
- Some staff feel overwhelmed by complex systems and requirements.

PARTICIPANT THEME: IT AND DATA GOVERNANCE

Participants highlighted several key aspects related to IT and data governance. The study team heard:

- There is a desire for a collaborative approach to facilitate transparent decision-making for IT governance.
- Public Health entities have different timelines and capabilities for data modernization.
- The most common priorities identified are ensuring appropriate data hygiene, improving maintenance and operations and increasing collaborations and data sharing.
- Data-sharing policies are nonexistent, outdated, or difficult to find.
- There is a desire for the adoption and dissemination of system standards.
- Participants desire curated and accessible data dictionaries and pre-selected technology systems.

PARTICIPANT THEME: SYSTEM INTEROPERABILITY

An overarching theme across all meetings and locations was the concept of system interoperability. The study team heard:

- Current systems do not always connect to each other which may cause duplication of data entry, increased data entry errors and/or billing denials.
- Entities encounter added efforts when they are required to translate or clean data provided to them in an unusable manner.
- Participants would like clear guidance on:
  - Data dictionaries and formats.
  - System setups and guidelines.
  - Low-code and analytical tools.

Participant Meeting Reports

The following pages provide information on each of the participant meetings held as part of each series.

Participant Series 1

ST. LOUIS

Key Themes

1 **Opportunity:** Participants were optimistic and open minded about Missouri's data modernization efforts and view these efforts as an opportunity to improve their data system integration processes and health outcomes.

2 **Collaboration and Relationship Building:** Strengthening health organization and entity relationships and communications with DHSS will be essential for DMI efforts. The COVID-19 pandemic catalyzed rapid communication and data sharing, which proved to be effective for accomplishing public health goals, and therefore may be used as a model for future success.

3 **Data Ownership:** Data ownership is fragmented and can vary based on contract terms between entities and their network. Owners include DHSS, hospitals and employers, depending on the context and type of data, though Missouri generally has overarching ownership. Various organizations handle data cleaning, aggregation and analysis, often facing challenges with data usability and accessibility. Data accessibility varies based on vendor management processes, system complexity and technical barriers.

4 **Variation in Resources and Governance in Missouri:** The structure of DHSS and public health entities in Missouri creates complications with data sharing. Additionally, Missouri has variable capabilities locally, with different levels of resources, resulting in a call for more balanced distribution.

DATE August 26, 2024

LOCATION St. Louis

HOST Missouri Foundation for Health

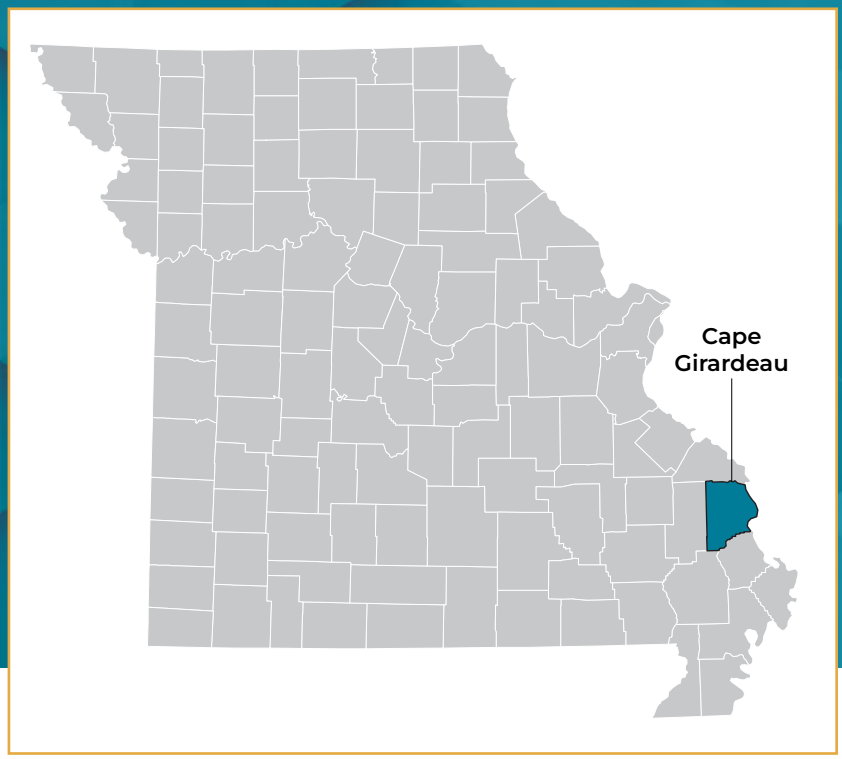
ATTENDANCE 5

REPRESENTATION Missouri Public Health Institute, Missouri Hospital Association, St. Louis Business Health Coalition, United Healthcare

It's a land of opportunity...

Participant Series 1

CAPE GIRARDEAU



Key Themes

1 **Poor Quality Data:** Participants described limited access to data and the need to place formal requests for certain types of data. LPHAs only have access to aggregate data (via MOPHIMS), but depending on the data, it might be 3-4 years old making the data irrelevant to the topic at hand. Participants indicated that they are better off using national data rather than DHSS data.

2 **State Shift Toward Standardization:** Missouri is currently transitioning to ShowMe WorldCare which will consolidate multiple current systems into one centralized system for increased ease and access. Workforce and training gaps were noted as barriers to standardization, including high turnover rates for IT staff and a lack of training and buy-in from current staff to effectively operate and optimize data systems.

3 **Fragmented Systems with Various Data Languages:** Missouri has ten Area Agencies on Aging (AAAs), each with multiple operating systems. One AAA might have different service definitions and data languages than another and, to make matters worse, none of them communicate. Concerns around HIPAA compliance and state statutes have limited willingness to address technical limitations and interoperability of data systems.

4 **Missouri Organizational Barriers:** Missouri has 115 LPHAs, 92 of which have Boards of Health and 23 which have another form of governance. Some health departments organize regionally and collaborate on activities, for example, they decided on the collective procurement of an EHR system called “Patagonia.” Although they all purchased the same Patagonia system, each EHR cannot share information between them.

DATE August 27, 2024

LOCATION Cape Girardeau

HOST Cape Girardeau County Public Health Center

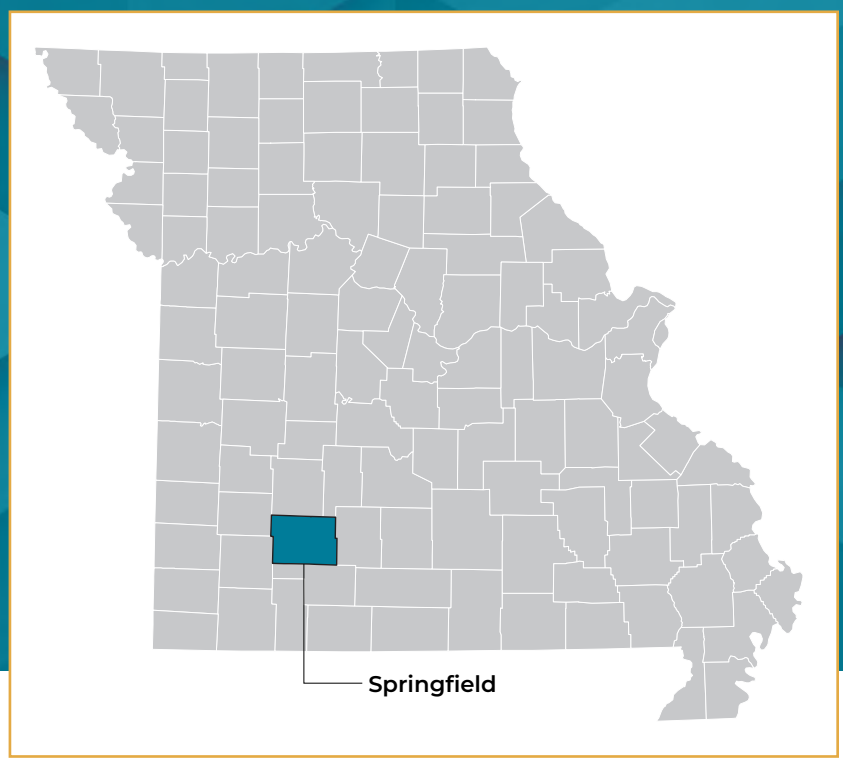
ATTENDANCE 3

REPRESENTATION Butler County Health Department, Cape Girardeau County Health Department, Missouri Association Area Agencies in Aging

> *Every AAA has an average of eight different platforms they’re using right now and most are spreadsheets.*

Participant Series 1

SPRINGFIELD



Key Themes

1 **Successful Coalition of Providers:** A group of 40-50 providers has been meeting monthly for an hour since COVID to discuss health care delivery, care flows and quality. These meetings have been an effective collaborative effort to understand what each entity is accomplishing and what data exists.

2 **Lack of Clarity on Data Existence or Location:** Often, health departments would benefit from acquiring certain data, but they do not know who owns it; for example, overdose numbers have been an ongoing request by one LPHA. Sometimes, no entity "owns" the data because there is no formal collection, which would be the case if it is not a reportable condition. In other situations, there is an owner, but accessing the data requires overcoming undocumented hurdles which are considered "insurmountable."

3 **Differences in Systems Leading to Complexity:** Many systems in Missouri operate differently, so it is difficult to create continuity across Missouri. For example, counties and cities have varying environmental health ordinances. Additionally, some counties accept permits from other counties while others do not (i.e. a food truck operating in multiple locations).

4 **Antiquated Technology:** Some technology and systems in Missouri are old and require an overhaul. For example, LPHA contracts with DHSS are saved in a non-searchable PDF. Missouri email system is also not meeting users' needs and some entities have chosen to acquire their own email platform or server to overcome those barriers.

5 **Data is People:** Participants emphasized that health care data describes people; therefore, maintaining data in silos prevents health care entities from developing a holistic image of a person, particularly since they may be receiving multiple services from multiple providers.

DATE August 28, 2024

LOCATION Springfield

HOST The Boathouse at Lake Springfield Park

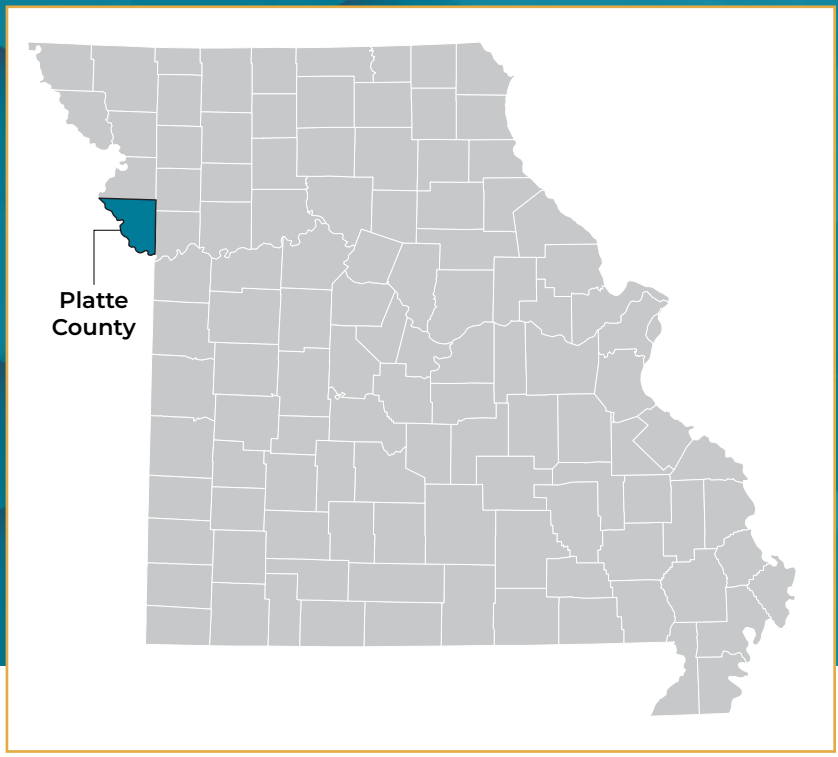
ATTENDANCE 6

REPRESENTATION ChoicesMedical Services, DHSS, Springfield-Greene County Health Department, Taney County Health Department, Webster County Health Unit

For our health departments, when we talk about data, we're talking about people.

Participant Series 1

KANSAS CITY



Key Themes

1 **Data Fragmentation:** The lack of standardized regulations has been a major barrier in achieving interoperability across health departments. Currently, data systems are fragmented around Missouri and ownership is unclear, which complicates effective public health data usage.

2 **Training and Workforce Capacity:** Participants noted a shortage of trained, qualified staff experienced with managing data systems. Data-driven decision-making has been emphasized before, but many participants lack the workforce capacity to analyze and use data effectively. Many participants have specifically requested an epidemiologist.

3 **Regional Collaboration:** Participants acknowledged the importance of regional collaboration for data consolidation and sharing but noted that trust issues and competition between entities hinders progress in this area. Building stronger relationships and streamlining communication processes are potential solutions.

4 **Sustainability and Long-Term Planning:** Participants noted concerns about the long-term sustainability of data systems, especially when initial funding runs out. Additionally, participants noted that data system maintenance and ongoing trainings are often overlooked components of public health infrastructure.

DATE August 29, 2024

LOCATION Kansas City

HOST Platte County Health Department

ATTENDANCE 7

REPRESENTATION Jackson County Public Health, Kansas City Health Department, Lewis and Clark Information Exchange, Platte County Health Department

Local public health agencies are all building, but are LPHAs building in the same direction?

Participant Series 1

JEFFERSON CITY

Key Themes

1 **Considering Provider Burden:** The lack of data sharing puts a burden on providers, who must enter the same information into multiple systems. Data modernization efforts should consider all impacts on providers, from dual data entry to other potential side effects of modernization.

2 **Benefits of a Data Lake:** Participants would like one central location to store data, rather than paying vendors to make multiple interfaces that complete the same activities. A data lake could save costs by reducing duplicative efforts and cutting down vendor costs. Additionally, it could allow scalability of data collected. ITSD has discussed data lakes in the past, but it has not come to fruition. In the interim, they are working on a data warehouse.

3 **Backdoor Data Sharing:** Sometimes, when data cannot formally be shared, entities will call one another and ask for data informally. Therefore, the data is already being shared and accessed, but without a formal process. Backdoor data sharing has the potential to put Missouri at risk.

4 **Competition Limiting Data Sharing:** The Community Health Needs Assessments (CHNAs) are an opportunity for entities to come together and work alongside each other to share knowledge and complete the required assessment. However, participants noted that hospitals are not always eager to collaborate, since they are often competitive and consequently protective over their data.

DATE August 29, 2024

LOCATION Jefferson City

HOST DHSS Offices

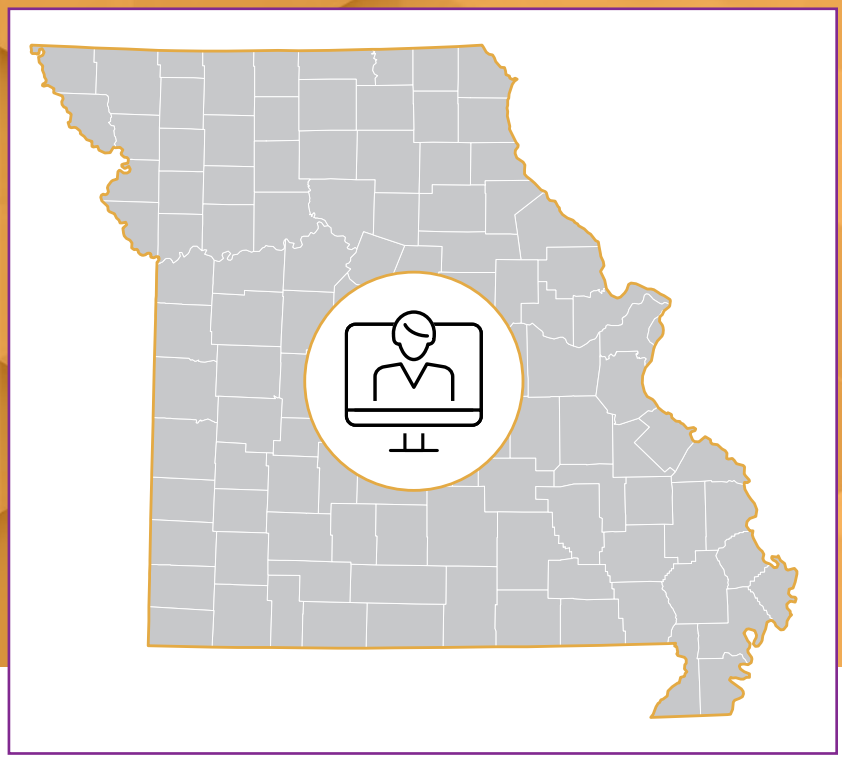
ATTENDANCE 9

REPRESENTATION Cole County Health Department, Community Asset Builders, Cooper County Health Department, Department of Mental Health, DHSS, Department of Social Services, Missouri Primary Care Association

As an employee of a LPHA, I feel like I'm forced to work in a silo.

I was excited that the State was asking us questions...

Participant Series 2



VIRTUAL SESSION 1 (MICROSOFT TEAMS)

Key Themes

1 **Data Governance Embedded into Culture:** Data governance is embedded into some organizations' data practices. Participants indicated that their motivation for governance comes from defending against emerging threats and trends. Some agencies are confident in their data hygiene, collection practices and training, but they are hoping for more data-informed decision-making and priorities, especially in the face of budget cuts.

2 **Lack of Governance:** While some LPHAs have stronger data governance standards, others have limited staff and resources, and therefore still work out of file cabinets. These LPHAs require standardized data practices, inter-organizational collaboration and the navigation of security protocols.

3 **Organizations Modernizing Separately:** Data modernization is a recognized priority for many organizations in Missouri, many of which are currently making efforts to modernize. However, there are concerns that these efforts will not be worthwhile if they do not integrate with other entities' systems.

4 **Barriers to Quality Data:** LPHAs must navigate and overcome privacy protections, for example, SharePoint access and permission-based access. While these are critical, they often lead to inefficiencies in sharing data which result in data lags. Manual data entry also increases error risk which can cause lower quality data.

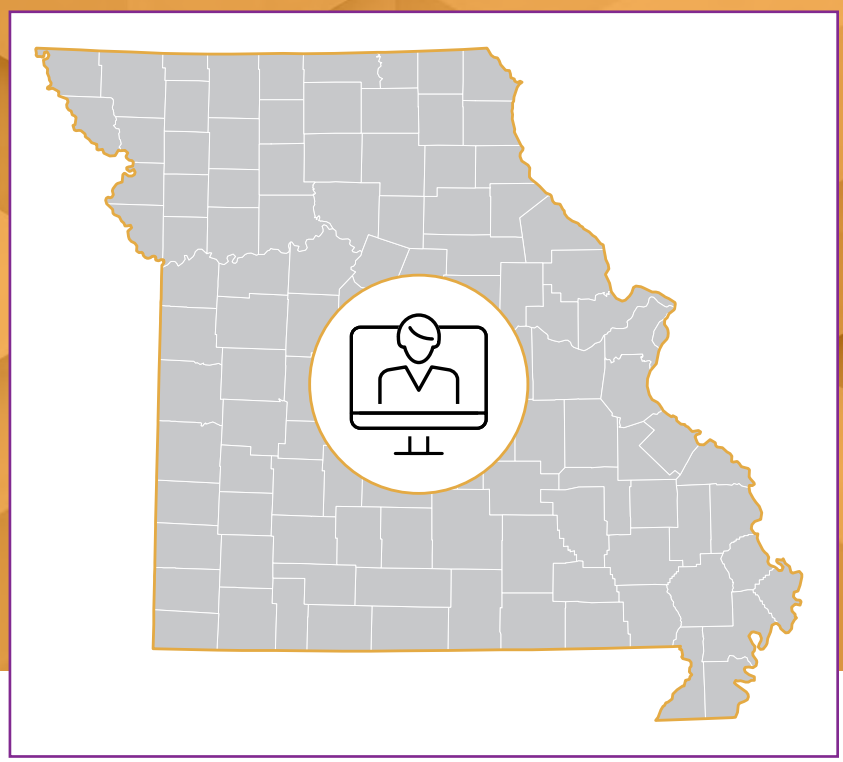
DATE September 11, 2024

ATTENDANCE 14

REPRESENTATION Bollinger County Health Center, Butler County Health Department, Dade County Health Department, Dent County Health Center, Healthy Blue MCO, Jackson County Public Health, Lawrence County Health Department, Mercy Hospital Washington, Mid-America Regional Council (MARC), Ozarks Public Health Institute at MSU, Phelps/Maries County Health Department, UMKC IHD, United Healthcare, Webster County Health Department

> *We know data modernization is something we need to do, but there's a fear that we're building structures and systems that aren't going to integrate with other entities doing similar things.*

Participant Series 2



VIRTUAL SESSION 2 (MICROSOFT TEAMS)

Key Themes

1 **Governance Priorities:** Participants discussed the need for structured governance frameworks, standardization and tight data security. Their main priorities included centralizing oversight, managing access control and developing a governance board for consistent practices.

2 **Training and Community Partners:** Participants emphasized the need for ongoing and structured training opportunities in data governance and analytics, including peer-to-peer training. To accomplish this goal, some participants have partnered with academic institutions like universities for training while others only offer on-the-job training.

3 **Building the Workforce Internally:** Community partners noted the gap in workforce capabilities, training and sufficient staff for handling data analytics. Participants discussed the need for skilled internal staff in data analysis, informatics and data science to reduce the reliance on external participants.

4 **Minimizing Faulty Data:** Data hygiene, data quality assessments and the varied levels of data maturity across organizations remain a focus for participants. Challenges such as data duplication, lack of unique identifiers and the need for data-cleaning processes were highlighted, along with the importance of consistent data procedures to improve trust in data quality.

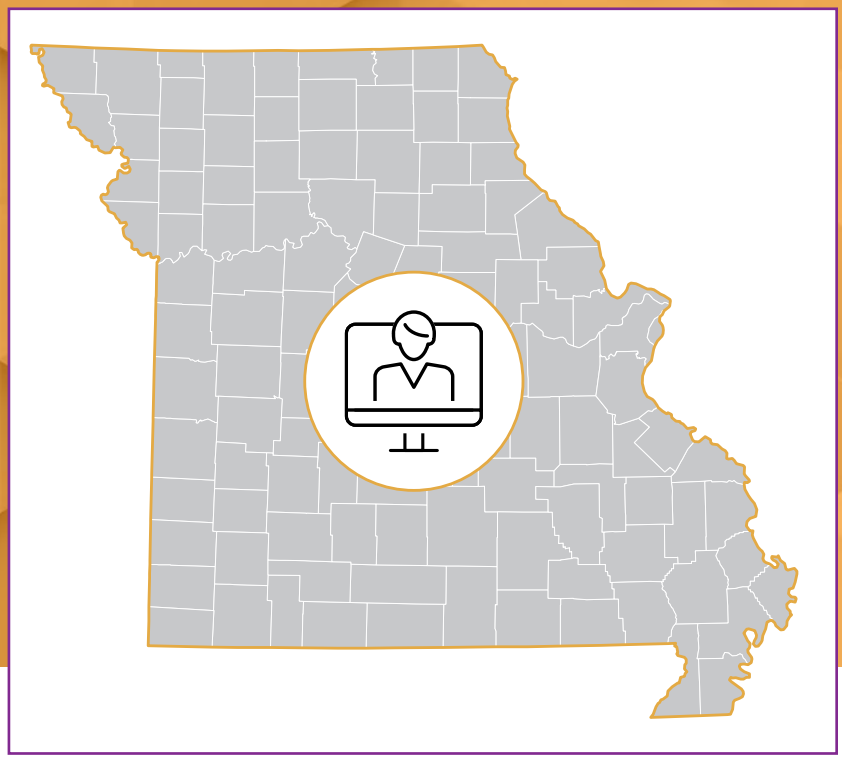
DATE September 12, 2024

ATTENDANCE 14

REPRESENTATION Cape Girardeau County Public Health Center, Clark County Health Department, Cole County Health Department, Department of Mental Health, Joplin Health Department, Kansas City Health Department, MO Dept of Natural Resources, Polk County Health Center, Pulaski County Health Department, Randolph County Health Department, St. Louis Department of Health, University of Missouri Institute of Public Policy, Velatura HIE Corp, Mercer County Health Department

Our team has data insights and the State has data insights, it would be great to collaborate.

Participant Series 2



VIRTUAL SESSION 3 (MICROSOFT TEAMS)

Key Themes

1 **Data Access and Ownership Challenges:** Participants face significant obstacles in accessing the data they need, often due to state level policy and varying data ownership. There is common frustration over the lack of current data and restrictive rules that designate ownership to the state rather than local health agencies.

2 **Governance Structures and Legal Constraints:** Data governance varies across jurisdictions, and legal and privacy compliance requires structured agreements and legal oversight. Some participants involve independent attorneys to address needs.

3 **Data Quality and Integration Issues:** Participants expressed concerns about the quality and consistency of data due to unstructured formats, inconsistent standards and challenges in data entry. Some efforts to integrate and standardize data are underway (e.g., Oracle), but data exchange across health information systems is often complex.

4 **Training, Data Literacy and Resource Constraints:** Many health agencies struggle with limited staff and resources for data analysis. Participants also expressed the need for promoting data literacy among staff to enhance understanding and use of data for community health assessments and strategic planning.

DATE October 17, 2024

ATTENDANCE 22

REPRESENTATION Cooper County Health Department, Department of Mental Health, Institute for Public Health, Washington University, Kansas City Health Department, Lewis and Clark Information Exchange (LACI), Miller County Health Center, Missouri Public Health Institute, Missouri Hospital Association, Missouri Primary Care Association, Missouri State Emergency Management Agency, MO Primary Care Association, Northeast Missouri Area Agency on Aging, Pike County Health Department, Saline County Health Department, SeniorAge Area Agency on Aging, State Technical Assistance Team, Tiger Institute for Health Innovation, Tri-County Health Department, United Healthcare, Webster County Health Unit

> *There have been times where LPHAs needed data but it wasn't available, so we had to go out on our own to find it.*

Participant Series 3

ST. LOUIS

Key Themes

1 **Data Interoperability and Access Issues:** Challenges exist in seamlessly integrating data across various health systems and platforms, resulting in data silos and lack of unified patient tracking. Various data formats and limitations in data-sharing policies create barriers to effective cross-agency collaboration.

2 **Data Quality and Consistency:** Inconsistent data definitions, data format changes and quality issues in different systems hinder effective analysis and reporting. This leads to manual data cleaning efforts and rework, which reduces operational efficiency and accuracy.

3 **Resource Constraints:** Budget limitations and staffing shortages impact the ability to maintain and upgrade necessary health information systems. Participants shared that reliance on outdated technology (e.g., manual faxing, paper-based data entry) and limited access to advanced tools create operational challenges.

4 **Collaboration and Transparency:** Participants expressed a strong desire for improved communication and transparency between the state and local agencies, particularly regarding funding plans, data-sharing policies and inclusion in decision-making processes that impact health and resource allocation.

DATE October 15, 2024

LOCATION St. Louis

HOST Missouri Foundation for Health

ATTENDANCE 17

REPRESENTATION St. Louis Department of Health, Find Help, Missouri Public Health Institute, Missouri Office of Prosecution Services, St. Charles County Health Department, St. Louis Business Health Coalition, St. Louis Department of Health, Washington University Data Center

> *If everyone wants improved interoperability, why would we all do it separately?*

Participant Series 3

CAPE GIRARDEAU

Key Themes

1 **Data Access and Interoperability:** Participants described a strong need for efficient, bi-directional data sharing across local, state and regional levels, as many participants lack access to data they input into state systems. This lack of data access, particularly with EHRs and registries, hinders public health responsiveness and internal operations.

2 **Resource Constraints and Cost Barriers:** Financial limitations impact LPHAs' ability to maintain or upgrade systems, connect with statewide databases, or adopt modern tools like Geographic Information Systems (GIS). Electronic Health Record integrations are often cost-prohibitive with high initial and annual fees, and smaller health agencies face the largest burden with this.

3 **Regionalization and Standardization:** Participants continue to call for more standardized processes, tools and regionalization to streamline operations. Participants support the idea of regional or centralized processes, which could improve resource allocation and effectiveness in public health reporting and response.

4 **Workforce Development:** Lack of standardized training and access to technical assistance forces LPHAs to figure out technical processes independently. Adequate, consistent training and a dedicated state resource to assist smaller counties would be highly beneficial, particularly for tasks such as GIS mapping and data analysis.

DATE October 16, 2024

LOCATION Cape Girardeau

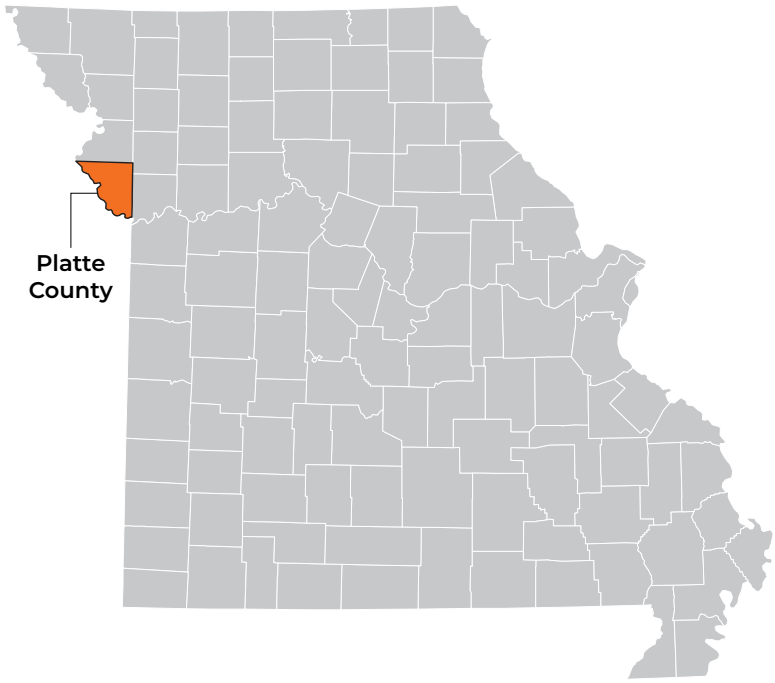
HOST Cape Girardeau County Public Health Center

ATTENDANCE 7

REPRESENTATION Butler County Health Department, Cape Girardeau County Health Department, Mercy Hospital Jefferson

> *Standardization is key to moving us all in the right direction.*

Participant Series 3



KANSAS CITY

Key Themes

1 **Integration Challenges:** Participants shared that numerous systems, platforms, logins and databases lead to duplication, errors and inefficiencies. Participants desire a unified data lake that serves as the central source of truth, particularly for EHRs, case management systems and other public health data.

2 **Governance and Compliance:** Efforts to integrate and share data are hindered by legal, policy and regulatory requirements, especially regarding data sharing agreements and adherence to state and federal laws. Local control is critical in Missouri, which adds complexity to statewide sharing initiatives.

3 **Technology Standards and Adoption:** Achieving interoperability depends on standardizing data exchange formats and protocols like FHIR and HL7. However, limited vocabulary and technical compatibility create barriers to adoption.

4 **Financial Limitations:** Funding constraints and high costs of connecting to Health Information Networks (HINs) make it challenging for agencies, especially small and rural entities, to participate in interoperability efforts. Limited resources and workforce availability also impact the ability to support and maintain interconnected systems.

DATE October 16, 2024

LOCATION Kansas City

HOST Platte County Health Department

ATTENDANCE 13

REPRESENTATION Cabe Consulting, Center for Practical Bioethics, Clay County Health Department, Kansas City Digital Drive, Kansas City Health Department, Platte County Health Department

We would like to see the adoption of state-level standards.

Participant Series 3

JEFFERSON CITY

Key Themes

1 **Bi-directional Data Exchange:** There is a common desire to move away from manual processes like faxing and emailing and towards electronic and automatic data exchange. System compatibility and lack of standardized formats remain overarching barriers, and solutions could include a universal data dictionary and standardized language.

2 **State Communication and Transparency:** Lack of coordination and transparency from DHSS poses challenges, especially when state-level decisions directly affect data usability for LPHAs. Improved communication and clarification of available data resources and data remediation strategies could support local agencies better.

3 **Long-term Planning:** Participants discussed the need for long-term solutions, rather than band-aid solution approaches. Participants advocated for thorough documentation of data processes and clear transition planning to ensure better continuity, particularly for workforce turnover.

4 **Involving LPHAs in Decision-Making:** LPHAs expressed a desire to be a part of DHSS decision processes and conversations regarding data, particularly since each county represents a very diverse population with different sets of needs. LPHAs believe they should have a say in which systems they will have to use.

DATE October 17, 2024

LOCATION Jefferson City

HOST DHSS Offices

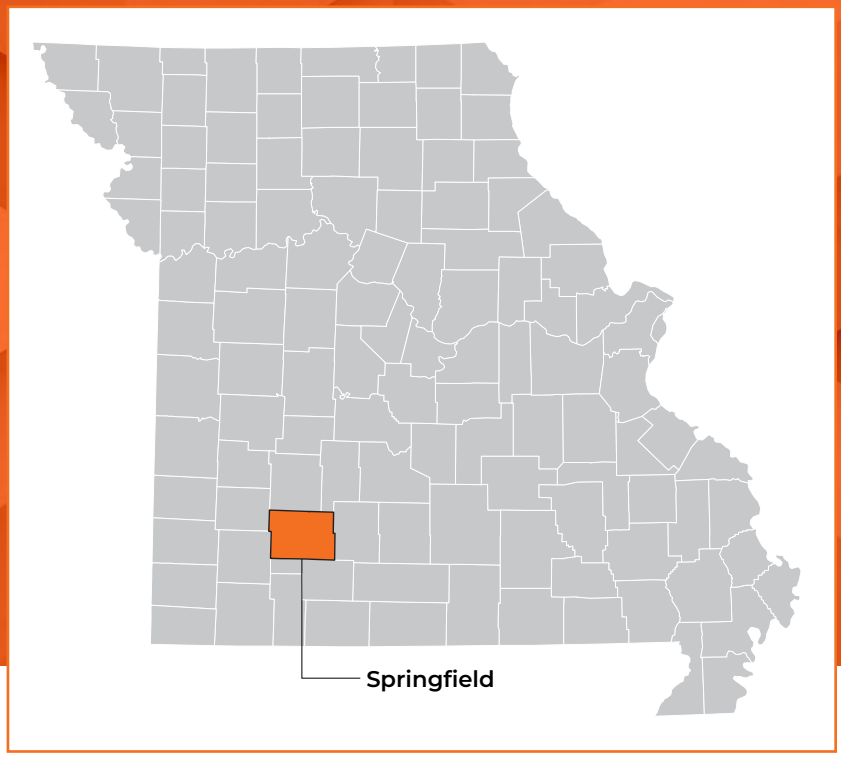
ATTENDANCE 25

REPRESENTATION Aging Best AAA, Cooper County Health Department, DHSS, DSS MoHealthNet, Missouri Hospital Association, Missouri Primary Care Association, Randolph County Health Department, UniteUs

> *We need DHSS leadership to advance interoperability with local public health.*

Participant Series 3

SPRINGFIELD



Key Themes

1 **Tech Debt:** Participants discussed the lack of data system interoperability, with most entities working in silos. Systems do not communicate with one another, causing significant "tech debt" to organizations who must clean-up, translate and/or manually track and report cases.

2 **Training and Usability of Existing Systems:** ShowMe WorldCare was named as an example of a state chosen and implemented system which was initiated with limited training or user guidance. It should be acknowledged that DHSS did engage with local staff during the selection and implementation process, however, staff felt overwhelmed by a complex system implementation and data entry requirements. User-friendly systems and better training was emphasized to cater to both technical and non-technical users.

3 **Regional Collaboration:** Participants called for improved data-sharing between local departments and across county lines. They recommended "regional data hubs" to improve data-driven decisions through a more holistic regional understanding of health concerns. Data protection regulations and decentralized governance complicates this collaboration.

4 **Cultural Resistance to Change:** Some health agencies resist data-sharing and technological changes due to concerns about autonomy and potential health department takeovers. This reluctance is particularly evident in smaller, rural health agencies. Effective change management strategies and building trust across are critical for achieving interoperability goals.

DATE October 17, 2024

LOCATION Springfield

HOST Springfield-Greene County Health Department

ATTENDANCE 4

REPRESENTATION Jasper County Health Department, Springfield-Greene Health Department

> *There is a very high technology debt to overcome a lack of interoperability.*

Participant Series 4

SALINE COUNTY

Key Themes

1 **System Fragmentation and Interoperability Challenges:** Local public health agencies use various systems (e.g., MoWINS, ShowMeVax, CureMD, VaxCare) that lack integration, leading to extensive workarounds like multiple logins and manual data entry. This fragmentation impacts efficient data sharing, especially for vital records, communicable disease reporting and immunization tracking.

2 **Resource and Funding Gaps from Missouri:** Local public health agencies often rely on inconsistent state funding and grants for essential software and infrastructure. Funding delays and interruptions in grants create challenges in technological advancements and reporting. Local public health agencies express concerns about the state's inadequate financial support, which impacts local operations and retention.

3 **Centralized and Comprehensive Public Health Database System:** Many participants advocate for a unified, state-supported health information system to centralize operations across local public health agencies for case reporting, billing, environmental health, etc. This will enable a statewide "single source of truth."

4 **Organizational Structure and Autonomy of LPHAs:** Missouri has a decentralized public health governance model, leaving local public health agencies with autonomy that is both beneficial and challenging. Participants expressed desire for a formalized district-based collaborative framework to tackle regional issues (e.g., resource sharing in public health crises).

DATE October 28, 2024

LOCATION Saline County

HOST Saline County Women, Infants, and Children (WIC)

ATTENDANCE 5

REPRESENTATION Cooper County Health Department, DHSS, Lafayette County Health Department, Saline County Health Department

> *Some LPHAs have a solid base of interoperability and we need that from the State.*

Participant Series 4

WEBSTER COUNTY

Key Themes

1 **EHR Requirements and Funding Disparities:** Local public health agencies manage and maintain EHRs independently. While systems like ShowMeVax were prioritized at the state-level, compatibility with other key platforms (e.g., EpiTrax) was not mandated, making interoperability more challenging. Many LPHAs functions are left unfunded or underfunded and only partially implemented, resulting in a piecemeal approach in state purchasing decisions.

2 **Data Governance and Quality Control Challenges:** Participants have significant data inconsistency. Local public health agencies using systems like Patagonia and Salesforce, often encounter incompatible data categories. State-level alignment to local standardization is limited. Consistent, automated quality checks across systems are challenging without a statewide standard.

3 **Communicating Gaps and Shifting State Priorities:** During COVID, Missouri prioritized HL7 compliance and hospital data integration without consistent communication regarding long-term data integration plans. State's priorities appear to be reactive, and there is a need for long-term state priorities for resource allocation.

4 **Constraints of State Policy and Funding on Local Initiatives:** Many LPHAs depend on Core funding, which only covers a small portion of essential service costs. Despite providing extensive county health information, LPHAs often receive only de-identified data in return, making it difficult to track health outcomes over time.

DATE October 29, 2024

LOCATION Webster County

HOST Webster County Health Unit

ATTENDANCE 11

REPRESENTATION Missouri Behavioral Health Council, Missouri Primary Care Association, Ozark County Health Department, Pulaski County Health Department, Springfield-Greene Health Department, Texas County Health Department, Webster County Health Unit

DHSS should revisit relevant statutes impacting public health data and interoperability.

Participant Series 4

ST. LOUIS

Key Themes

1 **Infrastructure and Interoperability Challenges:** Many health departments use fragmented, non-communicating systems, leading to redundant data entries and inefficiency. There is a crucial need for integrated, interoperable systems that can share data seamlessly, especially for critical areas like communicable disease tracking and immunization registries.

2 **Capacity and Workforce Development:** There is a clear gap in the availability of skilled data personnel, especially in smaller LPHAs. The data modernization initiative would benefit from enhanced training, role development (e.g., ensuring each LPHA has an Epidemiologist) and hiring more support staff.

3 **Standardization and Resource Sharing:** Inconsistent data management, reporting standards and analytical methods across LPHAs create challenges for data quality and reliability. Establishing shared data standards, a repository of code and analytical tools, and a central resource library would help smaller LPHAs adopt best practices.

4 **State-Level Coordination and Policy Support:** There is a strong need for the state to play a more active role as a coordinating entity. This could involve creating a central support role for fielding questions.

DATE October 30, 2024

LOCATION St. Louis

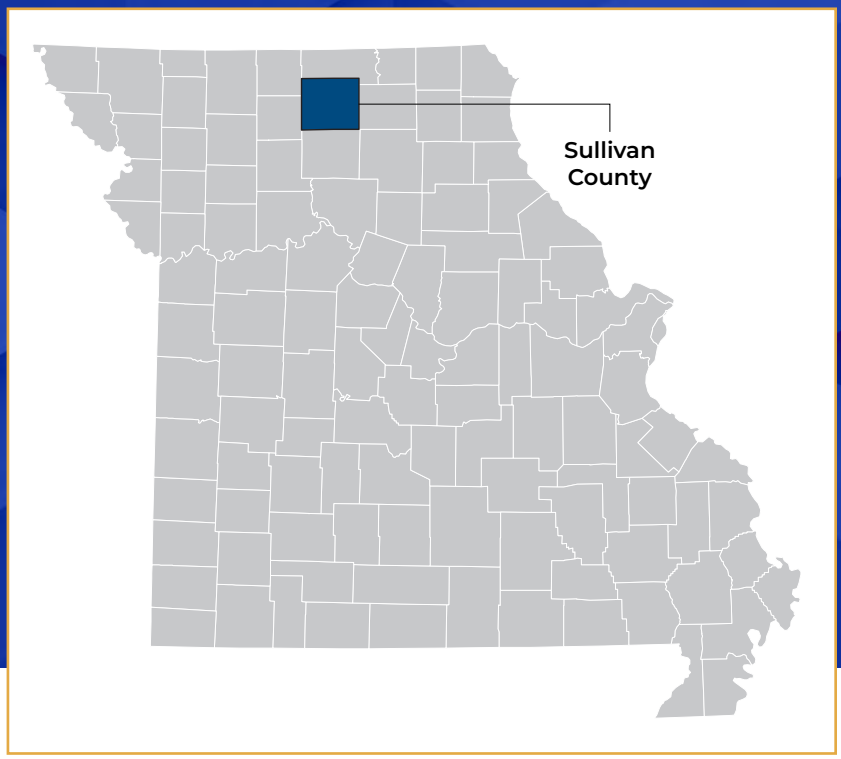
HOST Missouri Foundation for Health

ATTENDANCE 15

REPRESENTATION Institute for Public Health, Washington University, Kansas City Health Department, Mercy Hospital, Midwest Health Initiative, Missouri Public Health Institute, Missouri Hospital Association, St. Charles County Health Department, St. Louis Department of Health

A lot of data the LPHAs get from the State is fragmented or doesn't meet our needs.

Participant Series 4



SULLIVAN COUNTY

Key Themes

1 **Local and Regional Support:** Lack of staff capacity and knowledge of data and analytics keep participants from using predictive analytics and other data-based decision-making. Participants expressed a desire for a regional staff member to assist smaller public health entities with all things data including accessing, cleaning and analyzing data.

2 **Data Access:** Due to the size and rurality of some counties and areas of Missouri, public health entities struggle to receive detailed data. This makes it difficult for them to identify gaps in care and community needs. There is a strong desire for more comprehensive data to better understand and address local community needs.

3 **Collaboration:** Participants reported that multiple needs assessments are conducted within their communities, but they are often focused on specific topic or are agency specific. In many areas, there is little to no collaboration between the entities conducting these assessments. Participants seek a collaborative, community-wide needs assessment.

4 **Workforce:** Smaller organizations are focused on providing core services with a reduced workforce due to funding and/or available workforce in the community.

DATE October 31, 2024

LOCATION Sullivan County

HOST Sullivan County Community Center

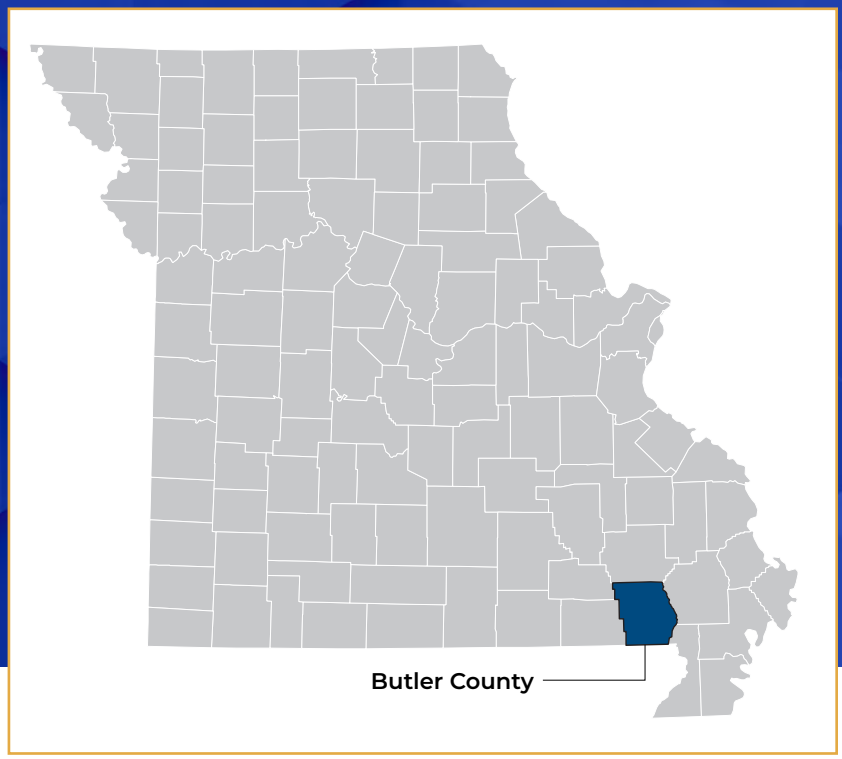
ATTENDANCE 8

REPRESENTATION Clay County Health Department, Sullivan County Health Department, Young at Heart

> *Missouri is often reactive to public health data management, not proactive.*

Participant Series 4

BUTLER COUNTY



Key Themes

1 **Data Accessibility and Integration Challenges:** LPHAs and rural hospitals struggle with fragmented and inaccessible data systems, making it difficult to obtain accurate, timely and usable data for community health initiatives. The lack of interoperability between systems and inconsistent access to certain data further complicate data-driven decision-making.

2 **Workforce Training and Retention Issues:** Staff turnover in rural areas and lack of structured and continuous training creates challenges in data handling and adapting to new technologies. Limited funding and grant-dependent roles contribute to an unstable public health workforce.

3 **Need for Financial Support and Sustainable Solutions:** Reliance on short term grants restrict sustainability of programs, systems updates and workforce. Participants desire state-supported sustainable funding solutions to cover operational costs and support workforce roles.

DATE November 1, 2024

LOCATION Butler County

HOST Butler County Health Center

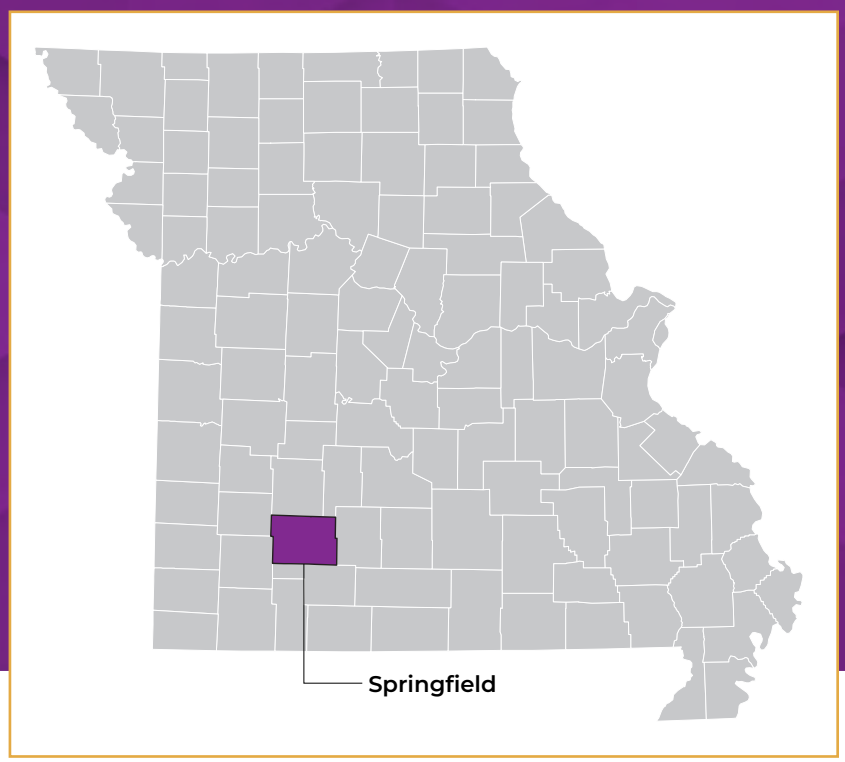
ATTENDANCE 5

REPRESENTATION Bollinger County Health Center, Butler County Health Department, Carter County Health Department, Pemiscot County Health Department, Washington County Ambulance District

We are sometimes lacking experience or skills essential to advanced data analysis or structuring any analytics.

Participant Series 5

SPRINGFIELD



Key Themes

1 **Technology Strategic Plan:** The idea of an "eight-year plan" for technology and systems development was introduced to make data collection easier for front-line workers, ensuring the data is clean and usable. It is important that everyone understands where the data goes and how it is used.

2 **Training Opportunities from DHSS:** Additional training opportunities are imperative for public health staff. Participants discussed insufficient training for ShowMe WorldCare and highlighted an over-reliance on virtual training with limited interactivity. Participants recommended developing a training arm within DHSS for ongoing support.

3 **Investment in Data Lake:** A data lake with user-friendly tools for accessing and analyzing data will simplify data collection for front-line staff while ensuring quality for downstream processes. It will also develop necessary feedback loops for data accuracy.

4 **Standards and Decision-Making:** Clarity around decision-making for data entry and prioritization around certain data fields will help streamline workflows. A data dictionary can also outline variables in data use.

DATE November 12, 2024

LOCATION Springfield

HOST Culture C-Street

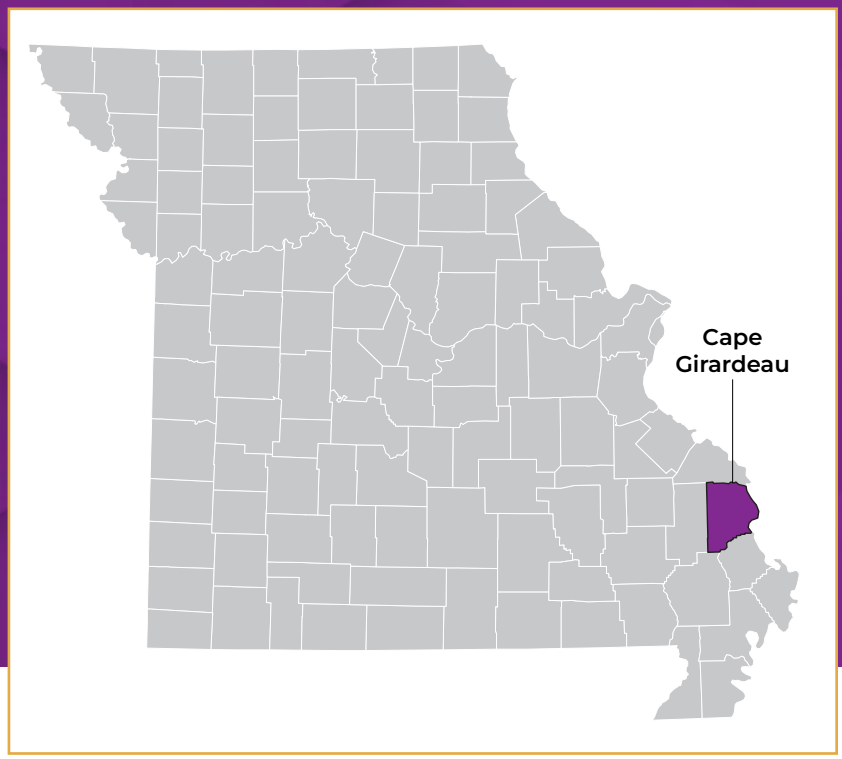
ATTENDANCE 5

REPRESENTATION Find Help, Hickory County Health Department, Ozarks Public Health Institute, Springfield-Greene Health Department

Having a long-term systems plan will be beneficial if the plan will remain the same over time.

Participant Series 5

CAPE GIRARDEAU



Key Themes

1 **Need for Transparency and Communication:** In the past, there have been instances of DHSS introducing systems and/or decommissioning systems without input or transparency with the LPHAs. For example, Missouri introduced an inventory program funded by FEMA and the LPHAs were required to adopt it. Shortly after, DHSS stopped using this system due to funding shortages but did not inform the LPHAs for their reasoning. In the future, more transparency with decisions would be helpful for the LPHAs.

2 **Need for Local Support:** Local public health agencies would benefit from further state support, including legal assistance, clear communication on contract needs, and centralized resources (e.g., epidemiologists, analysts).

3 **Unified Systems:** A single, state-funded system for all LPHAs would improve data sharing, reduce fragmentation and streamline processes. A unified and in-person training program and regional workshops, which takes local input into account, are critical to ensure adoption and proper use.

4 **Workforce Issues and Regional Needs:** Local public health agencies experience high turnover and lack of consistent training, leaving knowledge gaps. Rural and urban areas, as well as counties in the region, face unique challenges requiring tailored solutions. Flexibility is necessary to accommodate different resources, capabilities and operational needs.

DATE November 12, 2024

LOCATION Cape Girardeau

HOST Cape Girardeau County Public Health Center

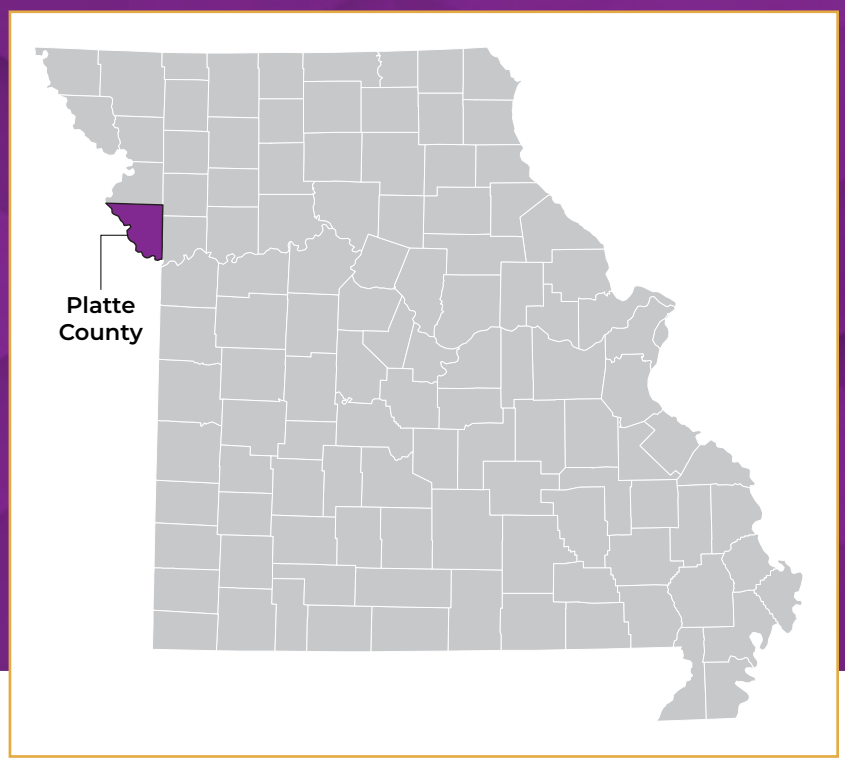
ATTENDANCE 4

REPRESENTATION Butler County Health Department, Pemiscot County Health Department, Bollinger County Health Center, Cape Girardeau County Health Department

Without data dictionaries, the data doesn't mean anything.

Participant Series 5

KANSAS CITY



Key Themes

1 **Infrastructure and Connectivity Challenges:** The lack of reliable internet and cellphone coverage in some rural areas, particularly for EMS and health care systems, inhibits sharing data. Therefore, EMS services have trouble implementing electronic patient care reports and connecting to statewide systems. For example, in the Ozarks, they rely on makeshift systems (e.g., grocery store-based dispatch) due to infrastructure gaps.

2 **Ambiguous Data Governance:** Ambiguity and inconsistency in data ownership, access and federal regulations create barriers for LPHAs and EMS services. Some counties must duplicate systems to retain access to their own data. Meanwhile, HIPAA restrictions limit granular data sharing in rural areas and there are variants in interpretations of data laws.

3 **Need for Data Infrastructure:** Funding is sometimes not used to its fullest potential due to restrictive red tape, lack of infrastructure and ineffective prioritization of needs. Communities require more than just funds; they would benefit from technical assistance, infrastructure development and strategic planning to effectively implement solutions.

4 **Prioritization of Data:** Data access without prioritization and strategic planning will undermine efforts to improve health outcomes and system performance. Without targeted metrics and strategic goals, resources are spread too thin and the potential for data analytics to enhance public health outcomes is underutilized. Prioritizing metrics that align with local needs and building a phased approach to achieve point-of-care data interoperability is essential.

DATE November 13, 2024

LOCATION Kansas City

HOST Platte County Health Department

ATTENDANCE 12

REPRESENTATION Clay County Health Department, Jackson County Public Health, Kansas City Digital Drive, Kansas City Health Department, Lewis and Clark Information Exchange (LACI), Platte County Health Department, State Advisory Council on EMS Regional Committee, Young at Heart

> *Worse than not having money is to have the money and not be able to use it.*

Participant Series 5

ST. LOUIS

Key Themes

1 **Regulatory and Technical Challenges:** Regulatory standards and technological limitations are major barriers to effective data sharing and utilization. Additionally, improving economies of scale in rural communities requires technological resources and using low-code scripts is recommended to enhance efficiency.

2 **Defining Trust in Data Sharing:** Actions to enhance trust between DHSS, LPHAs and other participants include transparency in how data is used and clear reporting mechanisms for misuse. For example, progress tracking for client referrals and processes to fix data errors like mismatched census tracts before public release can improve trust.

3 **State Involvement:** Missouri can play a larger role in vetting software, managing vendor contracts and creating approved lists of tools like R (programming language and software environment used for statistical computing and graphics) and SAS (Statistical Analysis System) to ease local burdens while fostering consistency.

4 **Future of Public Health Data Systems:** Investing in cutting-edge tools and analytic capabilities could support efficient data handling and real-time inputs. However, these must cater to both advanced users and under-resourced entities. Additionally, adhering to frameworks like the Trusted Exchange Framework and Common Agreement (TEFCA) can help ensure data is shared securely and consistently.

DATE November 14, 2024

LOCATION St. Louis

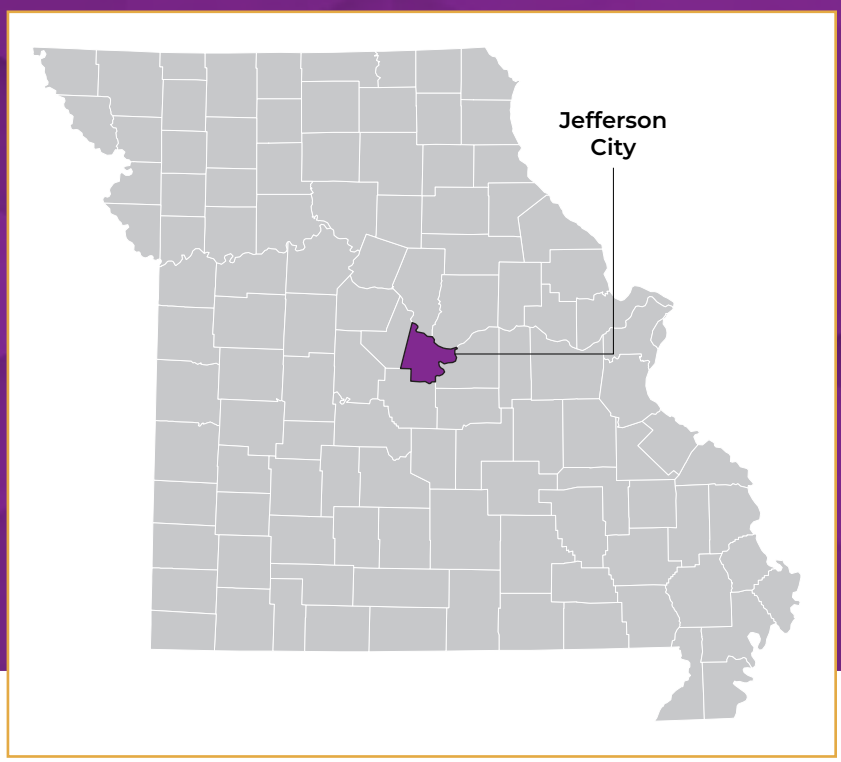
HOST Missouri Foundation for Health

ATTENDANCE 10

REPRESENTATION Institute for Public Health, Washington University, Missouri Behavioral Health Council, Missouri Hospital Association, St. Louis Area Agency on Aging, St. Louis Department of Health

The promise of TEFCA is to address access issues to consistent, actionable data and should be central to state-level data modernization strategies.

Participant Series 5



JEFFERSON CITY

Key Themes

1 **Participant Involvement:** Involving all participants for strategic direction and implementation of systems ensure that data systems serve the individuals using them. Engagement is crucial for governance, selection of priorities and ensuring systems address real-world needs. An External Participant Advisory Panel was suggested for decisions regarding the Data Modernization Initiative.

2 **Data Access and Transparency:** There are many ways to improve access to data. Some ideas presented include a patient portal for ShowMeVax or consolidated IT systems with a single sign-on capability. These would empower citizens to view their own data and enable LPHAs to streamline operations.

3 **Data Repository:** Systems across public health, EMS and health care should interact more seamlessly using a common data model and unique identifiers, such as Missouri's Department Client Numbers (DCNs) to improve information sharing. A centralized data repository with bilateral data sharing and predictive analytics capabilities would enhance efficiency.

4 **Funding Sustainability:** The cost of centralized systems and the funding required to implement them is difficult and requires state-level negotiations to reduce acquisition costs and provide funding for smaller counties. Sustainable, blended funding models including braiding funding from CDC and other sources are necessary to avoid dependency on short-term grants.

DATE November 15, 2024

LOCATION Jefferson City

HOST DHSS Offices

ATTENDANCE 9

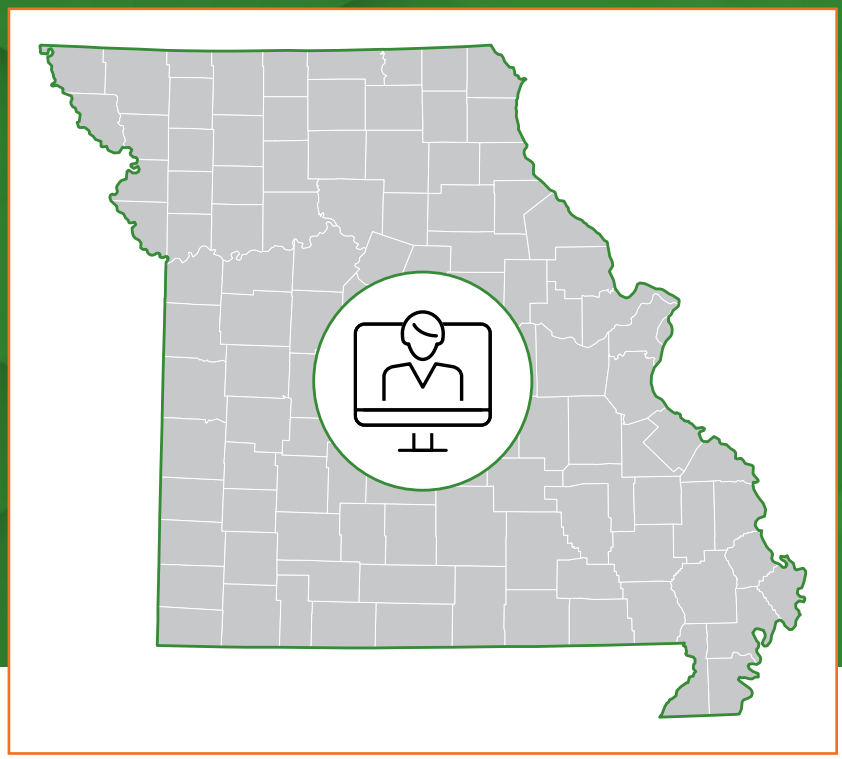
REPRESENTATION Cooper County Health Department, DHSS, Mercy Hospital, Missouri Primary Care Association, Pulaski County Health Department, University of Missouri, EMS

Data access is so powerful; you can open a lot of doors with broad access.

Specialty Meetings

Federal Partners

VIRTUAL SESSION (MICROSOFT TEAMS)



Key Themes

1 **Data Relationships and Collaboration:** Federal partners stressed the importance of fostering relationships between the CDC, states and local public health departments to improve the flow of data, disease surveillance and modernization initiatives.

2 **Data Quality and Interoperability:** Participants expressed there is a significant focus on improving data quality, adopting national standards and ensuring better interoperability between systems. Initiatives like TEFCA are promising for enhanced data-sharing capabilities.

3 **Sustainability and Funding Coordination:** As COVID-era funding phases out, state and local entities should coordinate across funding streams (e.g., PHIG, Epidemiology and Laboratory Capacity [ELC] funding) to maximize resources. Long-term funding strategies are crucial.

4 **Leadership and Cultural Shifts:** Federal partners discussed the importance of leadership in breaking silos and promoting data-sharing. Further, entities should shift away from terms like “my data” to be more collaborative and shift organizational perspectives to improve data governance and sharing.

DATE October 24, 2024

ATTENDANCE 7

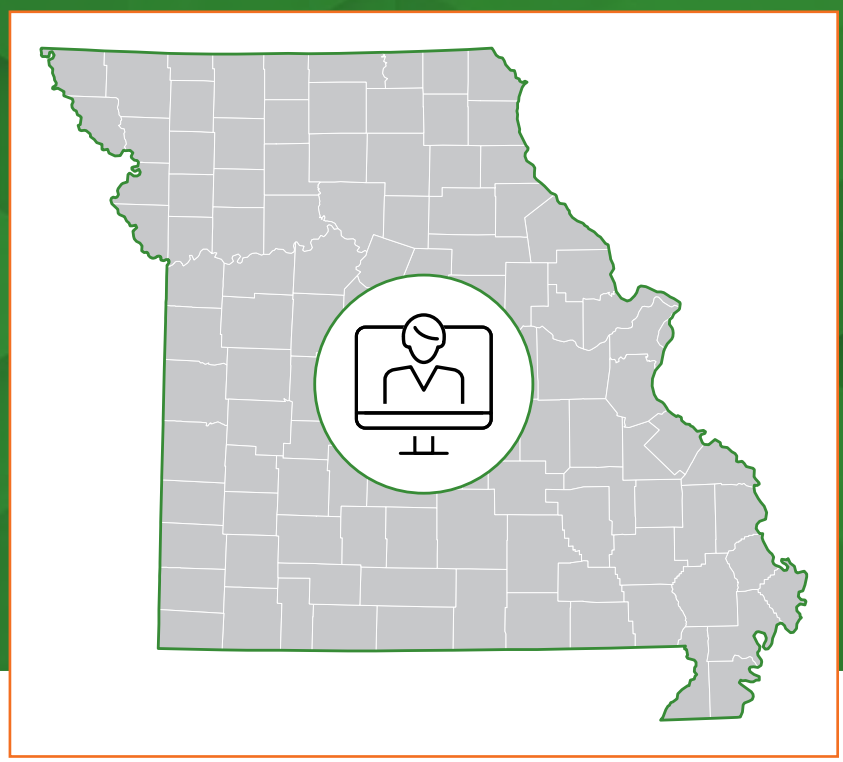
REPRESENTATION CDC Office for Public Health Surveillance and Technology, CDC’s National Center for Emerging Exotic and Infectious Diseases, Public Health Infrastructure Grant (PHIG) Data Modernization Workgroup

It all starts with leadership at the top. If we are going to break down data siloes, we must work together collaboratively.

Specialty Meetings

HIE Partners

VIRTUAL SESSION (MICROSOFT TEAMS)



Key Themes

1 **Improving Access for Vulnerable and Rural Populations:** The HIE representatives expressed the desire for data-sharing efforts to prioritize vulnerable populations, such as rural residents (who face challenges in limited broadband access and transportation barriers) and persons with Intellectual and Developmental Disabilities (IDD).

2 **Integration and Interoperability Challenges:** The HIEs recognize a need for better alignment with DHSS and public health systems to standardize data sharing, especially for registries, lab reporting and emergency preparedness. Bridging the gap between public health and clinical care also requires interoperability of systems.

3 **Resource Coordination:** Cost barriers, especially for rural health departments, hinder HIE participation and EHR implementation. HIE partners recommend DHSS provide guidance on selecting interoperable EHRs for LPHAs.

4 **Participant Engagement and Communication:** Buy-in is essential for developing user-friendly HIE/Health Data Utility (HDU) systems. Additionally, public health and health care often speak different "languages," so providing clear communication and the value of data-sharing is critical for alignment and participation.

DATE October 24, 2024

ATTENDANCE 7

REPRESENTATION LACIE, KONZA, Velatura, MO HealthNet

Public health is a dialect that is different from clinical care.

Recommendations Development Approach

To conclude the project, the study team conducted a thorough qualitative analysis of the focus group session notes to identify and extract key themes. This process involved systematically coding the data to categorize recurring patterns and significant insight. The study team used thematic analysis techniques to ensure that the themes accurately reflected the participants' perspectives and experiences. By meticulously reviewing and cross-referencing the notes, the study team was able to distill the focus group conversations into the five core themes presented in section *Phase 3: Strategic Assessment* that highlight the key issues and opportunities discussed during the sessions.

The study team then engaged in a series of collaborative discussions with key participants to review and refine the findings, key themes and recommendations from the *Phase 3: Strategic Assessment*. This process involved hosting several meetings with the department to discuss emerging themes and gather comprehensive feedback on the recommendations. The primary purpose of these interactions was to synthesize all collected data, insights and participant feedback into a cohesive and actionable final report.

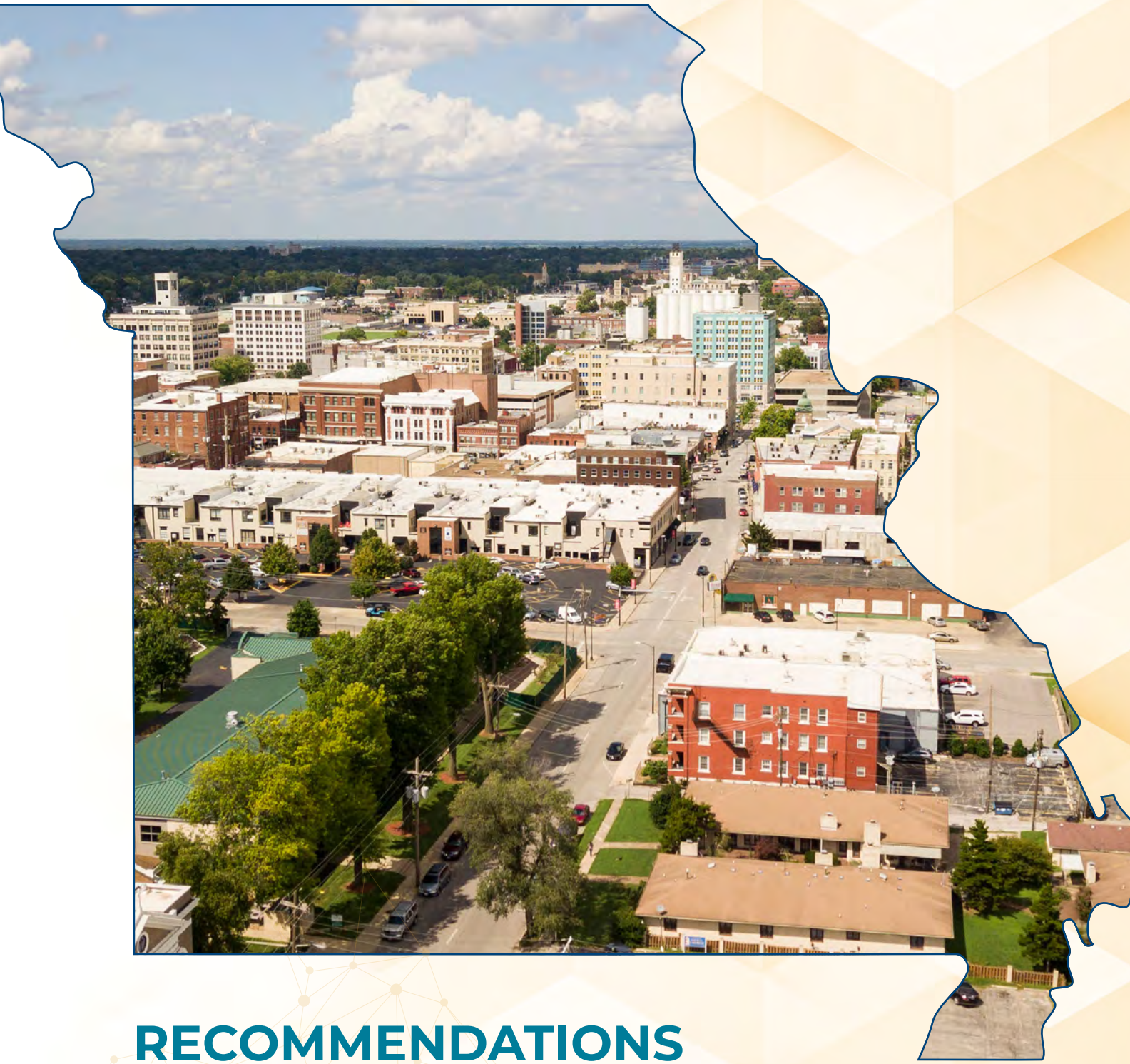
Key activities during the development of the final recommendations included:

1. **Thematic Analysis:** The study team systematically analyzed the qualitative data from the participant meetings to derive meaningful insights and key themes to inform the final report.
2. **Participant Workshops:** Conducting in-depth workshops with participants to validate findings and key themes across all participant meetings to ensure alignment with their expectations and needs.
3. **Feedback Sessions:** Organizing multiple feedback sessions to gather detailed input on the proposed recommendations and strategies, specifically with the DHSS Data Modernization Leadership Advisory Group.
4. **Drafting the Report:** Compiling all insights, data and feedback into a comprehensive report that outlines the current state, maturity and strategic recommendations for public health data transformation.

This comprehensive report aims to provide a strategic roadmap for enhancing public health data infrastructure and maturity, ensuring that the insights gained are effectively translated into practical and impactful actions.

Limitations

To assure that a wide range of input was recorded, study design and information collection procedures were designed to be comprehensive, accommodating and inclusive. The study design relied heavily on participant engagement, and the team implemented strategies such as broad outreach and flexible scheduling to ensure a wide range of participants were engaged. However, limitations should be noted when interpreting the themes and recommendations. Data collected was dependent on the availability and willingness of individuals to participate. This variability may have introduced selection bias, as the qualitative data collected throughout the participant meetings may not fully represent the perspectives of organizations or individuals who did not participate. As stated, the study design and efforts to be inclusive were intended to mitigate selection bias, and it is expected to be minimal. Additionally, it is possible that some ongoing activities and initiatives within DHSS, which are relevant to the recommendations, were not captured. These ongoing activities would be integrated into the planning for future actions based on the provided recommendations.



RECOMMENDATIONS

Recommendations from Strategic Assessment

Based on the findings and analysis documented by the study team, this section provides detailed recommendations for the department aimed at addressing the identified challenges in public health data landscape in the context of DHSS divisions, offices, bureaus and programs and participant activities to lead a strategic assessment of the way forward for public health data, analytics and technology.

The detailed strategic recommendations provided to DHSS are directed at addressing the public health data systems challenges identified in the settings of all DHSS divisions, offices, bureaus and programs. The recommendations are based on data, information and input collected during all three phases of the strategic assessment: (1) a comprehensive departmental, public health, data systems mapping, (2) internal digital maturity assessment and (3) inclusive statewide participant engagement and represents the input collected from participating sources. The study procedures were designed to be as complete as possible, however, the recommendations may not account for information not collected during the three phases.

All recommendations are designed to build on current work, either planned or actively underway within the department. For example, the Public Health Accreditation Board (PHAB) accreditation efforts, furthering the Foundational Public Health Services Model, and launching the DHSS Data Modernization Leadership Advisory Group initiative **(Appendix A)**. The engagement and data collection procedures implemented for this study were designed to be comprehensive. Any plans or actions taken based on these recommendations should consider building on initiatives currently underway.

The recommendations are not expressly ranked or ordinal, however some of the recommendations will be easier and more direct to implement than others, which will require more investment and long-term planning. Additionally, each recommendation is not explicitly discreet. There are interdependencies and the efforts required to implement recommendations will overlap.

RECOMMENDATION 1
ENHANCE SUPPORT OF LOCAL PUBLIC HEALTH AND SENIOR SERVICES ACTIVITIES

A common theme received throughout the participant engagement phase was the desire for enhanced support of local agencies. DHSS has effective mechanisms and policies in place that support local activities that are broadly appreciated within current resource limitations. Local public health agencies expressed a strong desire to be more actively included in Missouri's decision-making processes. For instance, participants have recommended the establishment of regional data hubs to enhance data-driven decision-making through a comprehensive regional understanding of health concerns.

Missouri's largely decentralized public health governance structure supports the operations of 115 independent local health agencies. This structure makes having uniform policies and procedures more difficult, as each local agencies have control over strategic decisions. Participants have expressed a strong desire for more consistent and organized support from the state, even if local agencies are not required to follow it. Enhancing the current organizational structures to better support local health agencies, senior services and other programs would help move towards standardization, particularly in areas including technology and data.

> **"Part of the reason DHSS exists is to build community and provide structure for jurisdictions to discuss and share stories, talk, relationship building, etc."**

This recommendation is based on the idea that current activities should be supported, improved and expanded. It outlines a plan to maximize the department's ability to support local work and enhance its capacity to provide comprehensive public health services across Missouri.

Supporting Factors

The following supporting factors were identified through participant engagement and feedback, highlighting key areas of concern and opportunities for improvement:

- Engaged participants consistently expressed appreciation and gratitude for the DHSS Center for Local Public Health Services staff and their efforts to support LPHAs, but recognized there are limits to what can be managed with current staffing, funding and technology.
- The study team encountered multiple examples in use for the regional organization of the LPHAs. The Highway Patrol Regional map[xxviii] was the construct referred to most often. The wide variability in the application of "regions" to organize counties in Missouri, including in some cases ad hoc regions for convenience as similar and typically adjacent LPHAs self-aggregate to solve problems they encounter, adds to a lack of clarity.

> **"The LPHAs in our region are very collaborative."**

- Participants were aware of routine cadence meetings for LPHA Administrators, but other professional "peer groups" including clinical, environmental, epidemiologic, technological and data scientists do not have similar organized convenings. Local organizations gather through the Missouri Public Health Institute learning collaboratives, and accreditation processes, out of a felt need for collaboration.
- There is a desire for stronger, consistent communication and increased transparency between state and local entities that should be managed at the departmental level.
- Participants stated frustration with multiple, disconnected access accounts and expressed interest in a state-supported and centralized information platform or portal, or "one-stop-shop" behind a single-sign-on that housed all relevant current information, policies, procedures, contracts, invoicing and financial processes.

> **"Networking with other LPHAs is always a powerful tool."**

> **"I've never seen there be thirteen different logins to do one thing!"**

OPPORTUNITIES FOR STATE SUPPORT IN EHR ADOPTION

Local public health agencies make independent choices about the systems they procure and deploy. There are more than ten distinct Electronic Health Record (EHR) systems in use across the 115 LPHAs in Missouri in addition to an unknown number that still use paper records. In the case where the same system is in use by multiple LPHAs, those systems do not interface and do not share data. This is based primarily on policy and cost barriers, versus technical limitations in the systems. In several cases, LPHAs were not aware of options available to interface with ShowMeVax, an HIE, or may have been aware but were not able to secure the funding to cover the cost.

In the example of one more commonly implemented EHR, several LPHAs gathered to collectively bargain for the system cost in one region of Missouri to benefit the group. Each LPHA determined their ability to purchase and maintain the system. Some used grant funds for the purchase but struggled to sustain the platform once the grant funds ended. Despite the volume discount, some of the LPHAs still could not afford the costs for the EHR. This situation highlights the need for enhanced state support to bolster this regionalized approach to data tools and provide more sustainable solutions.

Anticipated Impacts

The anticipated impacts of this recommendation are significant, promising to enhance the overall effectiveness and sustainability of public health efforts in Missouri. These impacts include:

- **Improved collaboration and enhanced coordination,** leading to more efficient use of resources and better service delivery across all public health entities.
- **Strengthened communication and information sharing,** which will bolster collaboration between the department, local public health entities and community partners.
- **Increased operational efficiency,** allowing for more streamlined processes and shared decision-making.
- **Reduced complexities** as systems and processes move toward standardization.

- **Improved relationships and increased trust** between state and local health entities, fostering a more cohesive public health network.
- **Enhanced support for LPHAs,** ensuring their active involvement in decision-making. This will contribute to more sustainable funding, resource-sharing, standardization and overall efficiency. Rather than viewing and funding data issues in siloes, Missouri will be empowered to create more sustainable solutions.

Next Steps

To support local public health entities, senior services and other programs more effectively, it is essential to augment the departmental organizational structures that currently exist to support external DHSS operations. The following next steps outline the actions necessary to achieve these improvements:

- **Conduct a comprehensive assessment of the existing organizational structure,** including roles, responsibilities and workflows that support local programming, administration, technology and programs. Design the assessment to identify areas of overlap, if they exist, and gaps in capacity of the current staff. Involve key partners, including department staff, local public health entities and community partners, as appropriate, to gather input on organizational needs and priorities. Based on assessment findings, increase the state staff capacity necessary for centralized coordination that oversees and streamlines LPHA and aging services engagement initiatives, ensuring consistent communication and collaboration across all programs that support local activities.
- **Design and adopt a regionalized administrative support structure** that functions between the department and the LPHAs. In conjunction with the assessment and augmented state staff proposed above, another feature could include designating a “coordinating LPHA.” Desired outcomes include supplementing the administrative capacity in under resourced LPHAs, reducing redundancies in administrative processes and program delivery and more effectively applying standards that involve processes between the department and LPHAs (e.g., contracts, programmatic reporting, invoicing, etc.). This recommendation is not suggesting officially regionalizing the LPHAs under a state governance structure which would require changes to the state statute.
- **Define professional peer groups conducting public health work** by building upon the success of the recurring LPHA Administrators meetings and establish routine cadence meetings for the defined peer groups. Examples of peer groups may include, but are not limited to, other administrative professionals, clinical providers, environmental groups, epidemiological groups, technology and data analytics. Additionally, establishing planning committees to manage meeting logistics, agenda development and content creation in coordination with designated departmental staff. Participant feedback was consistently positive about Missouri Public Health Institute learning collaboratives, which indicates there is also an opportunity to outsource meeting support to partner organizations.

- **Adopt a single, state-funded platform for all LPHAs** to improve access to information needed to administer the functions of an LPHA. This platform should leverage digital tools to automate and streamline workflows, further supporting learning collaboratives, training and peer group engagement across teams. By centralizing resources such as current data sources, policies, procedures, contracts, invoicing and financial processes, this platform will enhance collaboration, data sharing, reduce fragmentation and streamline processes.

By augmenting the departmental organizational structures that support local public health agencies, adopting a standard regional construct and establishing forums for strengthening engagement between the department and local agencies, Missouri can increase its current capacity to support local public health entities, senior services and other programs. This strategic approach will lead to more effective and responsive public health services.

RECOMMENDATION 2
DESIGN AND ADOPT OPERATIONAL INFORMATION TECHNOLOGY AND DATA GOVERNANCE STRUCTURES

Effective governance of information technology systems and data standards is crucial for ensuring the integrity, security and usability of public health information and the systems that collect, manage and store critical and sensitive data. Through the establishment of effective governance, an organization is better positioned to ensure technology investments align with program and strategy objectives and potential risks are more effectively identified, mitigated and managed. Adoption and implementation of clear technology and data policies, processes and controls at an enterprise level will facilitate stronger program support and optimize organizational operations by strategically guiding IT decision-making and resource allocation.

Adoption of data and technology standards under the direction of an enterprise level IT and data governance framework will create opportunities to increase system interoperability, improve data quality, mitigate data ownership disputes, improve cross-unit data sharing and address resistance to change. Effective governance creates a forum for representational decision-making which increases accountability for choices related to systems, data sharing and data quality. Despite the challenges posed by data protection regulations and decentralized governance in Missouri, there is a strong call for more standardized processes, tools and regionalization to streamline operations.

Supporting Factors

The following supporting factors were identified through participant engagement and feedback, highlighting key areas of concern and opportunities for improvement:

- The study team collected feedback that illuminated high variability in both the presence of technology and data governance and the application or enforcement of policies and standards. This was predominantly the result of limited or lack of requisite staff or de-prioritization due to competing pressures for staff time.
- Local public health agencies, senior services and other public health entities require standardized data practices, inter-organizational collaboration and the navigation of critical technology requirements such as security protocols. These organizations would benefit from standardization and publication of relevant policies, processes and procedures at the department level by establishing more formal structures.

> **"Every LPHA has their own rules."**

- Trust is at the forefront of data sharing. Enhancing trust between DHSS, LPHAs and other partners requires transparency in data usage and clear reporting mechanisms for misuse. These actions will ensure that data governance structures are reliable and trusted by all parties involved.
- Participants repeatedly raised issues related to inconsistent data quality received from various programs at the state level and understanding of data access procedures. Participants advocated for thorough documentation of standard data processing procedures, which would promote continuity during staff transition and workforce turnover.
- Local public health agencies, senior services and other organizations using commercial-off-the-shelf systems (e.g., software solutions developed for the mass market) often encounter incompatible data hindering interoperability. State-level alignment to local standardization is limited. Consistent, automated data quality procedures across systems are more challenging in the absence of statewide standards.
- Various data formats and limitations in data-sharing policies create barriers to effective cross-agency collaboration. Participants described a strong need for efficient, bi-directional data sharing across local, state and regional levels, as many participants lack access to data they input into state systems.

> **"Terminology is at the heart of the ability to connect, whether it's clinical or non-clinical."**

- Participating HIE leaders stated a need for better alignment with DHSS and public health systems to standardize data sharing, particularly for registries, lab result reporting and emergency preparedness and response activities. Bridging the gap between public health and clinical care requires system interoperability standards.[xxix]
- System compatibility and lack of standardized data formats remain overarching barriers, and solutions could include a universal data dictionary, standardized language and vendor qualification processes to streamline procurement and ensure systems can integrate.

> **"The State is a fantastic resource, but it would be good to feel empowered by our own data."**

- The department can play a larger role in vetting software, managing vendor contracts and creating approved lists of tools (e.g. R and SAS) to ease local burdens including use justification, procurement and compliance while fostering consistency.

- Cost barriers, particularly for rural health departments, hinder participation in HIEs and the implementation of EHRs. Providing guidance on selecting interoperable EHRs for LPHAs can mitigate these barriers. Additionally, collaboration with regional data owners, third-party contractors, academic institutions and data collective groups can optimize resources for smaller entities.
- Local health agencies use various systems that lack integration, leading to extensive workarounds including multiple logins and dual data entry. This fragmentation affects efficient data sharing, especially for vital records, communicable disease reporting and tracking immunization coverage rates.

Anticipated Impact

Implementing operational IT and data governance structures will have far-reaching and positive effects on Missouri's public health data landscape. The anticipated impacts include:

- **Increased accountability** through visible and inclusive decision-making processes, ensuring that all participants are engaged and understand their responsibility.
- Improved deployment of **Change Management principles** and procedures, leading to smoother transitions, higher adoption rates of new systems and minimized resistance to change.
- **Enhanced data quality, integrity and security,** reducing the risk of data breaches and ensuring compliance with regulations.
- **Efficient resource utilization,** driven by reliable and accessible data, enabling informed decision-making and optimal allocation of resources.
- **Adaptable systems** that can evolve with future needs and technological advancements, maintaining their relevance and effectiveness over time.
- **Improved data quality and reliability,** providing a solid foundation for public health initiatives.
- **Increased efficiency** and reduced redundancy, streamlining operations and eliminating unnecessary processes (e.g., manual data cleaning).
- **Optimal resource allocation,** ensuring that they are directed towards the most impactful areas.
- **Enhanced public health outcomes**, resulting from more informed and effective public health strategies.

Next Steps

To support local public health entities more effectively, it is essential to establish a robust IT and data governance structure that will better support DHSS's operations and ensure statewide consistency and quality. The following next steps outline the actions necessary to achieve these improvements.

- Design and adopt a **multidisciplinary data governance framework that crosses established jurisdictional lines** led at the state level by DHSS. The operating model could take on any number of different forms, such that the results serve the needs of DHSS. However, due to the nature and emphasis of local control, the selected operating model should maximize representational decision-making. Success will require strong collaboration, necessitating buy-in by executive

sponsorship at the highest feasible level of the department. Future actions initiated by this recommendation should account for existing decision-making committees and incorporate other relevant state entities including the Information Technology Services Division (ITSD) within the state Office of Administration (OA).

- Adopt and publish **policies, procedures and data systems standards** for managing information technology. Existing data projects and resources can be leveraged to provide best practices for managing data access, quality, security and privacy. By leveraging existing data projects and resources, DHSS can incorporate best practices and ensure that all IT and data governance activities are aligned with these standards. This approach will not only enhance consistency and reliability of data management across Missouri, but also foster a culture of transparency and accountability. Additionally, regular reviews and updates of these policies and procedures will be necessary to adapt to evolving technological advancements and emerging public health needs.

Adopting an IT and data governance framework will enable the department's capacity to strategically manage information technology and data effectively, which will lead to improved data quality, security and efficiency. This framework will also foster greater transparency and accountability, enhanced collaboration and ensure the department remains adaptable to future technological advancements. Ultimately, these improvements will contribute to better public health outcomes and more efficient use of resources across Missouri.

> **"People don't often see the impacts of poor data entry or poor system set-up."**

RECOMMENDATION 3
PLAN AND IMPLEMENT AN ENTERPRISE ANALYTIC ENVIRONMENT

Public health agencies, particularly at the state-level, have been historically hindered from effective enterprise data aggregation due to the nature of programmatic funding, which forces programs to implement and maintain systems that are inherently siloed. Even though strides are being made to improve interoperability and the application of data standards, technology systems in use by public health programs – including disease registries and case management – typically lack connectivity. Implementing an enterprise analytic environment will allow the department to ingest, manage, curate, integrate and analyze large amounts of structured, semi-structured and unstructured data at any scale. Public health agencies across the Nation are implementing similar analytics environments – often referred to as data lakes – in conjunction with state cloud migration initiatives or as department-led projects. Projects can range in scope to start small with selected system sources according to a data migration plan or can be more comprehensive and inclusive. Projects can be scaled based on the needs, resource availability and readiness of the programs.

> **"I'd like to see the data transformation steps reduced and data dictionaries consolidated."**

Capabilities made possible by an analytic environment are crucial for public health entities to address the need to combine data from various public health data sources to contribute to more comprehensive analyses. A fully functioning enterprise analytic environment enables advanced analytics that can lead to faster outbreak detection, more informed public health strategies, minimization of gaps in care, improved resource allocation and ultimately, improved health outcomes for Missourians.

Supporting Factors

The following supporting factors underscore the necessity of planning and implementing an enterprise analytic environment to streamline data management, enhance integration and improve data quality across public health programs:

- Participants shared that the use of numerous systems, platforms, logins and databases lead to duplication, errors and inefficiencies. Participants desire to have a "unified data lake" that serves as the central source of truth, particularly for clinical data, case management systems and other public health program data.
- Participants expressed concerns about the quality and consistency of data due to unstructured formats, inconsistent standards and challenges in data entry. Some efforts to integrate and standardize data are underway, but data exchange across health information systems is often complex.
- A data lake with user-friendly tools for accessing and analyzing data will improve data collection for front-line staff by monitoring quality downstream. It should include feedback loops for data accuracy.
- Local public health agencies need integrated data that can be shared seamlessly – particularly for communicable disease tracking and immunization registries. A shared platform could enable this integration.

Anticipated Impact

Implementing an enterprise analytic environment will have a profound impact on the efficiency and effectiveness of public health data management. The anticipated impacts include:

- **Improved situational awareness** facilitated by access to current, complete data through comprehensive data dashboards, enabling timely and informed decision-making.
- **Increased access to integrated and standardized data,** which will streamline data analysis and enhance decision-making processes across all levels of public health operations.
- **Enhanced data quality** through comprehensive data assessment and cleansing processes, ensuring high data quality and significantly reducing errors.
- **Increased efficiency** through the automation of processes including data transformation and mapping, which will streamline data management and reduce manual workloads.
- **Better public health outcomes** by leveraging high-quality, actionable data to improve public health interventions and achieve better health outcomes for Missouri communities.
- **Scalability and flexibility** in the analytic environment, allowing DHSS to adapt to future data needs including surges caused by outbreaks and other technological advancements.
- **Strengthened collaboration** through improved data sharing and integration between the state health department, local public health entities and community partners, fostering a more cohesive public health data network.
- **Enhanced interoperability** through seamless data exchange between various systems and platforms, ensuring that all public health entities have access to consistent up-to-date information.

> **"We need to improve the level of communications between the State and the LPHAs. We don't talk as often as we should."**

Next Steps

To enhance the department's ability to collect, transform, curate, store and analyze siloed and disparate data sets, it is recommended that the department move towards the implementation of an enterprise-level analytic environment, to be managed and maintained at the state level, to the benefit of programs across the department. The department will need to conduct an assessment and planning processes designed to document the data structure, data elements, data models and develop a data migration plan that culminates in the selection and implementation of an analytic environment (e.g., cloud-based data lake, sandboxes, Extract, Transform, Load [ETL] tools, analytics capacity). Outlined below are steps to document data structures, data elements and data models and develop a data mapping plan that culminates in the selection and implementation of an analytic environment.

- Complete a comprehensive **data systems assessment** that documents a validated list of systems to be included from which data will be mapped. This assessment should document all stored data, their formats and relationships and structures, including databases or applicable data warehouses. All data elements should be cataloged, including metadata, data types and data sources resulting in data models that represent the logical and physical structure of the existing data.
- **Select and implement an analytic environment**. The study team is aware there are efforts underway within Missouri's state government to build a data lake in which DHSS is a participant. If DHSS is permitted and makes the decision to begin a department-level initiative, there are myriad options as to how the project could be scoped, depending on procurement rules including more exclusive technology vendor relationships. The steps to solicit and select a technology vendor to provide the recommended capabilities could be adjusted as needed to include appropriate functionality for LPHAs to access their residents' data.
- **Create a comprehensive data ingestion strategy** that outlines the steps, timelines and resources required to extract, transform and load (ETL) data from various sources into the new analytic environment while preserving data integrity. This recommendation is chiefly focused on state managed systems but could also include other locally managed sources based on priority, system capabilities and staff capacity. This may include prioritizing data systems and sources and defining clear inclusion criteria for data elements. When developing the strategy, in addition to resource conflicts with program staff, contingencies to be considered include vendor relationships with current systems and how much historical data to include. Plans should consider different approaches to implementation, for instance, "big bang," rather than phases, or "trickle" approaches. Resources will need to be allocated, including creating a dedicated cross-functional project team to manage and monitor progress.

Success Story in Missouri: The Missouri Behavioral Health Council

The Missouri Behavioral Health Council ("the council") demonstrates the potential for successful data sharing in Missouri through their collaborative and iterative data management transformation process.

In 2015, Harvard conducted a case review on the implementation of the health home model, which spanned both behavioral health and primary care, involving the Department of Mental Health (DMH) and the Department of Social Services (DSS). Extensive interviews and reviews were conducted to understand the data and to build trust among participants. The study found that the council should build a reporting and monitoring system that would minimize burden on providers. The integration with electronic health records (EHRs) was crucial for improving care.

The council now supports 15 programs with a care management system that tracks client experiences, including interactions with law enforcement. This system has expanded to include referrals to community treatment and outreach programs. One example of an outreach program involves identifying high-cost Medicaid beneficiaries with untreated behavioral health conditions on a quarterly basis. The council's data warehouse and care management system are now central to their operations.

They collect data from various EHRs, ensuring ownership and governance through a dedicated team and with cyber liability insurance. The help desk provides technical assistance, ensuring smooth operations and addressing issues promptly. The council is also working with other states where the state department is doing similar work and applying similar rules. This initiative has saved the state significant funds and demonstrated positive health impacts.

HOW DID THEY DO IT?

In addition to millions of dollars in state and federal funding that were applied to mental health, key success factors that pioneered the necessary change were strong relationships, particularly between the council and DMH, and the leadership required to drive the transformation. Department of Mental Health and the council's efforts began in response to a 2008 mortality study highlighting the need for holistic, integrated care. Individuals with behavioral health conditions were experiencing high mortality rates at younger ages than expected due to underlying physical health conditions. Therefore, a need for change was identified, and funding and leadership support allowed for the advancement of progress in data sharing for clinical and mortality issues.

The relationship between the state and providers is foundational; in particular, building trust and collaboration, especially for those less familiar with technology, helped increase adoption. The council's approach involves regular meetings, steering committees and

inclusive decision-making processes, ensuring provider needs are met and fostering successful outcomes. The council's partnership with DMH includes project and data management, starting with the home health program. This relationship has evolved, incorporating training and technical assistance and expanding to Certified Community Behavioral Health Clinics (CCBHCs). The partnership with Netsmart, a health information technology vendor, began in 2015, offering a range of tech solutions and connecting to broader health information networks.

The council's unique position as a governing body trusted by its members has facilitated data sharing and accountability. The council has memorandums of understanding (MOUs) and involved attorneys, which have helped them with data security. Regular engagement with providers and transparent data practices have also been key to their success. The council's work emphasizes the importance of public health infrastructure and workforce development. In summary, the Missouri Behavioral Health Council's journey is a testament to the power of collaboration, leadership and innovative use of technology in improving behavioral health care. Their story serves as an inspiring example of what can be achieved through dedicated efforts and strong partnerships.

MAIN LESSONS LEARNED FROM THE MISSOURI BEHAVIORAL HEALTH COUNCIL:

- Reducing the administrative burdens on providers wherever possible;
- Achieving data transparency;
- Choosing the proper technology solution for a specific population's health management;
- Making connections between the data lake and Electronic Health Records;
- Automatically mapping and standardizing incoming data; and
- Maintaining a "one stop shop" for data, surveillance, trend analysis, etc.

ABOUT CCBHCS

Certified Community Behavioral Health Clinics (CCBHCs) are organizations that provide mental health and substance use disorder services to communities. CCBHCs are designed to increase access to high-quality behavioral health care for all, regardless of age, income or place of residence. CCBHCs provide a range of services, including comprehensive care, 24-hour crisis care, evidence-based practices, care coordination with local primary care and hospitals and pre-release support for people re-entering from jail or prison.

CCBHCs are funded through a partnership between SAMHSA, the Center for Medicare and Medicaid Services and the Office of the Assistant Secretary for Planning and Evaluation. They are also funded through the Medicaid demonstration program or SAMHSA grants. In Missouri, there are 20 CCBHCs providing services in every county and are certified by DMH, Division of Behavioral Health (DBH). The data infrastructure is supported through an administrative fee that is built into the CCBHC prospective payment system (PPS) rate. This fee is paid by CCBHCs to MBHC to cover the costs of the data platform, provide training and technical assistance to providers, and provide state reporting and analytics for monitoring and quality improvement.

These clinics represent a beacon of hope, transforming lives and fostering resilience within our communities.

For more information about Missouri CCBHCs, visit **Missouri Department of Mental Health: https://dmh.mo.gov/certified-community-behavioral-health**

For more information about CCBHCs nationally, visit **Substance Abuse and Mental Health Services Administration (SAMHSA): https://www.samhsa.gov/certified-community-behavioral-health-clinics**

ABOUT MISSOURI BEHAVIORAL HEALTH COUNCIL

The Missouri Behavioral Health Council (MBHC), founded in 1978, represents Missouri's not-for-profit certified community behavioral health clinics, substance use treatment agencies, affiliated community psychiatric rehabilitation service providers and a clinical call center. Over thirty member agencies employing more than 14,000 caring and qualified staff provide treatment and support services to more than 300,000 patients annually. The council actively leads the development and implementation of programs, systems and resources that unify and support the statewide providers, improving access to appropriate behavioral health care for all Missourians. **www.mobhc.org**

ABOUT NETSMART

Netsmart is an industry-leading healthcare technology organization empowering providers to deliver value-based care to the individuals and communities they serve. The Netsmart **CareFabric**® platform serves as a unified, connected framework of solutions and services for the human services, post-acute, payers and public sector communities. Together with our clients and Marketplace vendors, we develop and deliver innovative technology, including electronic health records (EHRs), interoperability, analytics, augmented intelligence (AI), population health management and telehealth solutions and services that assist organizations in transforming the care they deliver. The result has helped make an impact on the lives of more than 143 million individuals for the better. **www.ntst.com**

RECOMMENDATION 4
UPGRADE AND ENHANCE THE AVAILABILITY OF ACTIONABLE WEB-BASED DATA

> "All of the data is at least two to three years old..."

The Missouri Public Health Information Management System (MOPHIMS) is situated in the Division of Community and Public Health – Bureau of Health Care Analysis and Data Dissemination (BHCADD) and provides access to public health related data to assist users in understanding the status of health outcomes in Missouri. In the study team's data gathering, MOPHIMS was consistently referred to in a very positive light, and users across the system provided examples of how critical the data source was in various aspects of their work and research. Participants were complimentary of the staff and sympathetic in their understanding of the challenges faced by the team that manages the platform, however, frustrations regularly referred to issues with recency of data availability and in some cases low levels of understanding about back-end data management processes.

Increasing the amount and quality of data available on a public website can greatly benefit a state public health department. These efforts can enhance transparency, foster trust and empower partners and communities they serve with reliable, actionable information. Readily accessible, comprehensive and accurate health data allows practitioners, researchers and policymakers to make informed decisions about health practices and policies.

There are multiple factors involved in achieving a best-in-class web-based data platform, including staffing capacity, quality and recency of available data, proper tools and environments for data transformation and analysis and documented data quality procedures to assure potential errors can be managed. This recommendation outlines steps to upgrade and enhance the availability of actionable web-based data that includes a comprehensive capacity assessment of the technology and staff who operate the website and data management processes.

Supporting Factors

The following supporting factors were identified through participant engagement and feedback, highlighting key areas of concern and opportunities for improvement:

- MOPHIMS was initially designed for LPHAs to conduct community health assessments, often tied to Core Contracts held by LPHAs to provide public health core services. However, its scope has since expanded to serve nonprofit organizations, universities and other public health-related entities. Increasing the accessibility and use of MOPHIMS across these diverse participant groups is essential for maximizing its impact.

- One of the key challenges identified by participants is the need for clearer documentation and training around MOPHIMS. Many users face issues understanding how to request data, which hampers their ability to fully utilize the system. Additionally, suppression policies for small data sets and the lack of line-level data pose significant challenges for rural areas, limiting their ability to conduct detailed analyses.
- Data updates to MOPHIMS are often delayed due to manual processes, lack of automation, staffing shortages and the recent loss of institutional knowledge. This has led to outdated information being available. Participants, in some cases, reported that they rely on national data instead of DHSS data because the latter can be three to four years old and unhelpful to current topics.
- MOPHIMS operates on an outdated and rigid backend infrastructure (e.g., OLAP cubes) managed by ITSD with limited capacity for modifications. This outdated technology restricts the system's flexibility and ability to adapt to new requirements. In the short term, efforts are focused on maintaining the tool's current ability by updating population categories and improving access to more timely data. However, discussions are underway about the long-term vision for MOPHIMS, potentially replacing the current system with a more modern and flexible solution in the coming years.
- Participants have also highlighted the limited access to data and the need to place formal requests for certain types of information. This is especially apparent for rural LPHAs with limited broadband access. LPHAs only have access to aggregate data via MOPHIMS, which can be outdated and less helpful. There is a strong desire for more accurate, complete and up-to-date data.
- To support data sharing and enhance the system's capabilities, participants have suggested establishing shared data standards, a repository of code and analytical tools and a central resource library that would streamline processes and improve data quality.
- Participants, particularly from LPHAs with lower levels of available resources, repeatedly requested support with very specific needs including data mapmaking, data matching and deduplicating and statistical analysis suggesting a state-based capability would be highly beneficial to many LPHAs.

> **"Improved access will be great because everything can be in once place, but we need more training because we're running into issues making reports."**

By addressing these factors, the proposed gap analysis and technology needs assessment will identify the necessary upgrades and enhancements for MOPHIMS.

Anticipated Impact

Upgrading and enhancing the availability of actionable web-based data will significantly improve the efficiency and effectiveness of public health operations. The anticipated impacts include:

- **Reduction of manual workloads** through automated data integration and standardized processes, allowing staff to focus on higher-value tasks and strategic initiatives.
- **Improved informed decision-making** by providing easy access to accurate and timely web-based data, ensuring that decisions are based on the most current information available.
- **More effective monitoring, response and intervention strategies** through access to real-time, actionable data, enabling quicker and more precise public health actions.
- **Fostering stronger collaboration** through improved data sharing and communication between the state health department, local public health agencies and community partners, enhancing overall public health efforts.
- **Adaptability to future needs and advancements** through a modernized and scalable technology infrastructure, ensuring that systems remain relevant and effective over time.
- **Stronger control of data use** through consistent application of use agreements, ensuring that data is used responsibly and in compliance with established guidelines.

Next Steps

To support local public health agencies effectively, it will be crucial to apply the time and resources necessary to upgrade and enhance the availability of actionable web-based data through MOPHIMS. This capability is highly valuable and provides the platform for the department to be the trusted source of truth for population health outcome data for the state of Missouri. This recommendation outlines steps that could be taken including a comprehensive capacity assessment of the technology and staff who operate the website and data management processes and a future technology platform to best support the critical data and data analytics needs of DHSS, local public health and senior services entities.

The study team is aware there are discussions currently taking place related to this topic. Decisions made to address this recommendation should be considered in the context of the Governance Framework suggested in Recommendation Two. The study team noted that the MOPHIMS team works diligently to assure that accurate, timely and actionable data is available to meet the needs of data consumers. This recommendation is fundamentally intended to illuminate the need to support such a critical department function. See next steps outlined below:

- **Conduct a workforce assessment of the MOPHIMS team.** Evaluate the current workload and capacity of staff to manage and maintain the web-based data systems effectively. Determine what workforce gaps exist in the organizational structure based on workload, and if there are technical capacity and competency gaps that should be addressed based on a future state best-in-class data platform. The assessed training gaps and the training plan in proposed steps found in Recommendation 5 – Standardize and Expand Departmental Capacity for Training State and Local Staff – should take into account the training needs of current and future MOPHIMS staff and staff across the state at all levels of public health who use the platform.

- **Conduct a thorough capacity evaluation and assessment of the existing technology infrastructure.** Evaluate the performance and ability of the current system to handle increased data loads and user traffic as well as identify outdated or underperforming components. The evaluation should include servers, databases and content management systems. This effort should also assess the security measures in place to protect sensitive data and ensure compliance with relevant regulations, such as HIPAA.
- **Design and develop a modernized technology platform that meets the department's needs.** Conduct a process that results in the design of a future-state, best in class, web-based data sharing platform. The design should integrate advanced analytics tools and dashboards to provide real-time, dynamic and actionable insights. Utilize currently available off-the-shelf advanced analytic tools, which enhance data visualization and accessibility. Redesign the website to improve user experience, ensuring it is intuitive, responsive and accessible. Implement features such as interactive maps, customizable reports and data export options.
- **Document and enhance data management processes through data governance.** Work towards standardizing data formats and extraction protocols to ensure consistency across different systems. Where possible, implement automated data ingestion processes to streamline data collection, processing and dissemination. Use APIs and ETL tools to facilitate seamless data flow, as maximizing automation mitigates errors and increases timeliness. Establish robust data quality assurance processes to ensure the accuracy, completeness and timeliness of the data.
- **Develop and implement a formal data request process.** Under the management of the MOPHIMS team, develop and implement a department-level policy and procedure that guides requestors interested in receiving data not available on the web platform. The policy should include an enforceable Data Use Agreement that gives DHSS clear control over the requestors use and retainment of data. Integrate the policy with Institutional Review Board policies and procedures. Increase opportunities to maximize cost recovery though monetization of department data.

> **"This isn't a matter of trying to take charge of State data, it's a matter of trying to optimize local data."**

By conducting a comprehensive capacity assessment and implementing strategic upgrades, the department can significantly enhance the availability and usability of actionable web-based data. This will empower local public health agencies and other partners to access the information they need to make informed decisions and improve public health outcomes of Missourians.

RECOMMENDATION 5
STANDARDIZE AND EXPAND DEPARTMENTAL CAPACITY FOR TRAINING STATE AND LOCAL STAFF

Consistent and recurring training is crucial for assuring the overall effectiveness and resilience of public health initiatives. This project targeted topics specific to data systems and analytics capacity to support public health activities, however this recommendation goes beyond the topic in the scope of the project and is applicable to any disciplinary need for recurrent training across the department. It will be essential to secure stable funding from federal and state sources to accomplish and sustain the efforts and resources needed to address the components of this recommendation.

In our modern world, technology and relevant protocols and policies are ever evolving. Additionally, staff turnover or staff capacity needs change based on roles. Competing priorities make staying current challenging. This recommendation targets the expressed need for a department-led initiative to identify training needs and capacity gaps and to address those gaps with a centralized capability at the department level. This approach will ensure that staff remain up to date, improve job satisfaction and enhance staff retention.

This assessment will identify specific areas where staff require additional training and support, enabling the design and development of targeted training programs. By building staff capacity at DHSS to support recurring statewide training, the department can ensure these gaps are addressed continuously and effectively.

Training capacity exists variably across the LPHAs, and other public health agencies based on resource differences with smaller, rural counties tending to have a more urgent need for training and technical support. Additionally, the study team became aware of other assessments that have been conducted, including the DHSS Workforce Development Plan and the *Missouri Public Health System Capacity to Meet the Missouri Foundational Public Health Services Model*, the results from which are current and should be considered.[xxx]

Supporting Factors

The following supporting factors highlight the critical need for a standardized and expanded departmental capacity for training state and local staff. These factors emphasize the importance of consistent, comprehensive and accessible training to ensure staff are well equipped to handle their responsibilities effectively:

- The need for ongoing and structured training was emphasized by participants, with some participants partnering with academic institutions for trainings while others relied on on-the-job training.

> **"Training everyone on how to get the most out of any upgraded, modernized system will be imperative."**

The need for greater consistency around training was noted, as training often is provided by individual programs. Enhanced training based on roles and a training support system for LPHAs were stated as essential for the success of true data modernization.

- Overall, participants' statements about the implementation of ShowMe WorldCare were positive, however, repeatedly LPHAs cited it as an example where limited training and user guidance left staff feeling overwhelmed by a complex system and data entry requirements, underscoring the need for training that is comprehensive, user-friendly and catered to both technical and non-technical users. Participants also discussed the insufficiency of training for ShowMe WorldCare, noting an over-reliance on virtual training with limited interactivity. A dedicated training arm within DHSS was recommended as a solution to provide ongoing support, in this case, during a large implementation.

> **"Data hygiene is important and should be ongoing. It starts with the person entering data and ensuring they are educated on the importance of data accuracy when documenting in a structured data field."**

- Participants also remarked on the importance of communication, marketing and visualizing data with their communities and the public. Adequate, consistent training and a dedicated state resource to assist smaller counties would be highly beneficial, particularly for tasks such as Geographic Information System (GIS) mapping and visualizing data for marketing. The lack of standardized training and access to technical assistance forced LPHAs to figure out technical processes independently, highlighting the need for a more structured and supportive training environment.
- In multiple facilitated discussions, participants stated the need for a "total top to bottom" needs assessment of their capacity gaps to understand comprehensively what training needs exist across Missouri.
- Participants emphasized that not all trainings have equal impact. Some participants prefer in-person and hands-on training over online webinar style trainings. Additionally, participants were wary of adding too many training requirements, as this can lead to staff burnout.

> **"Achieving a good balance between providing necessary resources and maintaining simplicity is essential for people to work at their highest level of efficiency."**

Anticipated Impact

Implementing a standardized and expanded training capacity will have significant positive impacts on the effectiveness and efficiency of public health operations. The anticipated impacts include:

- **Prompt identification and addressing of training gaps,** ensuring all staff are adequately prepared to meet their responsibilities.
- **Continuous professional development,** fostering a skilled and resilient workforce capable of tackling current and future public health challenges.
- **Uniform training standards and practices across all levels,** ensuring consistency and quality in training delivery.
- **Streamlined training processes,** reducing duplication of efforts and enhancing overall efficiency.
- **Maintenance of high-quality training materials and delivery,** ensuring all staff receive the best possible training.

- **Centralized resources,** making training materials more accessible and cost-effective for all staff.
- **Consistent enhancement of the skills and knowledge of public health staff,** ensuring they are well-equipped to perform their duties.
- **Scalable training programs,** allowing for the accommodation of more staff or the introduction of new topics as needed.
- **Facilitation of adherence to regulatory and accreditation requirements,** ensuring compliance and high standards.
- **Fostering of collaboration and knowledge sharing among state and local staff,** enhancing teamwork and collective problem-solving.
- **Improved processes** for rapid updates and dissemination of new information and best practices.
- **Creation of clear metrics for monitoring training completion and effectiveness,** ensuring continuous improvement and accountability.
- **Reduction in staff burnout** through more efficient and effective training practices which maximize impact in a reduced period of amount of time.

Next Steps

- **Conduct a statewide gap analysis and training needs assessment.** Plan and conduct an assessment to evaluate the current capacity gaps and training needs at both state level and within local public health agencies. Approaches to completing should include surveys, focus groups and interviews with key informants. The data collection plan should include the collection of existing training programs and curriculum that are in use in across the system to identify areas for improvement and opportunities for reuse. Create and implement a training plan including a structured schedule of activities and exercises designed to improve specific skills, fitness or performance over a set period.
- **Expand training capacity at DHSS.** Design and develop a staffing model at DHSS to support recurring training needs available statewide to address gaps identified in the needs assessment. Potential solutions including partnering with organizations with the requisite competencies that develop and deliver training including universities, consultancies and other public health-oriented organizations. Work towards providing training in person as expressed by engaged participants, however, continue to provide flexible, accessible training options through video and e-learning platforms. Conduct regular evaluation of training programs through pre and post questionnaires and satisfaction surveys to ensure they meet the needs of local public health agencies and adapt to changing public health landscapes. As discussed in Recommendation 1, curriculum delivery could be tailored to peer learning networks to facilitate knowledge sharing and professional growth.
- **Develop standardized core curricula of training programs.** Based on the assessment findings, DHSS should create a standardized core curriculum that addresses essential public health competencies and accounts for the stated goals and objectives of the DHSS Workforce Development Plan. Ensure the curriculum is adaptable to different local contexts. Ensure that training programs are accredited by relevant professional bodies and offer certification upon completion where relevant to validate the skills and knowledge acquired. Key public health training programs include CDC TRAIN[xxxi], Public Health Informatics Institute (PHII)[xxxii] and the

Public Health Accreditation Board (PHAB)[xxxiii] education and training programs. Maximize the application of Missouri's Learning Management System where possible. Implement training very thoughtfully to avoid burnout, especially with online trainings. Ensure training is tailored to the role of the user and consider guided and interactive walkthroughs as opposed to traditional sit-and-listen webinars.

By starting with a comprehensive statewide capacity and needs assessment, the department can develop a targeted and effective strategy to standardize and expand training capacity. This approach will enhance the overall effectiveness and resilience of the public health workforce, ensuring that local public health agencies are well-equipped to address current and future public health challenges.

RECOMMENDATION 6
CONDUCT A LONG-RANGE TECHNOLOGY STRATEGIC PLANNING PROCESS

Having a department-level, enterprise-wide, long-range technology strategic plan enables the department to make more informed decisions about critical systems replacement based on the complete view of the status of the entire department technology portfolio. It will facilitate risk management and enhancing adaptability by staying ahead of technological trends which, allow the organization to prepare for changes in technology. By possessing a current, enterprise-wide awareness of the department's technology condition made possible by assessing the complete system portfolio – including critical programmatic and administrative systems – the department can prospectively identify gaps and inefficiencies and create a roadmap for systems maintenance, replacement, enhancement and interoperability.

A well-defined systems maintenance, upgrade and replacement schedule is crucial, as it documents planned timelines for updating or replacing outdated systems, ensuring continuous improvement and avoiding disruption to operations. The department's technology strategy should be aligned with well-defined objectives to ensure that technological needs directly support stated departmental goals, which will improve service delivery and public health outcomes overall. A comprehensive plan not only enhances operational efficiency but also prepares the department to respond to emerging events that can cause disruptive surges in utilization. For example, the department can better prepare for future technology that will advance digital maturity, including interoperability, analytics and governance policies to support digital transformation. Effective resource allocation will ultimately lead to better health outcomes for the community.

Supporting Factors

The following supporting factors highlight the importance of conducting a long-range technology strategic planning process to ensure the department's technology infrastructure is robust, efficient and capable of meeting future demands:

- Participants emphasized the need for long-term solutions rather than temporary, "band-aid" fixes. Without strategic planning, technology systems risk becoming obsolete before decisions can be made about upgrades or preplacement.

> "There seems to be an issue of short-term pay off versus long term goals."

- Due to staff turnover, as critical knowledge may be lost when employees leave their positions, a strategy with participant input will ensure that the long-term needs and challenges of all public health entities are considered and planned for, including the ability to plan for critical knowledge transfer.
- Current systems do not communicate with each other, leading to inefficiencies and issues like billing denials. One participant noted a loss of eight percent per month in revenue on billing due to the lack of interoperability of systems.
- Area Agencies on Aging (AAAs) do not share data, forcing consumers to restart documentation when they move between agencies. This lack of integration is often due to funding constraints rather than technological limitations, thus necessitating a need for long-term strategic planning.
- Participants regularly noted, there is no long-term state strategic planning and inquired about what the systems replacement plan should be. It was acknowledged the department has a strategic plan that changes every three to five years, but a long-range technological plan on the state level does not exist. Participants stated this would allow planning for the issues being raised today about critical technology needs.
- Data modernization is a recognized priority for many organizations in Missouri, many of which are currently making efforts to modernize. However, there are concerns that these efforts will not be worthwhile if they do not integrate with other entities' systems.

Anticipated Impact

Implementing a long-range technology strategic planning process will have numerous positive impacts on the department's operations and overall effectiveness. The anticipated impacts include:

- **Streamline operations** by identifying and addressing system inefficiencies, leading to more efficient workflows and resource utilization.
- **Proactive preparation for future technological advancements and challenges,** allowing the department to stay ahead rather than react to changes.
- **Reduced long-term costs** through strategic planning for timely upgrades and replacements, avoiding the higher expenses associated with reactive fixes.
- **Optimal allocation of resources** to critical areas according to a well-defined plan, ensuring that investments are made where they are most needed.
- **Increased awareness of integration and interoperability opportunities** between different systems, enhancing overall system functionality and data flow.

- **Reduced potential risks** due to higher awareness of system status and the development of strategies to mitigate these risks effectively.
- **Alignment of technology initiatives with the department's overall goals and objectives,** ensuring that all technological efforts support the department's mission.
- **Improved data accuracy, accessibility and security,** providing a reliable foundation for public health initiatives.
- **Enhanced trust with partners** through a clear and proactive technology strategy, demonstrating the department's commitment to transparency and efficiency.
- **Established framework for ongoing evaluation and enhancement of technology systems** through robust governance structure, ensuring continuous improvement.
- **Better preparedness to adapt the strategy** in response to changes in public health priorities, technological advancements and funding availability, ensuring the department will remain agile and responsive.

Next Steps

In the rapidly evolving public health environment, it is crucial to maintain and upgrade technological infrastructures to ensure efficient and effective operations and programmatic service delivery. This recommendation outlines steps for conducting a comprehensive process to plan for the maintenance, upgrade or replacement of technology over the next eight to ten years.

- **Conduct a Comprehensive Technology Assessment:** Building on the work conducted in Phase 1 for this study, the department should complete a department-level, enterprise-wide, strategic assessment of the current systems portfolio to fully document current technology assets including hardware, software, network infrastructure and system ownership. The process should identify systems that are nearing end-of-life or are no longer meeting performance requirements.
- **Develop a plan or roadmap for systems replacement, enhancement and interoperability** that aligns with stated department objectives. Involve key participants, including IT staff, public health professionals and external partners, to gather input on technology needs and priorities. Develop a decision and prioritization framework to assess which systems are most in need of attention for replacement or upgrade. This would include systems that directly affect public health services, including registries, electronic health records, laboratory information management systems (LIMS) and emergency preparedness and response systems, but should account for essential administrative back-office systems that are frequently deprioritized. Incorporate a process for routinely updating the plan to align with the latest technology advancements.
- **Encourage and support LPHAs to develop local long-term strategic plans** following the development of the department's plan. Provide a framework, resources and training opportunities for developing a strategic plan tailored to LPHA specific needs. Create networks for sharing best practices and successful strategies among LPHAs. Offer technical assistance and consistent communication for building effective and robust strategic plans that address local community health challenges.

- **Attend and participate in relevant technology conferences and workshops.** These events will provide valuable insights into emerging trends, innovation solutions and best practices in the field. By engaging with industry experts and peers, the department can continuously update its strategic roadmap, ensuring it remains relevant and effective over the eight to ten-year timeframe. This proactive approach will help the department adapt to technological changes, optimize resource allocation and maintain a competitive edge in public health data management.

A proactive and strategic approach to technology replacement will enhance the efficiency, effectiveness and resilience of public health services. By planning ahead and investing intentionally, the department can ensure it remains equipped to meet the challenges of the future.

RECOMMENDATION 7
ASSESS CURRENT PUBLIC HEALTH STATUTES AND RULES

Many of the challenges the study team encountered in the participant engagement series are a result of the inherent complexity of the largely decentralized public health governance structure in Missouri.[xxxiv] Local control arguably creates strengths in the ability of a locality to make appropriate decisions about what is best for the citizens of their jurisdiction. However, with some exceptions, the population health outcomes and emergency preparedness responsibilities vested in a state health agency are fundamentally cross jurisdictional. Furthermore, the technology and communication tools available to mitigate and manage health risks in a population are much less effective when well-intended policies create barriers to access information highly relevant to public health actions and interventions. Implicit in this is the acknowledgement that at all stages, the appropriate data protection rules should be well understood and adhered to, however in many cases from the study team's research, policies were not well understood nor were the reasons behind them apparent to participants.

Missouri's governance and financing processes contribute to challenges DHSS faces, particularly as it pertains to the fragmentation of technology systems implementation and data sharing. It has led to duplication of efforts creating inconsistencies, especially in smaller counties[xxxv]. The Missouri Public Health Institute, in conjunction with the Network for Public Health Law (NPHL), recently published a toolkit[xxxvi] for local public health that contains fact sheets that aid LPHAs in their understanding of the scope of their legal authority and responsibilities. This recommendation could build on this work and is aimed at understanding holistically the current state of public health statutes and rules related to the governance structures of Missouri's public health system and their impacts on administrative processes, systems interoperability, data sharing and service delivery.

Supporting Factors

The following supporting factors underscore the importance of assessing current public health statutes and rules to enhance the governance structures and operational efficiency of Missouri's public health system:

- Participants were consistent in highlighting the critical need for trust in data sharing. Improving consistency of guidance and transparency in how data can be used and establishing clear reporting mechanisms for misuse are essential steps. Implementing transparent processes to correct data errors and track progress will significantly improve trust between DHSS, LPHAs, other public health entities and the public.

> **"I inherited a data use agreement allowing me to get what I need, but if I didn't, I wouldn't know how to get that data."**

- Artificial barriers are created for LPHAs due to ambiguity and inconsistency in understanding data ownership, access policies and the impact of federal regulations. Several counties have decided to have duplicate systems to retain access to their own data. Lack of formal policies on data masking and suppression hamper data sharing particularly in rural areas where disease rates are proportionally smaller.
- Public health providers are the only mandatory immunization reporters, and immunization data access is restricted to data entered by the LPHA. Local agencies are left with no options other than localized manual immunization data sharing leading to significant diminution in efficiency and potential multiple vaccine doses.
- Participants expressed frustration over the lack of current data and restrictive laws that designate ownership to Missouri rather than LPHAs. Efforts to integrate and share data are often hindered by lack of understanding of legal, policy and regulatory requirements, particularly regarding data sharing agreements and adherence to state and federal laws.
- The emphasis on local control in Missouri adds complexity to statewide sharing initiatives. Statutes that limit the accessibility of identifiable data or even deidentified row level data restrict LPHAs' capacity to perform predictive modeling or longitudinal analyses.
- Restrictive state guidelines hinder LPHAs' ability to address broader public health needs.
- Participants face significant obstacles in accessing necessary data, often due to variable understanding of state-level regulations and varying data ownership, leading to frustration over outdated data and restrictive laws. There was low level of awareness of how to seek guidance.

> **"Data scientists at DHSS can do amazing things, but they are often hamstrung by processes and rules."**

- Local public health agencies rely on a variety of mechanisms to fund operations, including Core and federal funding from the state. Some LPHAs rely more heavily on Core funding than others, which only covers a fraction of operational costs for essential services. The assessment could include understanding state-based funding impacts to ensure more adequate and flexible funding mechanisms.

Anticipated Impact

Assessing and updating the current public health statutes and rules will have positive impacts on the governance and operational efficiency of Missouri's public health system. The anticipated impacts include:

- **Clarification and improved awareness** of the rules, policies and procedures for access to and management of protected health data, ensuring that all partners understand their responsibilities and limitation.
- **Foundational understanding of the legal framework,** providing a clear understanding of lines of authority for public health actions, which will enhance coordination and effectiveness.
- **Potential future reforms** could remove barriers to effective health service delivery, leading to better health outcomes for Missouri citizens.
- **Updated statutes and rules,** providing the necessary flexibility for the department to respond more swiftly and effectively to public health emergencies.

Next Steps

These challenges highlight the opportunity to assess and potentially revise current public health statutes and rules that govern the administration and delivery of public health services, data sharing and integration. The department could assess current state-based public health statutes and rules, particularly those that govern access to protected data and the impact they have on the capability of DHSS to address the ongoing health needs of Missourians effectively and efficiently in times of emergency.

- **Create a comprehensive inventory and assessment of relevant public health statutes and rules.** Compile a comprehensive inventory of all current public health statutes and rules, including those related to data sharing, administrative procedures, emergency response, disease control, health services and senior care. Engage legal experts, including public health attorneys and policy analysts, to provide insights into the legal framework and its implications for public health practice. Collect input in a structured manner on benefits and limitations of the current form of public health governance.
- **Conduct a comparative analysis to other state public health agencies structures.** Through a deliberative process, select comparison states based on a set of agreed upon criteria that are most relevant. Evaluate how public health policies are developed and how financial, technological and human resources are allocated and managed. Understand the extent of legal authority at the state and local levels.

By conducting a thorough assessment of current public health statutes and rules, the department will have a better understanding can enhance its capacity to address the health needs of Missouri citizens and respond to emergencies effectively and efficiently.

CONCLUSION

Conclusion

This critical project aims to support DHSS' mission of "optimal health and safety for all Missourians, in all communities, for life." Both *health* and *safety* are emphasized in this mission as DHSS' divisions, offices, bureaus and programs are designed to serve Missourians to improve their health outcomes and ensure they live safe and healthy lives. The phrases "in all communities" and "for life" underscores the department's commitment to serve all citizens in Missouri, regardless of where they live and throughout all stages of life.

The department works tirelessly on efforts to protect and to improve the health of all Missourians. There have been actionable improvements to date. Investments in the public health system and the health care workforce will be instrumental in this effort. The public health and health care systems must continue to identify methods to address the complex, inter-related factors which impact health outcomes for individuals in Missouri.

This project and its goals stand alongside other DHSS investments to improve the overall health and safety of Missouri's citizens. The department has pioneered a path that can lead to better health outcomes by assessing and evaluating the following health information ecosystem needs:

- Create better regulatory oversight and report generation.
- Eliminate duplicative data sets, both internally and externally.
- Reduce the amount of manual data entry.
- Standardize functions performed in differing ways across divisions, programs and partners.
- Modernize heath data systems and eliminate dependencies on antiquated applications.
- Increase and streamline data exchanges with relevant data partners, both internal and external.
- Ensure compliance with data security standards.
- Ensure data quality, integrity and completeness.

Strategic congruence of final recommendations from both Guidehouse and HIMSS was not a surprise given the intentional and thoughtful design of this project. A crosswalk of recommendation alignment is presented in **Table 15** below. The table matches the recommendations from HIMSS and the study team to show alignment between data modernization analyses across Missouri. It is recommended that areas with full match recommendations be prioritized for immediate action, as both independent studies agree on importance and high value impact. Partial match recommendations and project

purpose alignment highlight areas that should be secondary goals for implementation and may need additional planning and refinement. The alignment of all recommendations, from both assessments, provides a strong foundation for successful improvements for data modernization across Missouri. By leveraging these alignments, DHSS can ensure a more coordinated, efficient and effective approach to data modernization.

DHSS could not accomplish this undertaking alone nor in a vacuum. The monumental effort to engage strategic partnerships with fellow state departments and industry organizations mentioned and thanked in **Appendix A: Acknowledgements** provide confidence that measurable progress will occur for Missourians.

Table 15: Alignment of Guidehouse Recommendations and HIMSS Opportunities

GUIDEHOUSE RECOMMENDATIONS	HIMSS OPPORTUNITIES				
	LEGEND: ● = FULL MATCH ◗ = PARTIAL MATCH ○ = PROJECT PURPOSE				
	DIGITAL INFRASTRUCTURE	CITIZEN ENGAGEMENT AND CARE	DATA ANALYTICS AND INSIGHTS	WORKFORCE DEVELOPMENT	TAKEAWAYS
Local Support	◗	●	○	◗	• HIMSS recommendation of prioritizing citizen engagement and care was aligned with the Guidehouse recommendation to enhance local support as enhancing local support structures directly supports local public health programs, enhancing citizen engagement and person-centered care. • Enhancing local support includes elements of training and standardization, contributing to workforce development and digital infrastructure.
IT/Data Governance Structure	●	○	○	○	• Both assessments identified the need for improved state IT and digital infrastructure and governance.
Data Lake	●	○	●	○	• Planning and implementing a data environment directly supports the development of a robust data infrastructure. • A data lake also directly enhances the ability to collect, transform and analyze data, turning it into actionable insights.

Table 15: Alignment of Guidehouse Recommendations and HIMSS Opportunities (Cont.)

GUIDEHOUSE RECOMMENDATIONS	HIMSS OPPORTUNITIES				
	LEGEND: ● = FULL MATCH ◗ = PARTIAL MATCH ○ = PROJECT PURPOSE				
	DIGITAL INFRASTRUCTURE	CITIZEN ENGAGEMENT AND CARE	DATA ANALYTICS AND INSIGHTS	WORKFORCE DEVELOPMENT	TAKEAWAYS
Upgrade and Enhance MOPHIMS	●	○	●	○	• Upgrading MOPHIMS is essential for improving digital systems and supports critical data analytics needs.
Training Needs Assessment	○	○	○	●	• Conducting a training needs assessment and developing training programs directly builds workforce digital capacity and development.
Long-range Technology Strategic Planning	●	○	●	○	• Strategic planning ensures a sustainable and scalable digital infrastructure. Planning for future data systems supports advanced analytics and insights.
Assess Current Statutes and Rules	○	○	○	◗	• Understanding and updating regulations can impact training and development, ensuring compliance and effectiveness.

This project has identified opportunities to optimize current operations, leverage existing tools and invest in a way that maximizes state resources while strengthening business and operational alignment with the DHSS' mission, vision and values. Guidehouse believes the findings and recommendations of this study can fully address the pressing need to identify the current state and future opportunities across public health data, analytics and visualization capabilities.

APPENDIX A

Appendix

We would like to extend our heartfelt gratitude to all those who contributed to the success of this project. Our deepest thanks go to the DHSS Data Modernization Leadership Advisory Group for their unwavering dedication and insightful guidance throughout the process. We are also immensely grateful to the host sites across the state of Missouri, whose hospitality and support during the Participant Meeting Series were invaluable. Additionally, we appreciate the collaboration and expertise of our identified external partners, whose contributions were crucial in achieving a thorough understanding of Missouri's current data ecosystem. Your collective efforts have been instrumental in the development of this final report, and we are truly thankful for your commitment and hard work.

DHSS Data Modernization Leadership Advisory Group

Data Modernization Leadership Team 1

Initiative Sponsors for Strategy and Alignment
The leadership team provides overarching support for other groups, removed roadblocks and has insight into funding sources.

Data and Technology Modernization Advisory Team 2

Project Managers and Subject Matter Experts (SMEs)
The advisory team is operational, conducts projects ongoing, manages administrative tasks and suggests future projects based on current needs.

External Stakeholder Advisory Panel 3

Communities and Consults
The advisory panel advises on external areas through feedback and analysis.

All groups meet quarterly or as needed.

Special Recognitions

The project sponsor and leadership team would like to recognize these individuals for their impactful contributions to the report.

- Susan Dulle
- Zachary Kempf
- Ryan Marsch
- Shanna West
- Travis West

Data Modernization Leadership Team

Hosts for Participant Focus Group Series

- Butler County Health Center
- Cape Girardeau Local Public Health Department
- Cape Girardeau Public Health Center
- Culture C-Street, Springfield, Missouri
- DHSS Office
- Missouri Foundation for Health
- Platte County Health Department
- Saline County WIC
- Springfield-Greene County Health Department
- Sullivan County Community Center
- The Boathouse, Springfield, Missouri
- Webster County Health Department

Identified External Partners

- American Association of Retired Persons (AARP)
- Adair County Health Department
- Aging Ahead
- Aging Best
- Aging Matters
- Alzheimer's Association of Missouri
- American Academy of Pediatrics, Missouri Chapter
- Andrew County Health Department
- Association for Maternal and Child Health Programs (AMCHP)
- Association of Public Health Laboratories
- Association of State and Territorial Health Officials (ASTHO)
- Atchison County Health Department
- Audrain County Health Department
- Barry County Health Department
- Barton County Health Department
- Bates County Health Center
- Benton County Health Department
- Bollinger County Health Center
- Bootheel Babies & Families
- Bootheel Perinatal Network
- Butler County Health Department
- Caldwell County Health Department
- Callaway County Health Department
- Camden County Health Department
- Cape Girardeau County Public Health Center
- Care Connection for Aging Services
- Carroll County Health Department
- Carter County Health Center
- Cass County Health Department
- Cedar County Health Department
- Center for Population Health and Equity
- Center for Practical Bioethics
- Center for Quality Prehospital Care at Mizzou
- Centers for Disease Control and Prevention
- Central States Center for Agricultural Safety and Health (CS-CASH)
- Chariton County Health Center
- Children's Mercy Kansas City
- Choices Medical Services
- Christian County Health Department
- Citizens Memorial Hospital
- City of Columbia on behalf of Columbia-Boone County Health Department
- City of St Joseph Health Department
- City of St. Louis Department of Health

- Clark County Health Department
- Clay County Public Health Center
- Cole County Health Department
- Community Assist Builders
- Cooper County Public Health Center
- Crawford County Health Department
- Dade County Health Department
- Dallas County Health Department
- Daviess County Health Department
- Delta Regional Authority
- Dent County Health Center
- Department of Agriculture
- Department of Commerce and Insurance
- Department of Conservation
- Department of Corrections
- Department of Economic Development
- Department of Elementary and Secondary Education
- Department of Higher Education and Workforce Development
- Department of Labor and Industrial Relations
- Department of Mental Health
- Department of Natural Resources
- Department of Public Safety
- Department of Revenue
- Department of Social Services
- Department of Transportation
- Douglas County Health Department
- Dunklin County Health Department
- Elder Abuse Financial Exploitation Response Coordination (EAFEC)
- Emergency Medicine, University of Missouri
- Find Help
- Federally Qualified Health Center (FQHC)
- Franklin County Health Department
- Gasconade County Health Department
- Golden Valley Memorial Healthcare
- Grundy County Health Department
- Health Quality Innovation Network
- Health Resources and Services Administration
- Healthy Blue
- Heartland Environmental Justice Center
- Heartland Telehealth Resource Center
- Henry County Health Center
- Hickory County Health Department
- Home State Health
- Howard County Public Health Department
- Howell County Health Department
- Iron County Health Department
- iShare Medical
- Jackson County Public Health
- Jasper County Health Department
- Jefferson County Health Center (JCHC)
- Johnson County Community Health Services
- Joplin City Health Department
- Kansas City Health Department
- KC Digital Drive
- KC Health Collaborative
- Knox County Health Department
- Konza National Network
- Laclede County Health Department
- Lafayette County Health Department
- Lawrence County Health Department
- Lewis and Clark Information Exchange (LACIE)
- Lewis County Health Department
- Lincoln County Health Department
- Linn County Health Department
- Livingston County Health Center
- Macon County Health Department
- Madison County Health Department
- March of Dimes
- Marion County Health Department
- McDonald County Health Department
- Mercer County Health Department
- Mercy
- Mercy Hospital Washington
- Missouri HealthNet Division (MHD)
- MHD Transformation Office
- Mid-America Coalition on Health Care
- Mid-America Regional Council Area Agency on Aging (AAA)

- Miller County Health Center
- Mississippi County Health Department
- Missouri American College of Obstetricians and Gynecologists (ACOG)
- Missouri Adult Day Association
- Missouri Alliance for Home Care
- Missouri Area Health Education Centers
- Missouri Assisted Living Association
- Missouri Association of Area Agencies
- Missouri Association of Local Public Health Agencies (MoALPHA)
- Missouri Association of Rural Health Clinics
- Missouri Center for Public Health Excellence (MOCPHE)
- Missouri Centers for Independent Living (MOCIL)
- Missouri Community Action Network
- Missouri Council for In-Home Services
- Missouri Emergency Medical Services (EMS)
- Missouri Family and Community Trust
- Missouri Foundation for Health
- Missouri Health Care Association
- Missouri Hospital Association
- Missouri Institute for Community Alliances
- Missouri National Guard
- Missouri Primary Care Association (MPCA)
- Missouri Public Health Association
- Missouri Public Health Institute
- Missouri Rural Crisis Center
- Missouri Rural Health Association
- Missouri Science and Technology (S&T) Student Health
- Missouri State Medical Association
- Missouri Statewide Independent Living Council
- Missouri Telehealth Network
- MO Behavioral Health Council
- Moniteau County Health Department
- Monroe County Health Department
- Montgomery County Health Department
- Morgan County Health Center
- New Birth Company
- New Madrid County Health Department
- Newton County Health Department
- Nodaway County Health Center
- North Central Regional Center for Rural Development
- Northeast Missouri AAA
- NOVUS Health
- Office of Administration
- Oregon County Health Department
- Osage County Health Department
- Ozark County Health Department
- Ozarks Public Health Institute (OPHI)
- Pemiscot County Health Department
- Perry County Health Department
- Pettis County Health Center
- Phelps-Maries County Health Department
- Pike County Health Department
- Platte County Health Department
- Polk County Health Center
- Priority Care Pediatrics
- Pulaski County Health Center
- Putnam County Health Department
- Ralls County Health Department
- Randolph County Health Department
- Ray County Health Department
- Region 7 Rural Opioid Technical Assistance Regional (ROTA-R) Center
- Region X AAA
- Reynolds County Health Center
- Ripley County Health Department
- Rural Hospital Council and Critical Access Hospital Network
- Saline County Health Department
- Schuyler County Health Department
- Scotland County Health Department
- Scott County Health Department
- SeniorAge
- Shannon County Health Center
- Shannon County Health Department
- Shelby County Health Department
- Show-Me Healthy Kids
- Show-Me Health Information Network of Missouri (SHINE)
- Springfield-Greene County LPHA

- St. Charles County Department of Public Health
- St. Clair County Health Center
- St. Francois County Health Center
- St. Louis Association of Community Organizations (SLACO)
- St. Louis City AAA
- St. Louis County Department of Public Health
- St. Louis County on behalf of the Department of Public Health
- St. Louis Integrated Health Network (IHN)
- St. Louis Regional Data Alliance – Community Information Exchange
- St. Peters Animal Control
- St. Louis Business Health Coalition
- St. Louis Integrated Health Network
- St. Louis University
- State Advisory Council on Emergency Medical Services
- Ste. Genevieve County Health Department
- St. Louis Area Business Health Coalition (STL-BHC)
- Stoddard County Public Health Center
- Stone County Health Department
- Sullivan County Health Department
- Taney County Health Department
- Texas County Health Department
- The Center for Quality Prehospital Care
- The SPOT/Project ARK (Supporting Positive Opportunities with Teens) at Washington University in St. Louis
- Tiger Institute for Health Innovation
- Tri-County Health Department
- Unite Missouri
- Unite Us
- United Healthcare
- United Way 211
- University of Missouri
- University of Missouri – Kansas City
- US Department of Agriculture Rural Development Office
- US Department of Housing and Urban Development
- US Department of Agriculture Rural Development Missouri State Office
- Velatura Public Benefit Corporation
- Vernon County Health Department
- Veterans Affairs
- Wade County Health Department
- Warren County Health Department
- Washington County Ambulance District
- Washington County Health Department
- Washington University in St. Louis
- Washington University in St. Louis – Institute for Public Health, Data and Training Center
- Wayne County Health Center
- Webster County Health Unit
- Wright County Health Department
- Young at Heart Resources

APPENDIX B

A HIMSS Digital Health Indicator Analysis

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ABSTRACT

This study examines the Missouri Department of Health and Senior Services' (DHSS) digital health capabilities measured by the HIMSS Digital Health Indicator (DHI) assessment tool, adapted specifically for public health contexts. Guidehouse partnered with HIMSS to conduct a first of its kind assessment of a public health agency to evaluate the maturity of digital transformation across the public health system statewide. The objectives of the HIMSS assessment were to map data flows within and across divisions, evaluate data-driven decision-making processes, identify patterns of data sharing between public health entities and programs and assess digital capacity needs for modernization.

HIMSS collected data and information on 59 programs across DHSS using the DHI tool, conducting both quantitative and qualitative assessments of digital capacity. The findings revealed significant strengths, including a culture that is highly supportive of digital transformation, evidenced by several programs achieving significant advances in digital health. The assessment outcomes revealed a number of opportunities for advancing digital strengths, such as overcoming technological disparities across programs, advancing the capacity for automated data sharing, strengthening workforce capacity and competencies in digitally enabled work environments, advancing patient engagement and strengthening analytics strategy. The DHI assessment of DHSS programs was compared with international agencies for global benchmarking. These comparisons highlight opportunities to further advance the modernization of public health infrastructure across the 115 local public health agencies delivering services to Missouri citizens.[i] The results of the HIMSS assessment provide a foundation for developing a strategic roadmap to drive the digital transformation of Missouri's state public health system.

BACKGROUND

In 2019, the Centers for Disease Control and Prevention (CDC) launched the Data Modernization Initiative (DMI) to promote technological innovation, data analytics and the modernization of public health infrastructure across the United States.[ii] This $50 million investment is designed to upgrade public health digital infrastructure to improve interoperability, real-time data sharing, improved data analytics and automatic reporting.[iii] The goal of the initiative was to improve timely and accurate data sharing to improve evidence-based decision-making.[iv]

As Missouri's designated public health agency, DHSS coordinates with 115 local public health agencies (LPHAs) and numerous healthcare partners to deliver public health services statewide, supported by over 1,800 public health professionals working throughout the state.[i] In 2023, DHSS developed a new strategic plan (2023 to 2027), focusing on statewide public health transformation.[i] The goals identified in the plan include:[i]

- Invest in Innovation to Modernize Infrastructure.
- Re-envision and Strengthen the Workforce.
- Build and Strengthen Partnerships.
- Use Clear and Consistent Communication to Educate and Build Trust.
- Expand Access to Services.

As part of this strategic effort, Missouri DHSS initiated a comprehensive digital health assessment through a strategic partnership with Guidehouse, Inc. and HIMSS. HIMSS leveraged their DHI tool, an industry-standard evaluation framework, to systematically assess DHSS digital health capabilities, strengths and opportunities to inform a strategic roadmap to advance digital health transformation of the Missouri Public Health system.

The Digital Health Indicator

The DHI measures progress toward a digital health ecosystem that connects providers with people, enabling them to manage their health and wellness using digital tools in a secure and private environment whenever and wherever services are needed. The DHI is a self-paced, 120-question assessment that evaluates an organization's performance across four dimensions of digital health: Governance and Workforce, Interoperability, Predictive Analytics and Person-Enabled. Responses are recorded using a five-point Likert scale. Scores are created on a scale of 0-400 and then standardized to 100 to provide a percentage, with higher scores

indicating a more mature digital health organization. This enables programs to identify strengths and areas for improvement and benchmark their digital health capabilities against industry standards, which helps inform the development of strategic plans for further digital transformation.

Since its introduction in 2018, the DHI has demonstrated significant global impact, having been adopted in 13 countries, generating comprehensive benchmark data and proving its effectiveness in guiding digital transformation initiatives.[v] The DHI provides an evidence-based approach to evaluating current capabilities across the department to inform and guide future investments in digital infrastructure.

The HIMSS DHI assessment was administered using guided interviews to achieve the following four objectives:

- Map data flows within and across divisions.
- Evaluate data-driven decision-making processes.
- Identify patterns of data sharing between public health entities and external organizations.
- Assess digital capacity and needs for modernization.

This report synthesizes the findings for each of the four objectives above informed by the results of the 59 DHI assessments conducted across DHSS. The results and analyses were then benchmarked with both the North American average and international DHI results to further inform the design of actionable recommendations to advance digital transformation of DHSS. It is noteworthy that DHSS is the very first state-level public health organization in the world to deploy a strategy using the DHI to measure digital capacity and information infrastructure to inform a strategic digital transformation roadmap. The insights provided in this report are particularly timely and relevant as jurisdictions globally are working to strengthen their digital public health data capabilities and competencies to effectively respond to rapidly emerging public health challenges that hold the potential to significantly impact population health.

Methodology

The DHI is a measurement tool designed for the full spectrum of healthcare organizations, including acute care, community care and public health. Although the DHI tool was designed to be agnostic to the type of health system, the uniqueness of state public health's role required the HIMSS team to ensure the questions (e.g., wording of indicator statements, examples for each indicator assessed, etc.) were accurately reflective of public health mandates and role in the health system.

The HIMSS team undertook an in-depth review of the DHI indicator statements to ensure the framing and the wording were relevant and reflective of the unique contextual features of state public health systems. The review team included two experts with advanced degrees in public health to review the DHI indicators for terminology and for examples that accurately reflect public health practice. The outcome of the review resulted in wording changes for approximately 30% of the indicators and the introduction of public health examples that accurately represent operational and clinical public health services. The new public health version of the DHI tool was then subjected to two rounds of beta testing.

The first beta test consisted of a comprehensive review and discussion of each indicator statement with the lead public health expert from the Guidehouse Team. This review examined the wording, the relevance and the appropriateness of the examples provided for each indicator's criteria. The guided interview methodology was also reviewed to ensure the DHI tool offered a high degree of validity for the DHSS project objectives. Feedback on the indicators and the examples for each indicator were incorporated into the DHI tool and then beta tested again in the second phase of testing.

The second beta test was a similar, in-depth review of the DHI indicators, public health examples and the guided interview strategy with a senior leader at DHSS. This review provided a second validity check with DHSS leadership on the appropriateness and relevance of the adapted Public Health version of the DHI tool. Feedback and input were finalized by the HIMSS team and invitations to participate were sent by DHSS leadership to the program staff within the divisions, offices, bureaus and programs. The HIMSS team managed the logistics and scheduling with the DHSS program teams and guided interviews were conducted by four subject matter experts from the HIMSS team.

PARTICIPANT SELECTION

All participating programs were requested by their executive leadership to participate in the DHI assessment interviews. The Guidehouse team provided the contact information for all participants. Executive leaders at DHSS communicated the project purpose and goals through emails and "kick-off" calls alongside participant engagement sessions led by the Guidehouse team. The identified DHSS programs were categorized based on their primary functions and division mandates (e.g., regulatory, administrative, community public health services, etc.).

All program teams that offer public health services to Missouri citizens completed a full DHI assessment, which included all four dimensions, Governance and Workforce, Interoperability, Predictive Analytics and Person-Enabled Care. Those participating programs whose mandate and roles did not require direct interaction with Missouri citizens completed a partial DHI that assessed three of the four dimensions, excluding Person-Enabled Care. The participating program teams were organized into five main groups, each group being assigned to one HIMSS team member to complete the guided interviews for data collection.

The five groups of DHSS programs include:

- Division of State Public Health Laboratory Services (n=12)
- Division of Community and Public Health (n=20)
- Division of Regulation and Licensure (n=11)
- Division of Senior and Disability Services (n=8)
- Division of Administration and Division of Cannabis Regulation (n=8)

There was a total of 59 programs that were invited to participate in the guided interviews for data collection. Two programs whose work is closely aligned requested a joint guided interview to complete the DHI assessment.

DATA COLLECTION

The HIMSS team conducted guided interviews using the public health version of the DHI. Interviews were conducted using Microsoft Teams and were recorded with the verbal consent of the participants so answers and comments could be examined by the HIMSS team for accuracy, quality and consistency. The interviews were conducted over a five-week period (September through October 2024) and lasted between one to two hours in duration. On some occasions, interviews were completed over two time periods to minimize the disruption to work schedules of the DHSS teams.

The structured interviews allowed for systematic and standardized collection of data across all DHI dimensions and ensured that each team had the opportunity to ask clarifying questions regarding the meaning of each indicator item. Discussion was encouraged among participating team members to achieve consensus on responses. Interview responses were documented in real-time in standardized Excel spreadsheets and uploaded to the HIMSS platform. Statistical analysis was conducted using the R software program and qualitative analysis was conducted utilizing manual analysis. All responses were checked for accuracy to ensure data integrity and consistency.

ANALYSIS

The data was subjected to both quantitative and qualitative analyses in a mixed-method approach. The quantitative analysis enabled the identification of direct relationships and statistical patterns and a deeper understanding of digital capacity within and between programs. This approach facilitated comparisons between programs and highlighted specific areas of strength and opportunities for advancing digital transformation. The qualitative analysis complemented the quantitative findings by providing rich contextual insights that uncovered nuanced relationships and captured the meaning of the DHI scores for the four dimensions. This dual analytical approach aligns with mixed-methods research best practices,[vi] where the integration of quantitative and qualitative data provides a more nuanced and more complete understanding of complex organizational findings.

Quantitative Data Analysis

Overall DHI scores were first computed for DHSS as a percentage of the points achieved out of the total points possible to achieve. The DHI measures were all converted into percent scale to allow for comparisons across a standardized scale (0 - 100). Scores

were calculated by dividing the total points achieved by the program in that dimension, by the total points that were possible to achieve and then multiplied by 100. This method made it possible to account for indicators that were not relevant to a particular participating program, because the points pertaining to that indicator were removed from the total points achievable.

Descriptive statistics were calculated including mean, standard deviations, ranges and percentages, to report on the overall results of the analysis. Comparisons among the participating programs were performed using the statistical method ANOVA (Analysis of Variance) to identify programs that were statistically significantly different from others in their average DHI points achieved. Bar charts with error bars were created to visualize the results. The pairwise comparisons between each pair of programs were illustrated using forest plots, which show estimates of the differences as horizontal bars that represent 95% confidence intervals with estimated difference as their midpoints. If the horizontal bars demonstrating the comparison do not intersect with the vertical zero line, then the differences in scores are statistically significant.

Qualitative Data Analysis

The qualitative methods employed a rigorous thematic analysis to examine team responses. All indicator responses were systematically organized in an Excel spreadsheet, structured hierarchically by sub-dimension responses to indicator questions to identify where programs reported strengths in achievement of DHI indicators and to identify areas of opportunity for growth.

The thematic analysis followed Braun and Clarke's[vii] six-phase, iterative approach for the qualitative thematic analysis. This approach ensured both depth in understanding of specific patterns of team responses and captured thematic findings across the 59 programs. The researchers familiarized themselves with the data through multiple readings of indicator responses to identify patterns in the data. Initial codes were then generated for meaningful segments of text. These codes were subsequently collated into potential themes, which were reviewed and refined through an iterative process. Themes were first analyzed within each of the four sub-dimensions to capture granular insights, then synthesized across dimensions to identify overarching patterns and relationships in the data.

RESULTS

The analysis of DHSS digital health capabilities revealed significant variations across programs, with both notable strengths and opportunities for improvement. The assessment examined quantitative scores across the four dimensions of digital health, as well as qualitative insights from interviews with program leaders and staff. Below are the key findings from this comprehensive evaluation.

Quantitative Results

There were 59 programs represented in the data set, of which 20 were in the Division of Community and Public Health (DCPH), eight were in the Division of Administration (DA) and the Division of Cannabis Regulation (DCR), 11 were in the Division of Regulation and Licensure (DRL), eight were in the Division of Senior and Disability Services (DSDS) and 12 were at the State Public Health Laboratory (SPHL).

The overall mean DHI score for DHSS was 35.6 (Standard Deviation=16.1). This DHI index score is a summative average across all 59 team scores, calculated as the percentage (out of 100) achievement for each dimension **(Figure 1)**. Community and Public Health programs achieved the highest average score of 50.8, followed by Regulation and Licensure (36.6). The lowest average was 19.0 for SPHL.

The analysis highlights that DCPH has a consistently higher average DHI score than the other groups (14 - 32 points higher) and SPHL has a significantly lower average score compared to DRL. However, the differences between the remaining group pairs were not statistically significant, suggesting that their mean values are comparable within the data set. Pairwise differences of all Divisions and their 95% confidence intervals are reported in **Figure 2**. Horizontal bars that do not intersect with the vertical line (line of zero) indicate statistically significant differences between the two groups being compared.

Figure 1: Mean and Standard Deviation Error Bars for the Overall DHI by Division

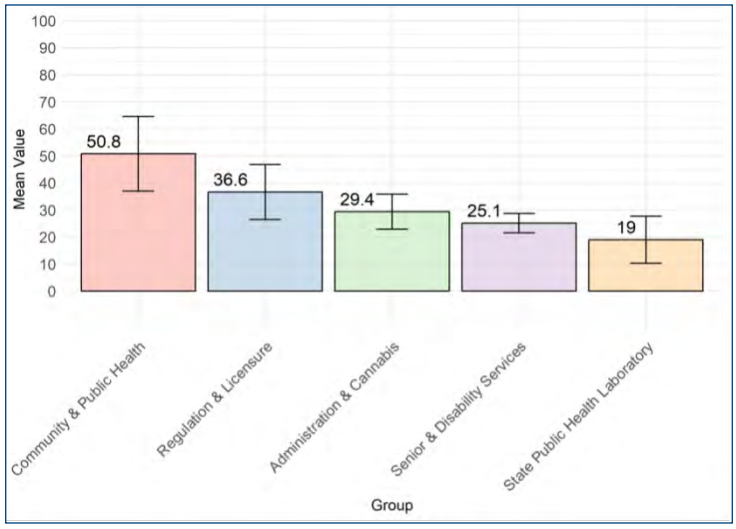
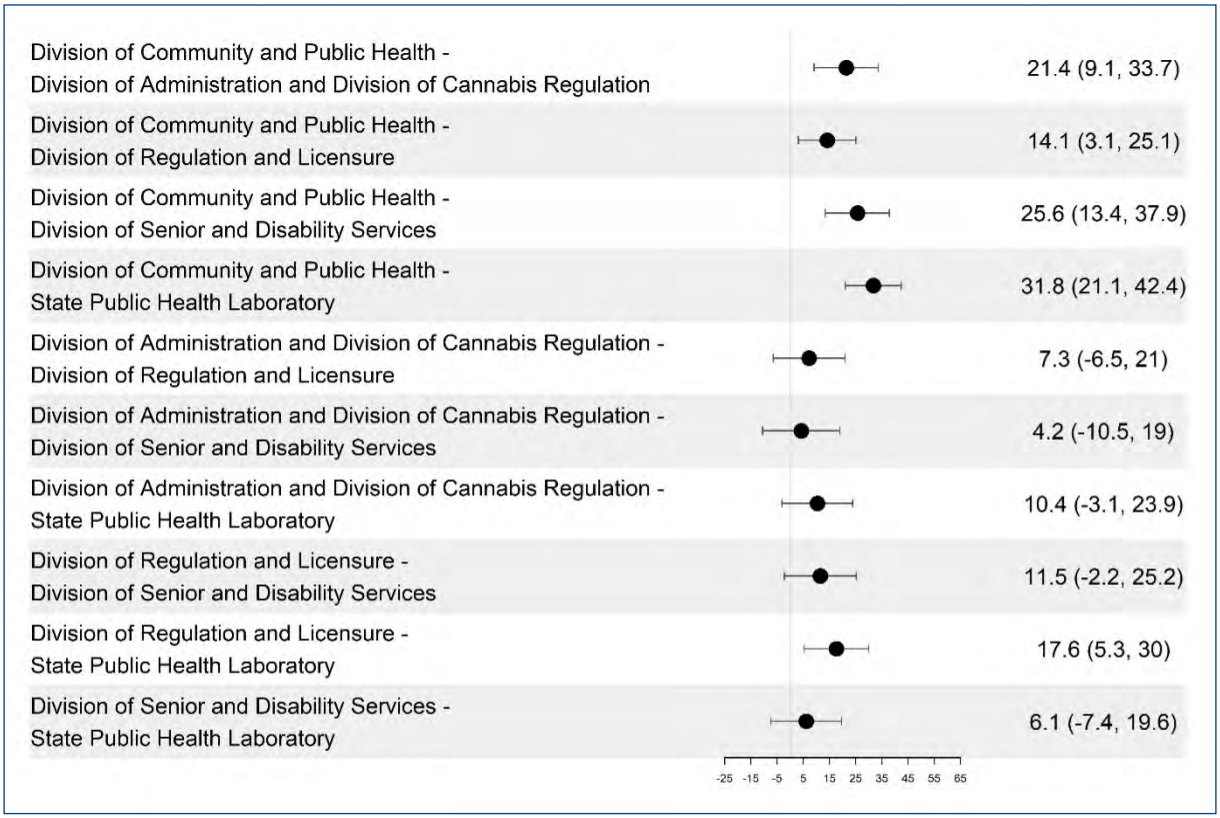


Figure 2: Pairwise Differences in Mean DHI Scores Among the Divisions and Their 95% Confidence Intervals.



When looking at the four dimensions individually, the DCPH grouping has the highest average score in all dimensions. DRL has the second highest average score in Interoperability and Governance. Statistically significant pairwise differences among the divisions and with respect to the four dimensions are described in the following section.

STATISTICALLY SIGNIFICANT GROUP DIFFERENCES WITH RESPECT TO THE DHI DIMENSION GOVERNANCE AND WORKFORCE

When looking at the Governance and Workforce dimension, the data show that DCPH scored higher than DA and DCR by 22.1 points (p=0.021) and DCPH is higher than SPHL by 28.4 points (p=0.0004) **(Figures 3 and 4)**. The remaining calculated differences were not statistically significant.

Figure 3: Mean and Standard Deviation Error Bars for the Overall Governance and Workforce Dimension by Division

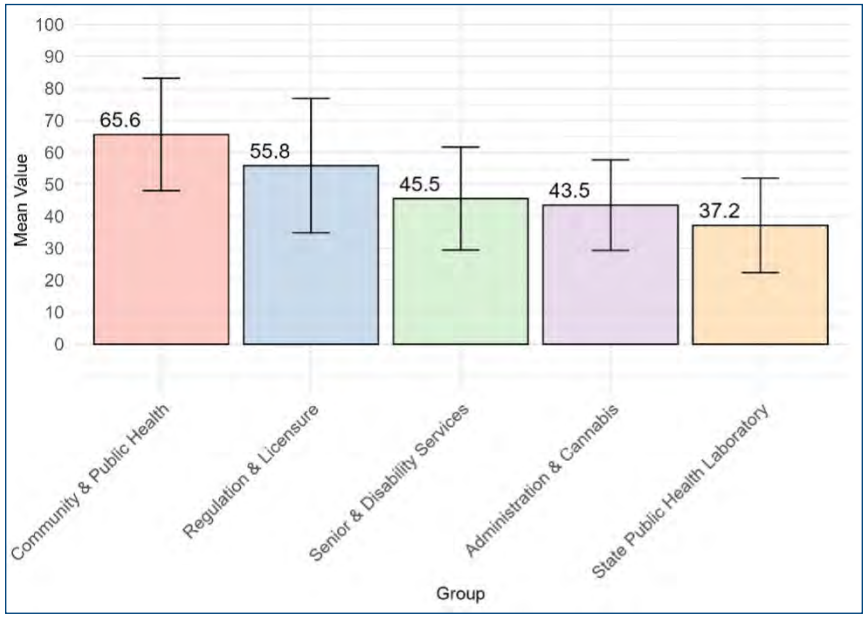
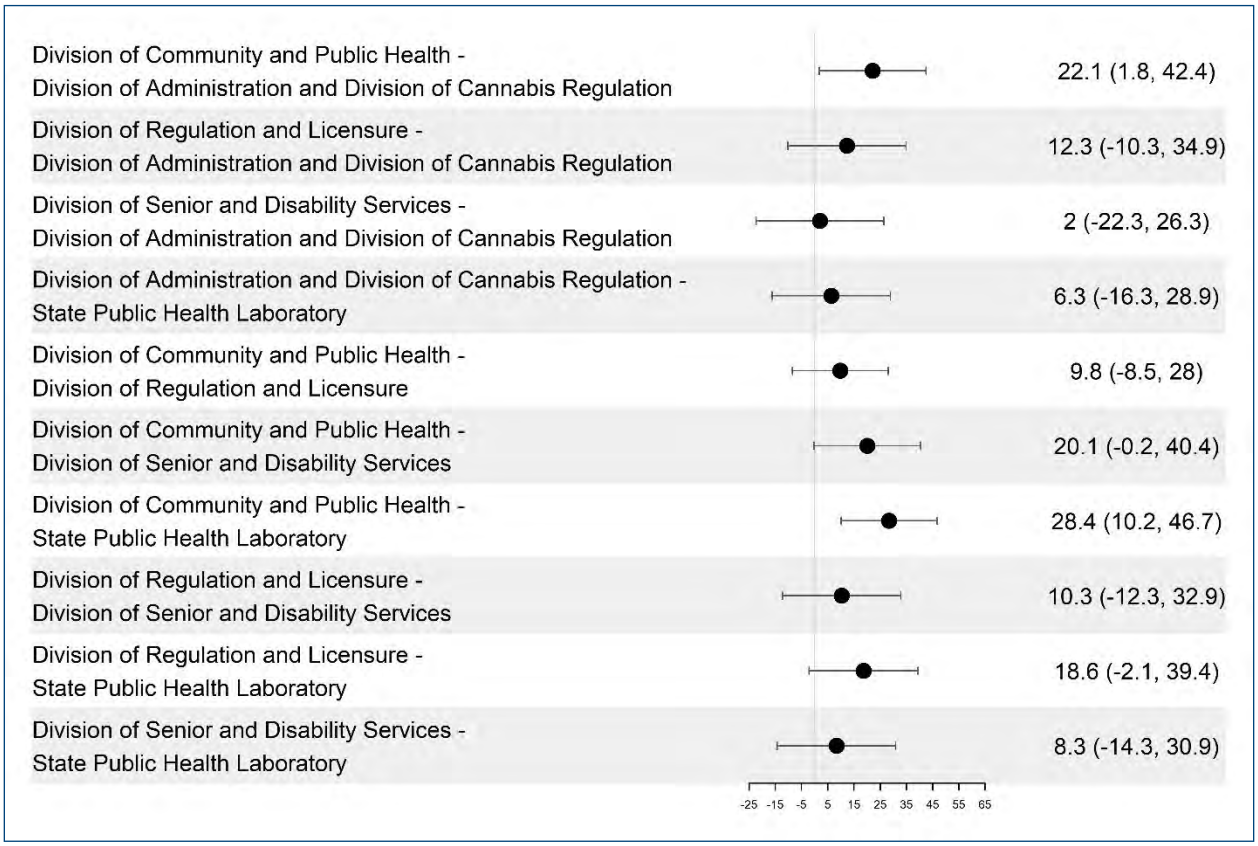


Figure 4: Pairwise Differences in Mean Governance and Workforce Dimension Scores Among the Divisions and Their 95% Confidence Intervals



STATISTICALLY SIGNIFICANT GROUP DIFFERENCES WITH RESPECT TO THE DHI DIMENSION INTEROPERABILITY

The Division of Community and Public Health scored higher than DA and DCR by 33.9 points (p<0.0001), higher than SPHL by 52.9 points (p<0.0001) and higher than DSDS by 45.2 points (p<0.0001). Regulation and Licensure scored higher than SPHL by 47.1 points (p<0.000) **(Figures 5 and 6)**.

Figure 5: Mean and Standard Deviation Error Bars for the Overall Interoperability Dimension by Division

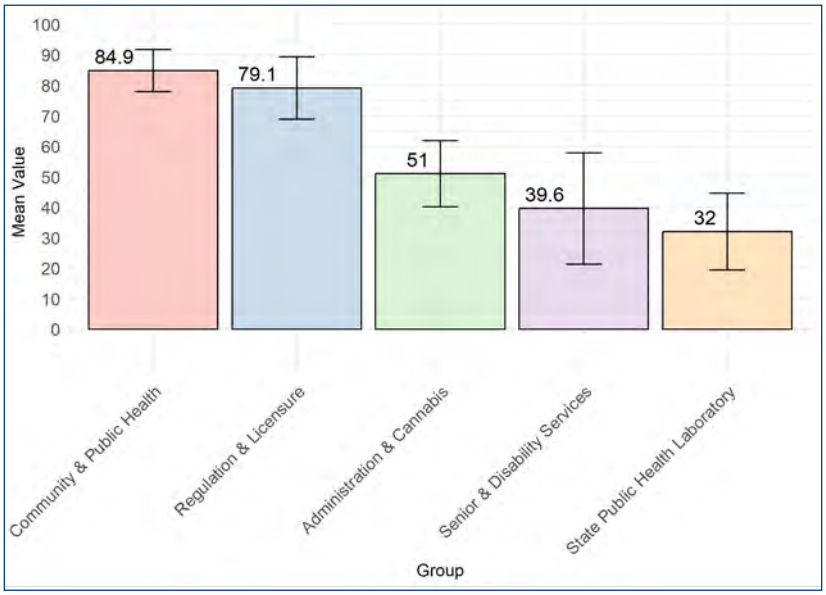
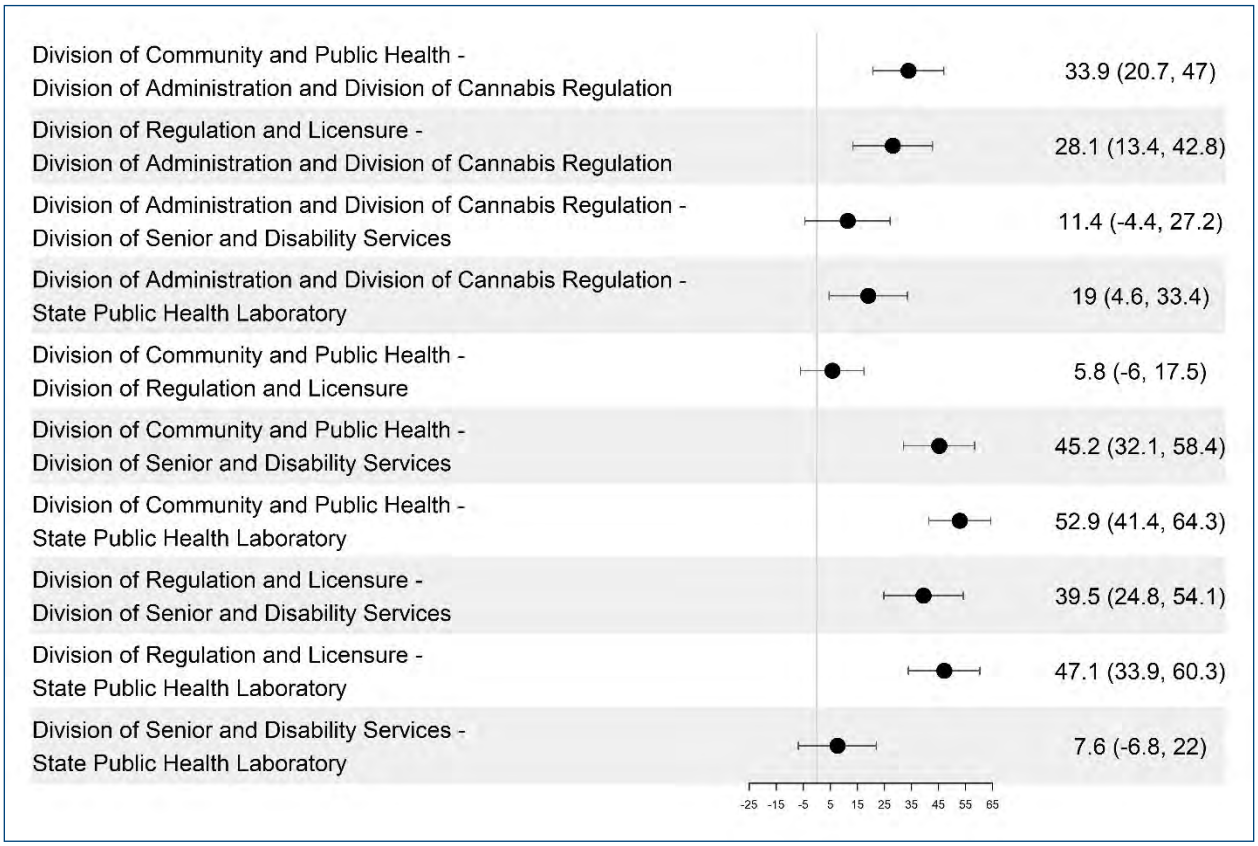


Figure 6: Pairwise Differences in Mean Interoperability Dimension Scores Among the Divisions and Their 95% Confidence Intervals



STATISTICALLY SIGNIFICANT GROUP DIFFERENCES WITH RESPECT TO THE DHI DIMENSION PREDICTIVE ANALYTICS

The Division of Community and Public Health ranked higher than DA and DCR by 27.1 points (p=0.007), higher than DSDS by 41.3 points (p=0.00002) and higher than SPHL by 28.4 points (p=0.00002) **(Figures 7 and 8)**.

Figure 7: Mean and Standard Deviation Error Bars for Predictive Analytics by Division

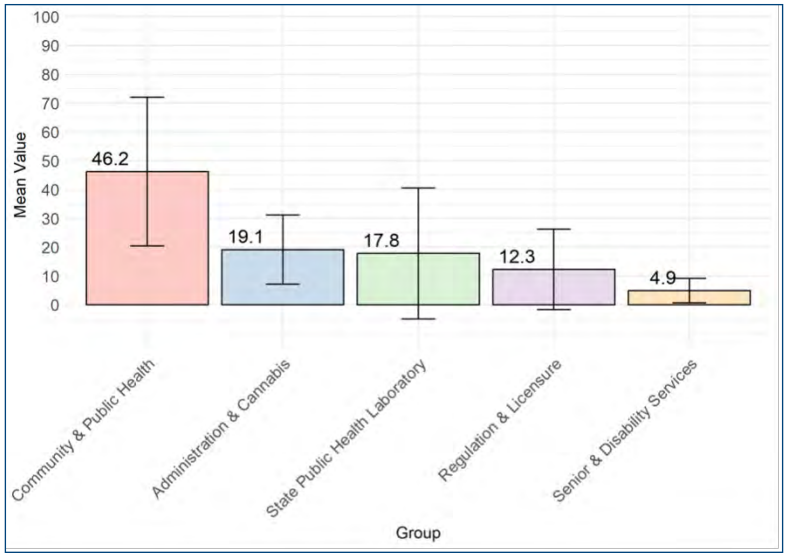
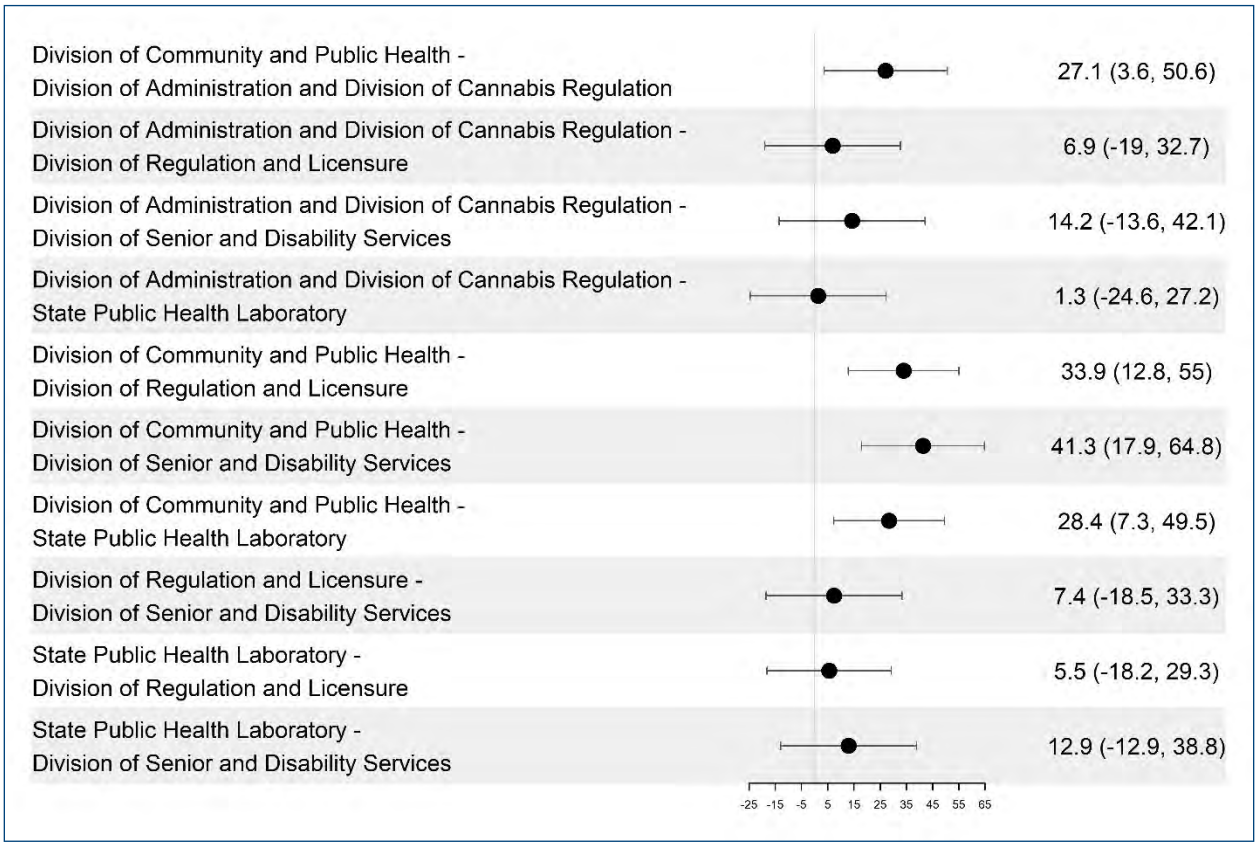


Figure 8: Pairwise Differences in Mean Predictive Analytics Dimension Scores Among Divisions and Their 95% Confidence Intervals



STATISTICALLY SIGNIFICANT GROUP DIFFERENCES WITH RESPECT TO THE DHI DIMENSION PERSON-ENABLED HEALTH

The Divisions of Administration, Cannabis Regulation and Regulation and Licensure are not patient or citizen facing programs therefore fell under the partial DHI data collection methodology and did not include questions related to the Person-Enabled Health dimension. Community and Public Health scored higher than DSDS by 24.1 points (p=0.002), higher than SPHL by 40.5 points (p<0.00001) **(Figures 9 and 10)**.

Figure 9: Mean and Standard Deviation Error Bars for Person-Enabled Health by Division

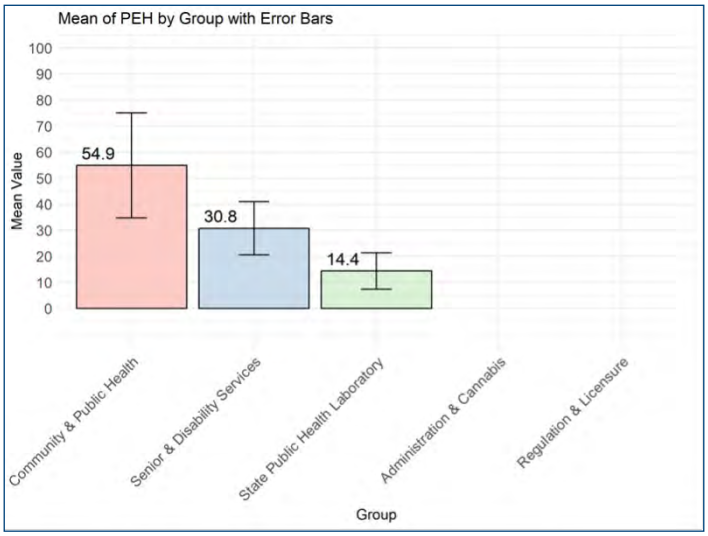
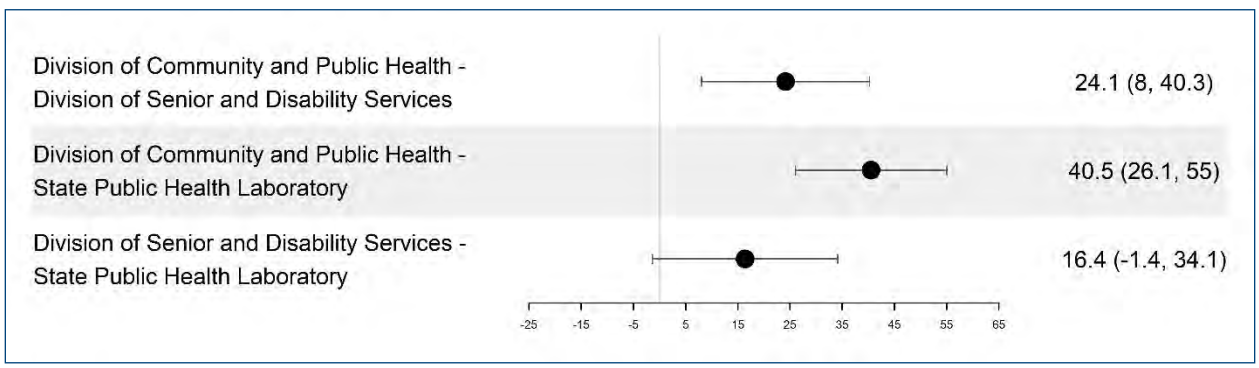


Figure 10: Pairwise Differences in Mean Person-Enabled Dimension Scores Among the Divisions and Their 95% Confidence Intervals



When comparing the 59 programs measured, there is a consistent finding that DCPH outperforms all the others on all four dimensions of the DHI. This is particularly the case when DCPH is compared to DA and DCR, DSDS and SPHL. In **Table 1** we present a detailed summary of the scores for each of the four dimensions of the DHI for each program. The scores are illustrated alongside the North American DHI Average.

Table 1: Department DHI Averages for Each Division and Each DHI Dimension Compared to the North American (NA) Average

	DHI SCORE (mean)	GOVERNANCE & WORKFORCE (NA mean=60/100)	INTEROPERABILITY (NA mean=75/100)	PERSON-ENABLED (NA mean=50/100)	PREDICTIVE ANALYTICS (NA mean=40/100)
Mean Scores	35.6	52.5	62.2	37.4	24
Range of Scores	7-68	9-95	11-95	6-82	0-85
Community and Public Health	50.8	65.6	84.9	54.9	46.2
Regulation and Licensure	36.6	55.8	79.1	*	12.3
Administration and Cannabis	29.4	43.5	51.0	*	19.1
Senior and Disability	25.1	45.5	39.6	30.8	4.8
State Public Health Laboratory	19.0	37.2	32.0	14.4	17.8

* Programs whose work did not require interactions with Missouri citizens completed a partial DHI tool that did not include the Person Enabled dimension.

Qualitative Results

This analysis examined the thematic findings of the qualitative analysis of indicator assessments for each of the four dimensions of the DHI tool. The goal of this analysis was to identify where each of the program groupings had particular strengths in digital capacity and where the gaps may indicate opportunities for strengthening digital transformation of DHSS in Missouri.

GOVERNANCE AND WORKFORCE

Governance and Workforce is the strategic leadership and oversight of digital health systems that ensures the policy and regulatory environment supports privacy, security, stewardship and accountability. Governance puts priority focus on a sustainable, high-performing workforce that is supported to deliver digitally enabled health services, working within quality digital work environments. The future of sustainable, high-performing digital health ecosystems requires unique governance structures to transform digitally enabled work environments to enable care delivery models that are informed by data and analytics and guided by robust data stewardship and policy and decision-making processes. There are four sub-dimensions of Governance and Workforce.

Policy and Decision-Making describes resource allocation and coordination of governance processes required to support digital health transformation. Policy and decision-making include evidence-based digital strategies, alignment of digital processes and value-based incentives and frameworks focused on outcomes. Policy frameworks support and incentivize performance outcomes (e.g., efficiency, productivity, quality and cost) and enable health system partners to build and sustain meaningful relationships with the people and populations public health programs are designed to serve.

Stewardship describes the leadership, culture, vision and strategic objectives required to support digital health, including accountability frameworks and management processes such as planning, building, running and monitoring digital health as well as the resources and expertise to evaluate new technologies. The adoption of digital technologies is informed by evidence to support system-wide adoption at scale. Criteria aligned with the use of data and digital technologies are guided by data-driven decision-making to strengthen performance.

Workforce capacity is the knowledge, skills and abilities across the workforce to support and enable adoption of digital health strategies that support Person-Enabled care focused on health and wellness. Workforce policies support a high-performing workforce that is incentivized to design, adopt and scale digitally enabled care processes and operational strategies, focused on outcomes for people and populations that advance system sustainability.

Transparency is the engagement of people and populations using digitally enabled, transparent communication of quality, safety and performance outcomes. Every person is considered a partner in supporting public health, whereby governance and oversight ensures transparent access to personal health information and performance outcomes, as well as equitable access to public health services and personal health data. **Table 2** summarizes the Governance and Workforce scores for DHSS programs.

Table 2: Governance and Workforce Scores by Division (Scored from 1 to 100)

DIVISION	POLICY AND DECISION-MAKING	STEWARDSHIP	WORKFORCE CAPACITY	TRANSPARENCY
Community and Public Health	58	63	68	64
Regulation and Licensure	55	46	62	38
Administration and Cannabis Regulation	42	39	51	37
Senior and Disability Services	37	38	41	29
State Public Health Laboratory	33	34	39	23

The following are key findings of the Governance and Workforce scores among DHSS programs.

1. **Readiness to Advance a Digital Culture:** Leaders and staff demonstrate very strong commitment to digital transformation across all programs, creating a foundation of "readiness" for digital transformation. High scores on digital capacity indicators and consistent support from senior leadership to frontline teams were described as key factors relative to organizational readiness for advancing digital transformation across programs. This cultural alignment positions the DHSS workforce very favorably to support the design and implementation of a robust digital strategy for DHSS.
2. **Opportunities for Digital Workforce Competency Training:** While some programs demonstrate advanced digital competency, there was inconsistency across programs in access to digital training, implementation of data standards and use of digital technologies. Despite leadership supporting resources for workforce development, actual training programs and upskilling opportunities were found to be limited. There was also an absence of workforce data (e.g., standardized performance metrics) that could be helpful to examine opportunities to strengthen digital workforce competencies, workflows and expertise. Data infrastructure focused on workforce capacity and digital competencies may be important to inform resource allocation to build capacity for advancing the digital public health workforce across DHSS.
3. **Opportunities for Community Input and Engagement:** There are limited opportunities for community engagement and input across public health programs which may contribute to gaps in services. Community engagement in program evaluation and design of policy frameworks can strengthen the alignment of public health programs with community

health needs. While some programs did report community participation in governance and organizational policy, most programs described very limited opportunities for citizens to have input into program design, service delivery, or policy development.

Implications of these findings:

- The workforce appears eager to transition towards more robust digitally enabled work environments. This will be highly beneficial for DHSS to enable workforce competencies and capacity for learning new digital systems and supporting patient populations or citizens to engage digitally with program teams and digital services. For example, program teams that implement new telehealth services, can design new workflows to engage with patients digitally, while actively helping those populations (e.g., elderly) to navigate digital tools and processes that strengthen program impact and outcomes.
- Public health teams have varying levels of digital proficiency which may impact variation in delivery of public health services. Advancing the digitally enabled workforce can be further supported by standardized training frameworks and approaches that ensure every team and every program acquire the digital competencies needed for program teams across DHSS. The development of standardized workforce metrics may also advance and inform accountabilities for digital competencies across program teams. For example, a program team that advances new telehealth services across multiple clinics could benefit from standardized performance metrics that document workload and streamline workflows to enable scalability of digitally enabled services across DHSS programs. Standardized metrics may also enable tracking and analysis of workload, workforce capacity and opportunities to optimize digital work environments.
- Active engagement of communities using digital tools is an opportunity to inform the design of programs and services to ensure alignment to community needs and values. For example, community input to guide the design and implementation of digital services (e.g., self-management programs for chronic conditions) enables teams to consider factors that influence equity, such as internet access, cultural preferences and needs of unique population groups, particularly for vulnerable communities.
- Community engagement is an opportunity to build and strengthen trust in public health services while strengthening relationships with program teams to ensure public health programs meet the needs of the population. Through robust community engagement, programs can build trust with their local communities which builds confidence in teams to support meaningful engagement, in and participation in public health programs and services. A community that trusts their local providers, builds confidence in program participation such as health screening and immunization program.
- Community engagement has the added value of understanding and supporting the unique needs of vulnerable communities to reduce barriers to access for programs and services. For example, a maternal health program may experience limited participation from immigrant communities because services were not designed to account for unique cultural practices or language preferences. Through listening to community voices, programs can be informed and delivered to meet the unique needs of all communities to overcome inequities in both access and outcomes of public health programs and services.

INTEROPERABILITY

The Interoperability dimension of the DHI tool measures the capacity of entities to securely capture, store and flow data across DHSS and to external organizations. Interoperability in this framework is the ability of different information systems, devices and applications to access, exchange, integrate and cooperatively use data in a coordinated manner, within and across organizational, regional and national boundaries. Interoperability provides timely and seamless portability of information, that informs decisions to optimize the health of individuals and populations globally. Health data exchange architectures, application interfaces and standards enable data to be accessed and shared appropriately and securely across the complete spectrum of care, within all applicable settings and with all relevant partners, including individual citizens accessing public health information and services.

When the Interoperability scores were analyzed across all the DHSS teams, there were notable differences in access to digital tools and information technologies across divisions, bureaus and programs which may directly impact their capacity to deliver digitally enabled services to Missouri citizens and flow data within and across DHSS programs. This analysis reflected three key findings: high variation in the use of digital tools and technologies; differences in the availability of digital infrastructure; and a “digital divide” in programs’ clinical data integration and large dataset capabilities.

1. **High Variation in Use of Digital Tools and Technologies:** Programs are highly varied in their use of digital health technologies and mobile digital tools. There is significant variation in basic digital infrastructure, as some programs had digital systems to collect and share data, while others were limited to basic office functions. For example, programs in Community and Public Health, such as Cancer and Chronic Disease Immunizations and Emergency Medical Services are able to connect to health care organizations such as hospitals and clinics that enables connectivity with fully integrated Electronic Medical Record (EMR) technologies to capture data for individual citizens seeking public health services. Other programs, such as Breath Alcohol, Financial Services and Environmental Bacteriology have more limited digital infrastructure (e.g., no access to Wi-Fi) which makes it impossible to share or receive data from other programs. Despite significant strengths among programs for privacy and data security, some programs have very limited capacity to capture and exchange data, which may be resulting in a "digital divide"; whereby some programs have digital tools and technologies, while others continue to rely on manual, paper-based processes.
2. **Availability of Digital Infrastructure:** Our findings revealed variations in digital infrastructure among programs, particularly in their ability to exchange data with clinical organizations and offer patient access to their health data. Some programs have progressed their digital maturity more than others. Maternal Health, WIC and Nutrition Services and Immunizations all scored higher on digital infrastructure than other programs. These programs are able to connect directly to data infrastructure (e.g., clinical EMRs) to collect and utilize data to make decisions. In contrast, programs such as Senior Programs, Virology and Protective Services had limited access to digital infrastructure capacity to share or exchange data with teams across DHSS. Many programs were found to lack access to the digital infrastructure that is required to collect and flow data between programs, within clinical settings, or to patients. Similarly, for these same divisions and programs, there were limitations in the capacity to connect and flow data to and from either statewide DHSS infrastructure and external agencies such as the Food and Drug Administration (FDA), Centers for Medicare and Medicaid Services (CMS) and the Federal Emergency Management Agency (FEMA).
3. **Clinical Data Integration and Large Dataset Capabilities:** Analysis revealed a potential "digital divide" in the capacity of programs to access and leverage comprehensive health datasets to inform program strategy and service delivery. Several departments successfully integrate with clinically focused Electronic Medical Records and large population datasets, enabling evidence-based public health interventions. These programs can track health patterns in real-time, connect Social Drivers of Health (SDOH) data with clinical outcomes and share insights with healthcare providers on program outcomes and effectiveness. However, other departments lack the capacity to aggregate data, or access broader population health datasets. This limitation precludes teams from gaining data-driven insights and knowledge from large datasets to inform program design, public health services, or strategies to advance equity.

Implications of these findings:

- DHSS has achieved very strong internal data controls over data management to ensure highly secure and private data environments. However, there remains limited capacity for data access or exchange for some programs. Across the programs, it was clear that current staff value data and evidence to inform decisions. There is an opportunity for advancing digital infrastructure to progress digital transformation that enables program teams to deliver digitally enabled services to Missouri citizens.
- Access to digital tools and technologies are advanced for some programs, yet not accessible or utilized by other programs. This variability results in significant limitations in team collaboration across DHSS. It also limits the flow of data to inform decisions, such as financial and case costing, workload and workforce capacity to inform operational leader decisions to strengthen workforce capacity and quality work environments. Variation in access to digital tools may also limit data-driven decisions to protect and sustain the health and wellness for some Missouri citizens.
- DHSS has significant opportunity for improving both population health surveillance and communication between programs to collaborate on a wide variety of public health mandates. For example, the flow of data from the SPHL can identify a critical result that may identify the risk for an infectious disease outbreak in key populations such as seniors and children. With a strong digital infrastructure, data can be tracked proactively and communicated readily to statewide teams and external agencies to inform coordinated communication and public health response initiatives.

- Many programs are limited in their ability to access and utilize large data sets such as SDOH and population health data. Access to integrated data sets enables tracking of health services utilization and outcomes, particularly for vulnerable populations, to inform the design of preventive public health programs focused on population health and wellness. For example, during a waterborne illness outbreak, limited data access could delay linking environmental testing data with hospital admission patterns, which delays public health response opportunities to manage public health emergencies.
- Programs lacking robust data integration and access to large datasets face significant barriers in disease surveillance, outbreak management and interventions to overcome health disparities. Access to real-time integration of clinical and population health data, could enable public health teams to accelerate responses to emerging threats to population health to inform allocation and prioritization of resources to communities at greatest risk.

PREDICTIVE ANALYTICS

Predictive analytics examines the transformation of data into knowledge and real-world insights to inform decisions for public health services, public health teams and leaders. Predictive analytics brings together health system and population health data, mobilized by digital tools to inform care delivery approaches, operational strategy and advances in personalized care to unique populations. Predictive analytics also creates the capacity to track and optimize outcomes for unique populations served by DHSS. There are three types of predictive analytics: operational analytics, personalized analytics and predictive analytics, described in the following section.

Operational Analytics mobilize data and digital tools to track performance outcomes such as efficiency, productivity, quality, safety, access to care, equity and cost. Operational analytics include real-time dashboards used by leaders and decision makers to assess value, outcomes and sustainability (e.g., workforce sustainability, financial sustainability) to inform performance strategies.

Predictive Analytics enables tracking of outcomes to identify strategies that work best for every individual citizen and identify the conditions under which best outcomes are achieved. Predictive analytics tracks program and population level outcomes to identify risk for potential harm or poor outcomes, to inform quality and safety strategies and proactively alert teams to strategies that keep people well.

Personalized Analytics collects individual and population health data from multiple sources (e.g., personal digital tools, mobile devices, wearables), including progressive data sources (e.g., genomic and biometric), to enable teams to track progress towards health and wellness outcomes. Personalized analytics connect people to their health teams to meaningfully connect and enable patient reported outcomes and track progress towards personal health goals. **Table 3** summarizes the Predictive Analytics scores for each group of DHSS programs.

Table 3: Predictive Analytics Scores by Division (Scored from 1 to 100)

DIVISION	OPERATIONAL	PERSONALIZED	PREDICTIVE
Community and Public Health	40	39	36
Regulation and Licensure	24	4	8
Administration and Cannabis Regulation	30	8	17
Senior and Disability Services	14	3	4
State Public Health Laboratory	17	1	7

The following are key findings from the Predictive Analytics dimension scores among the programs of DHSS.

1. **Limited operational analytics capabilities** are evident in the findings, particularly for predictive analytics and population health. This leads to limitations in utilizing population health and SDOH data to identify public health risks for communities and to inform more personalized approaches to public health services. For example, advanced analytics capabilities could enable programs to track patient or community outcomes to effectively predict health risks. This would inform proactive and preventive measures that mitigate that risk and sustain health. Similarly, the ability to analyze SDOH data provides public health teams with the capacity to identify unique population segments to inform the design of services and programs that support public health for unique populations. Advanced analytics tools also enable the delivery of proactive, data-driven public health services.
2. **Inconsistencies in the capacity for predictive population health and risk analyses.** There were notable inconsistencies among programs for predictive analytics scores. Some programs including WIC, Epidemiology and Maternal Health demonstrate sophisticated capabilities in data analysis and health outcomes tracking. Specifically, WIC is able to identify populations at risk to inform interventions that support health and reduce public health risks. These high-scoring programs are able to collect data and mobilize advanced analytics to better support patients and to inform strategies to mitigate risks to patients and communities. However, most programs struggle with advanced analytics and comprehensive data collection which limits their ability to track outcomes and identify risk. Many programs scored low in the predictive risk indicators.

Implications of these findings:

- Limitations in the ability to access and utilize population health data results in more reactive public health responses, rather than proactive strategies focused on agile and highly responsive public health preparedness and resilience. As analytics capabilities advance, programs can be more proactive to minimize the impact of communicable diseases to mitigate and prevent outbreaks across populations or geographies.
- Limitations in analytics precludes the capacity of program teams to analyze and track both patient and population outcomes, as well as program-level operational outcomes. Leaders and decision makers that have access to analytics are able to make data-driven decisions, fueled by the insights and evidence that analytics tools can generate to inform decisions. Analytics can inform operational decisions to prioritize financial resource allocation to ensure programs offer the greatest impact potential for vulnerable populations and are well supported.
- Many programs are limited in their ability to collect and stratify data to fully examine the needs of unique population segments to inform the design of public health programs. Limitations in predictive analytics and risk analysis precludes more proactive approaches to public health services that focus on risk mitigation. For example, during a measles outbreak, health departments with limited data capabilities can only track overall case numbers once they are diagnosed. However, advanced analytics offers the opportunity to proactively identify populations at risk for disease transmission to inform preventive strategies that mitigate the risk of outbreak for communities with low immunization rates. Predictive analytics creates the capacity for a more proactive and digitally enabled public health system.

PERSON-ENABLED HEALTH

A Person-Enabled public health system positions the patient and community as the expert in managing health and wellness in a manner that is consistent with their individualized values and unique life circumstances. Individuals and communities are able to choose the services delivery model that best suits their needs, such as online or in person and choose from various digital technologies with the expectations that data flow seamlessly between public health teams and the recipients of public health services. Programs are fully integrated, coordinated and focused on the personalized health goals for each individual or community, as care pathways and processes are aligned to the unique needs of the person, community, or family. There are three sub-dimensions of Person-Enabled Health measured by the DHI tool.

Personalized Care Delivery is the personalization of health services whereby individuals or communities are the primary decision-maker in managing health needs and challenges. People have the option to choose the digital tools and technologies (e.g., mobile devices, wearables) that best suit their unique life circumstances and personalized approaches to health services.

Predictive Population Health mobilizes data and robust analytics tools to track population health outcomes in order to anticipate risks (e.g., gaps in health screening, risks of chronic illness) and inform program-level strategies to mitigate risks to strengthen health and wellness. Predictive population health is informed by a robust analytics infrastructure that mobilizes digital tools, dashboards and population health datasets to inform strategies aimed at strengthening population health outcomes.

Proactive Risk Management focuses on care delivery that proactively identifies risks to health and wellness, cues individuals and their provider team of the risks and strategies to proactively intervene to prevent risk in order to progress toward public health goals. Proactive care delivery requires a transformational shift towards enabling personalized care delivery to individuals, communities, or populations. Proactive health services is defined as anticipating and identifying populations who are at risk and proactively intervening to support health to keep people well. **Table 4** describes the Person-Enabled scores for each division of public health teams.

Table 4: Person-Enabled Scores by Division (Scored from 1 to 100)

DIVISION	PERSONALIZED	PREDICTIVE	PROACTIVE
Community and Public Health	39	43	35
Regulation and Licensure	*	*	*
Administration and Cannabis Regulation	*	*	*
Senior and Disability Services	19	13	9
State Public Health Laboratory	11	10	6

* Teams whose roles did not require interactions with Missouri citizens completed a partial DHI tool that did not include the Person-Enabled dimension.

The following are key findings of the Person-Enabled Health dimension scores among the programs of DHSS.

1. **High variation in capacity to deliver personalized services:** While traditional patient engagement efforts are evident in high scores on trust-building and relationships, there are distinct differences among DHSS programs in the capacity to deliver personalized services. High-performing programs such as Immunizations, WIC and Maternal Child Health offer advanced digital capabilities and patient empowerment tools. However, programs such as SPHL and Senior Services lack basic digital infrastructure to offer patients access to data or virtual services. The variability in capacity for personalized services delivery may be contributing to a "digital divide" whereby some patients have access to data and personalized services, while others have limited or no opportunities to engage with digitally enabled services or public health teams.
2. **Limited Patient Engagement:** Most public health programs demonstrate significant gaps in digital infrastructure to meaningfully engage with patients or communities. While select programs like WIC and Maternal Child Health utilize digital services, the majority of programs lack basic digital tools, virtual care options, or information systems to engage with citizens or external partners. Only a few programs (Cancer and Chronic Disease Control, Community Food and Nutrition Assistance, Vital Records) were found to monitor patient or population health outcomes. Limitations in digital capacity may fuel barriers for communities to access public health services or engage with public health teams, which may limit "self-serve" options, or limit data-driven program improvements. The absence of a digital strategy may also limit care for vulnerable populations who could most benefit from accessible public health programs. Advanced digital infrastructure supports patient engagement, by offering patients access to their health data to inform decisions and enables providers to be better informed about their patient's health.

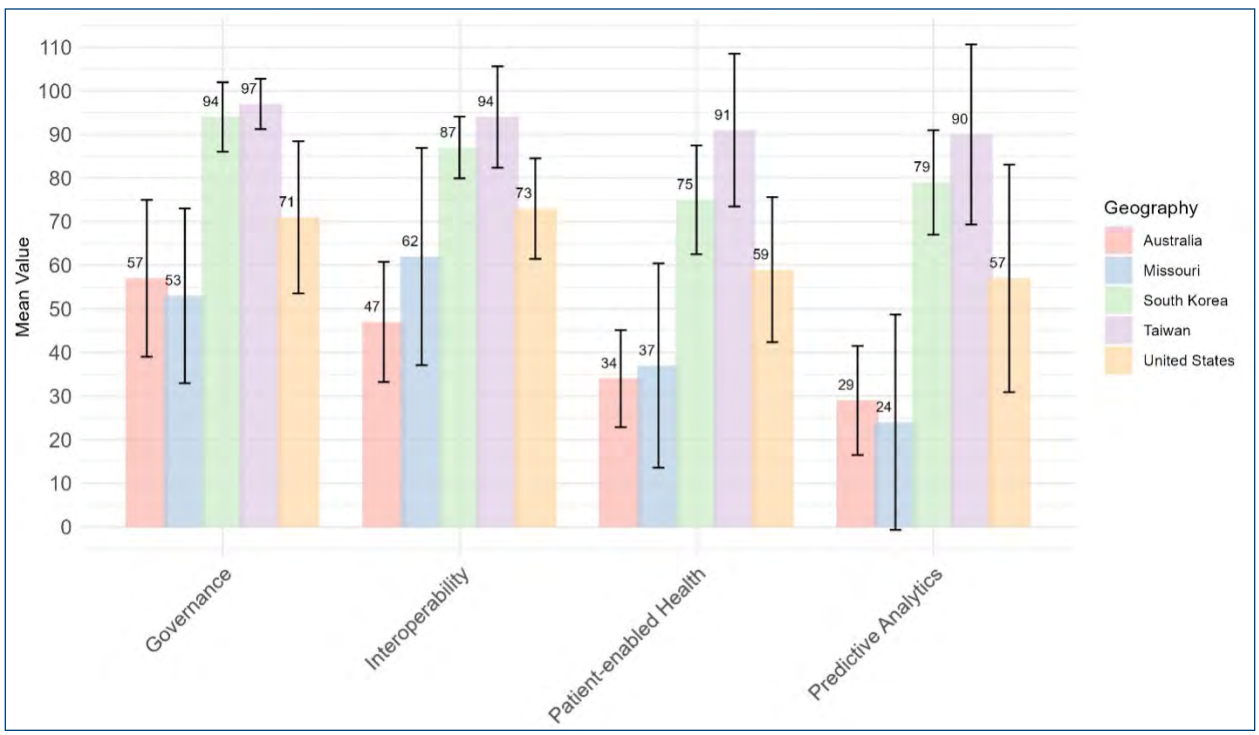
Implications of These Findings:

- Patients and communities have limited opportunity to access health data, to make data-driven decisions that support active participation in managing health goals. For example, a mother tracking her child's vaccination schedule must rely on provider appointments to ensure vaccinations are up to date. Alternatively, digitally enabled services provide the opportunity for automated alerts and scheduling to optimize vaccination tracking, preventive health screening and public health services.
- Lack of virtual care options and digital tools create barriers to accessing public health services, particularly for rural or remote communities. Consider a rural community where citizens must travel hours for routine services such as health screening that could be supported digitally to strengthen access to care and access to health information that strengthens health literacy.
- Capacity to measure and track outcomes is not well developed and may limit public health teams from effectively measuring program impact and outcomes to identify opportunities to strengthen program performance. For example, a diabetes intervention program that is able to track patients' progress to fully examine program strategies associated with positive outcomes, is an opportunity to strengthen program performance and value.

INTERNATIONAL COMPARISON

Internationally, we compared data for the State of Missouri DHSS DHI dimensions with data from Australia, South Korea, the United States and Taiwan. These comparisons are shown in **Figure 11** for all four DHI dimensions. Results indicate that Missouri has lower average scores than the other four jurisdictions in this comparative analysis. Here is a summary of how and in which dimensions Missouri data differs from the other countries.

Figure 11: Mean and Standard Deviation (error bars) for all Four Dimensions by Geography, Comparing Missouri to Australia, the United States, Taiwan and South Korea



With respect to Governance, Missouri is comparable to Australia. However, Missouri has significantly lower scores compared to the other geographies. Missouri's average score was 50.1 points lower than South Korea ($p<0.001$). Similarly, Missouri scored 65.7 points lower than Taiwan ($p<0.001$), reinforcing the contrast in organizational work culture. Even within the same country, Missouri scored 33.2 points lower than the United States ($p<0.001$).

In Interoperability, Missouri scored 15.94 points higher than Australia ($p=0.006$) but lagged behind South Korea by 24.79 points ($p=0.002$) and Taiwan by 30.96 points ($p=0.03$). Interestingly, when compared to the United States, Missouri's scores for Interoperability were not statistically different, with a mean difference of only 10.21 points ($p=0.71$) signaling that the Missouri DHSS is comparable with other organizations in the United States for Interoperability.

In Predictive Analytics, Missouri was consistently lower when compared to most countries. The score difference between Missouri and South Korea was 54.49 points ($p<0.001$), while the gap with Taiwan was 65.09 points ($p<0.001$). Missouri also scored significantly lower than the United States, with a difference of 32.67 points ($p=0.002$). However, the results indicated no significant difference between Missouri and Australia, with a mean difference of just 4.35 points ($p=0.89$).

Finally, in Person-Enabled Health, Missouri scored lower compared to other countries. While there was no significant difference between Missouri and Australia, with a mean difference of 3.92 points ($p=0.91$), Missouri scored 37.01 points lower than South Korea ($p<0.001$) and 53.17 points lower than Taiwan ($p<0.001$). When compared to the United States, Missouri's score was also significantly lower by 21.13 points ($p=0.046$).

The results of this international comparison are limited given the majority of organizations in other countries with DHI measures primarily represent hospitals, rather than public health agencies. Hence, this international comparison offers limited insights into how public health agencies in other countries compare with Missouri DHSS. It is notable that Missouri data is very comparable to Australia DHI scores, which may indicate that Missouri DHSS has advanced its digital capacity when compared with Australia, a largely publicly funded health care system.

OPPORTUNITIES FOR ADVANCING DIGITAL TRANSFORMATION

Following the HIMSS comprehensive analysis of digital health capacity across DHSS, four opportunities have emerged that may advance digital health transformation across DHSS to strengthen operational and population health outcomes for Missouri. These opportunities offer DHSS insights into strategies for advancing digital transformation, focused on standardizing digital infrastructure, enhancing person-centered public health services, developing and leveraging advanced analytics and strengthening digital workforce capacity. Each opportunity addresses current gaps in digital maturity, while also positioning DHSS to meet current and future public health challenges. The following section outlines four opportunities to advance digital transformation across DHSS.

1. ADVANCE AND STANDARDIZE DIGITAL INFRASTRUCTURE TO REDUCE VARIABILITY

The findings of the DHI analysis revealed two opportunities to advance digital infrastructure across DHSS programs and divisions.

Implement Digital Infrastructure and Standards: Across DHSS divisions, programs are highly varied in their ability to utilize digital tools and provide digitally enabled services. Investment in digital infrastructure that offers a standardized, statewide infrastructure would ensure greater digital capacity and data sharing for all programs and divisions. This would include secure data exchange protocols including HL7, FHIR, unified cybersecurity safeguards, centralized data repositories and infrastructure to support the automated flow of data within and across programs to support data-driven decision-making. Standardization enables seamless flow of data between divisions and programs to support coordinated and collaborative public health initiatives, reduces technical barriers and ensures data access within a highly private and secure digital environment.

A standardized digital infrastructure enables program teams to proactively identify and respond to challenges and advance collaboration to coordinate execution of public health priorities. For example, laboratory services with digital capacity would have the capacity to flow critical results to relevant programs and division leaders. This would allow for automated information exchange with other public health programs, to inform agile and responsive public health initiatives that support the health of Missouri citizens. If digital infrastructure were advanced, automation of data sharing offers data-driven decision-making to proactively mitigate risks, inform response strategies and track progress towards strategic outcomes using advanced analytics. Digital capacity is heavily reliant on the ability to access, collect and securely store data that is analyzed to create knowledge and insights to inform decisions. Advancing digital infrastructure offers the capacity to identify and track public health risks to vulnerable populations, to inform a proactive and coordinated response that engages DHSS programs, clinical healthcare organizations and state leaders.

Advance Integrated Information Exchange Platforms: Currently, many of the programs are unable to exchange data in real-time and cannot flow data to data repositories such as population health registries. These limitations preclude knowledge and information sharing among divisions and program teams. Investing in platforms that automate the exchange and submission of data to external health data registries, patient portals and electronic medical records could support robust, statewide data sets, improve information sharing and offer greater operational efficiencies. Integrated information exchange platforms allow for streamlined data collection and data sharing that offers operational efficiencies including finance, procurement and operational reporting. For example, when a Local Public Health Agency integrates data across its immunization clinics, WIC programs and community health screenings, it can automatically track the outcomes (e.g., cost, infectious disease risks) of preventive health services by combining clinical, supply chain and financial data in real-time. Variances in vaccine utilization across communities or populations could be tracked to inform operational decisions such as resource management and inform strategic decisions and program strategies (such as mobile clinics) to strengthen prevention outcomes. Vaccine supply decisions can be informed by accurate utilization data and rates of infections can inform procurement decisions that minimize waste. Information exchange platforms create transparency of data across public health programs to identify opportunities for resource optimization and opportunities to advance cost-effective service delivery models.

2. ADVANCE CITIZEN ENGAGEMENT AND PERSON-CENTERED CAPABILITIES

There are two opportunities to advance citizen engagement and person-centered care across DHSS described in the following.

Develop Patient-Centered Care Delivery Strategies: Patient access to digitally enabled public health services (e.g., virtual care, online services) are limited. Few programs offer patients the ability to monitor and manage their health and care digitally, which limits patient engagement in managing their health and care. To enhance patient experience and engagement in public health programming, DHSS may consider investing in digitally enabled public health services that prioritize accessibility to, and engagement with, public health programs. Examples of digital tools to support Person-Enabled Health includes online scheduling, wearables that enable patients to report outcomes and use of digital devices that support self-management, all designed to foster engaged and empowered patient participation that builds meaningful relationships between public health teams and the communities they are mandated to serve. Digitally enabled services require the seamless flow of data to decision-makers including patients, communities and public health teams. For instance, a community-wide program to address chronic disease could offer patients an online tool to monitor progress towards their health goals (e.g., healthy child development milestones, health behavior goals). As people track their progress, they can see the positive impact of their lifestyle changes on their health outcomes and engage with public health teams to inform health decisions to meet their personal health goals. Digital connectivity also offers strong relationship building between patients, communities and public health teams to strengthen trust and build confidence in DHSS as a “single source of truth” for public health information. Robust digital connectivity also helps to avoid inaccurate information being disseminated as patients can more readily access public health teams for seeking relevant and accurate health information. Automated flow of data across the public health system, enables real-time monitoring of population health trends and outcomes. As public health challenges emerge, the system can trigger automated outreach to support patients to access resources and appropriate care providers when and where needed. This approach not only empowers patients to take charge of their health but also supports equitable, timely and targeted public health interventions, improving outcomes for both individuals and communities.

Strengthen Patient Data Collection and Patient Data Flow: Many programs currently lack digital tools to record or track patient data, resulting in patients not being able to access or view their own health data, such as laboratory results or vaccination records. Program teams have limited insights into patient needs, risks, or outcomes to inform program strategies that address patient needs and effectively allocate resources. There is an opportunity to strengthen digital capacity for patients to access and report their progress and outcomes digitally, which will strengthen DHSS datasets and enable flow of data between patients and program teams. This opportunity empowers patients by enabling access to their health data and program information while also supporting program teams to develop impactful, data-driven initiatives tailored to specific population needs. In addition, this opportunity standardizes practices across program teams to capture patient-reported outcomes, satisfaction and service preferences. Robust datasets of patient-reported data can also be integrated with large datasets, such as SDOH, or national registries, to inform program strategies that are uniquely personalized to the needs and preferences of Missouri communities and populations. For example, analysis of community health data might reveal transportation barriers that contribute to missed immunization appointments in certain neighborhoods. This insight could drive the implementation of mobile vaccination clinics and transportation assistance initiatives to overcome this barrier. Data systems can monitor the impact of new initiatives in real time, informed by patient input and outcomes data to inform strategies to tailor services to unique needs and preferences of each community or population for greater impact. Furthermore, patient data would be immediately updated, allowing individuals to track their immunization records and stay informed about future public health needs of the communities they serve. This comprehensive approach is well positioned to strengthen population and community health outcomes.

3. ADVANCE ANALYTICS AND PREDICTIVE MODELING TO TRANSFORM DATA INTO KNOWLEDGE AND INSIGHTS TO INFORM DECISIONS

Analytics is an emerging opportunity across all global health systems. Based on this DHI analysis, there are two opportunities to advance analytics capacity across DHSS, described in the following section.

Establish an Analytics Strategy: Across the program teams there is high variation in use of analytics and analytic capacity, with many of the programs operating without the ability to access or analyze large data sets that offer evidence-informed decisions. There is a significant opportunity to advance the capacity for advanced analytics across DHSS so that programs can proactively identify patient needs, outcomes and risks, which then informs proactive and preventive care program strategies. Advances in analytics capabilities can have significant impact when different data sources, such as registries, EMRs and Electronic Health Records (EHR) wearables and patient portals are integrated to provide a robust data-driven strategy across DHSS. Advanced analytics transforms raw data into actionable insights to inform program strategies, to help anticipate public health challenges and inform data-driven decision-making. Analytics capabilities could support evidence-informed decisions and information sharing to support collaboration across programs and divisions. For example, data from various public health programs, including disease surveillance, emergency room visits and environmental monitoring, could be analyzed to identify health threats (e.g., exacerbation of asthma or cardiac disease) during extreme weather events. Analytics could enable early identification of risks to communities that are most vulnerable to respiratory health challenges and dehydration during heatwaves. Public health teams from across the state, can then coordinate efforts to distribute resources, issue heat advisories and increase awareness of heat safety measures in high-risk areas.

Identify Potential Risks informed by Analytics: Currently, many programs are not able to track program outcomes to proactively identify impact, value or equity of program access and outcomes. Advanced analytics capabilities enable program teams to identify those populations or communities at greatest risk for harm or poor health outcomes, due to limitations in accessing programs and services, or due to unique vulnerabilities to health risks. Analytics is foundational to advancing proactive risk mitigation public health strategies. For example, analytics capacity enables predictive modeling techniques to proactively identify unique populations at greatest risk for illness (e.g., diabetes, heart disease or stroke), or threats to SDOH (e.g., communities at risk for food insecurity, or seniors at risk for social isolation). Proactive identification of risks can inform program teams of the needs of communities or populations to inform decisions on resource allocation, or program delivery strategies, tailored to meet the unique needs of each community or population. Early identification of risks, proactive risk mitigation strategies that can be leveraged to prioritize, protect and sustain population health for the most vulnerable communities. Advanced analytics can also readily identify inequities in access to programs and services to further strengthen the impact of risk mitigation initiatives.

4. BUILD DIGITAL CAPACITY WITHIN THE WORKFORCE

There are three unique opportunities for building digital capacity for the DHSS workforce, described in the following section.

Foster a Culture of Data-Driven Decision-Making: Many programs across the department demonstrated strong support for advancing digital transformation to support evidence-based decision-making. As programs increasingly adopt digital tools and processes, a culture of data-driven decision-making will emerge rapidly to support digitally enabled public health initiatives. Enhancing data literacy, designing data-informed program strategies and equipping programs with digital tools and analytics capabilities to track and evaluate outcomes, provides a strong foundation for empowering data-driven decision-making. Digital capacity creates transparency of impact and value of programs and divisions, to inform strategic planning and priority setting. Operational processes are automated, such as program reporting, to strengthen efficiency and productivity. Data-driven decision-making informs resource allocation to focus resources on high-demand programs, ultimately optimizing public health initiatives to advance population health.

Build Competency and Capacity for Digitally Enabled Public Health Workforce: Many individuals across the programs aspired to advance digital capabilities but were limited by opportunities for professional development focused on digital competencies and capacity building. Strengthening resources and opportunities to foster a digitally enabled public health workforce is a significant opportunity to accelerate digital transformation across DHSS. Workforce capacity building in digital transformation not only strengthens current digital capabilities, but also advances transformation of digital public health towards proactive, data-driven services that are tailored to the unique health needs of every community across the state. To strengthen digital workforce competencies, access to training and professional development opportunities focused on data literacy, advanced analytics and digitally enabled program delivery strategies is required. Pathways for upskilling current staff to advance digital transformation could be enabled by collaborations with educational institutions to design curricula that align with emerging healthcare technologies and public health priorities. For example, education on co-design strategies within and across program teams create the opportunity for transformational approaches to digital public health that builds collaboration and coordination across DHSS. Use of simulation exercises and hands-on training approaches may offer program teams the opportunity to "pilot test" new program practices to identify potential areas of impact and value for unique communities or populations. Simulation training is one example of workforce development that could enable programs to enhance their skill sets, streamline workflows, improve efficiency and responsiveness to ultimately reduce workload and foster confidence in their digital competencies.

Invest in Automated and Secure Communication Platforms: Currently, many programs lack efficient, digitally secure platforms to support communication and collaboration within and across program teams. There is a unique opportunity to advance an integrated and secure communication platform that is designed to streamline workflows and enhance collaboration that could offer significant value toward workforce development and productivity. For example, access to a secure messaging platform would enable program teams to coordinate responses across multiple divisions to strengthen rapid and agile responsiveness during a community health crisis. Secure communication systems can also automatically route urgent alerts to the appropriate team members, track response times and securely document all communications for evaluation of public health responsiveness during post-event debriefs. Secure communication and data sharing builds confidence and collaborative opportunities that strengthen coordination of public health response efforts among all partners, ultimately strengthening crisis response, operational efficiency and effective programs to strengthen population health.

These opportunities are well positioned to advance and strengthen digital transformation of public health services across the State of Missouri. Modernizing digital infrastructure, advancing person-centered health, harnessing predictive analytics and building digital workforce capacity can reshape public health service delivery across Missouri's communities, uniquely tailored to the needs of each community and population. Digital transformation aims to streamline operations and creates transparency of data and outcomes to strengthen proactive responsiveness to public health challenges. The department is well positioned to advance these opportunities to achieve a resilient, responsive and data-informed digital public health system to support the health of all Missourians. These opportunities also hold the potential for advancing Missouri DHSS as a global leader in digital public health.

APPENDIX A: QUALITATIVE RESULTS

Division of Community and Public Health Findings

GOVERNANCE AND WORKFORCE

Policy and Decision-Making

Policy and Decision-Making capabilities demonstrate a strong data-driven culture across programs, though strategy development and outcome measurement practices vary. While programs effectively maintain data practices, opportunities exist to strengthen patient data visibility and information access. This highlights potential areas for infrastructure enhancement to better align organizational data culture with operational systems, enabling more integrated data collection and usage across networks.

Stewardship

Programs have built strong foundations in governance through thoughtful privacy protocols and accountability practices. Teams display varying approaches to using data and integrating external sources like SDOH, creating opportunities to learn from each other's successes. While each program has developed unique ways of working with data and digital tools, there's potential to align these approaches through shared infrastructure and standardized practices. This would help teams better leverage their data for decision-making while maintaining their strong administrative frameworks.

Transparency

Many of the programs had strong public information practices. However, there was variation when it came to measuring quality and safety, performance indicator sharing and cross-organization performance measurement. This suggests a missing standardized process in how programs track and evaluate their performance metrics, particularly in areas of quality, safety and program progress.

Workforce Capacity and Competency

In Workforce, programs appear to support learning and workforce training illustrating a strong culture of learning. Although they have a strong foundational culture, there were limitations in external engagement and partnerships for digital learning for the workforce. This illustrates that programs may not have the resources, or capacity, to upskill staff in digital technologies. Indicators showed that accountability was varied in programs, illustrating that there are some levels of accountability, but it may not be standardized. This suggests that there is a strong foundation that can be utilized given the right governance structures and training opportunities for staff.

INTEROPERABILITY

Foundational

The security infrastructure across DCPH demonstrates notable strength, particularly in data access controls and secure storage systems. However, clinical data integration capabilities vary substantially between programs, with high variability of implementation of point-of-care capture and EMR integration. For example, some programs have full integration with EMR and clinical organizations, while others do not have the digital infrastructure to allow for connection. This pattern suggests a solid security foundation systemwide, while highlighting opportunities to standardize clinical data integration practices across programs.

Structural

In the assessment of Structural Interoperability, programs have strong foundations in Wi-Fi, cloud-based platforms and network capabilities. Performance varied widely on clinical automation indicators, such as laboratory results, patient medications and transitions of care. Programs appeared to have limited patient-centered digital capabilities, including digital tool usage and patient-recorded outcomes. These scores indicate stronger technical infrastructure but significant gaps in patient-facing digital integration and clinical workflow automation. This may also indicate missing digital infrastructure for the collection and utilization of large data sets.

Organizational
DCPH programs excel in internal digital capabilities, particularly data security, privacy policies and technology utilization. While most programs have established interoperability frameworks through policies, their implementation varies across programs. External integration, specifically clinical partnerships and health data sharing, remains varied between programs. The disconnect that exists between strong internal infrastructure and limited external connectivity, indicates that while programs have built solid foundations, they may lack the comprehensive digital architecture needed for full interoperability.

Semantic
Semantic Interoperability varied significantly across programs. While some programs demonstrated robust capabilities for external data sharing and clinical organization connectivity, others lacked the basic infrastructure for external connections. This uneven landscape reflects the system's varied progress toward comprehensive data integration; some areas have achieved sophisticated bi-directional data flows and analytics usage, while others remain at earlier stages of implementation.

PREDICTIVE ANALYTICS

Predictive Analytics
Analytical capabilities demonstrate encouraging progress across programs in integrating analytics tools for patient safety and clinical care. While some programs have implemented advanced data integration systems, there are opportunities to expand analytics adoption for public health strategy development and patient outcome tracking. This variation highlights promising pathways to enhance population-level insights and patient monitoring by building upon existing successful analytics implementations. The foundation exists to strengthen analytical capabilities systemwide through knowledge sharing and infrastructure development.

Personalized
In the assessment of Personalized Analytics, programs showed high variability in their scoring for analytic strategy, tracking patient risk and outcomes and utilizing data for analytics and person-centered strategies. This significant variation suggests that while some programs have developed robust analytical capabilities and digital infrastructure, others may lack these fundamental tools and systems. It may indicate inconsistent adoption of data-driven approaches across the sector, potentially leading to varying levels of capability in delivering data-informed, personalized healthcare services.

Operational Analytics
In assessing Operational Analytics, programs are highly varied throughout the indicators, suggesting programs are at different levels of maturity. This wide distribution across maturity levels indicates that while some programs have developed sophisticated analytical capabilities, others are still in early stages.

PERSON-ENABLED HEALTH

Personalized Care Delivery
DCPH programs widely employ digital tools to support individualized patient care and cross-program coordination. However, patient choice capabilities—including virtual service access, digital tool availability and patient goal documentation—vary significantly between programs. This disparity reveals differences in technical infrastructure, with some programs well-equipped for patient-centered care while others lack the capabilities to offer flexible, individualized care options.

Predictive Population Health
The assessment of Predictive Population Health indicates varied performance across programs. Programs appear to show considerable variation in data collection, health outcome tracking and evidence-based decision-making. The findings suggest varying levels in advanced analytics and digital tool adoption. Most programs do not collect insight from large population data sets. These results indicate differing levels of access to digital tools and analytics capacities and suggests most programs have not yet developed the infrastructure needed for data-driven healthcare approaches.

Proactive Risk Management

Programs excel in product tracking and digital tool implementation. Data collection and analysis capabilities present key growth opportunities, particularly in wearables integration, analytics and risk identification. While some programs leverage comprehensive data gathering and sophisticated analysis for decision-making, others could enhance their data infrastructure and analytical capabilities. This highlights opportunities to develop standardized practices and strengthen technical infrastructure to support consistent risk management approaches systemwide.

State Public Health Laboratory Findings

GOVERNANCE AND WORKFORCE

Policy and Decision-Making

The assessment of Policy and Decision-Making in SPHL revealed significant differences between culture and infrastructure capability indicators. Programs demonstrated stronger performance in indicators related to data-supporting culture (i.e., knowledge of the importance of data). However, performance varied significantly in digital strategy and governance. All SPHL programs showed limited visibility into patient journeys. These findings indicate that while SPHL programs value data-driven decision-making and evidence-based practices, they lack the digital strategy and infrastructure necessary to effectively implement these principles.

Stewardship

The assessment of Stewardship in SPHL Services revealed strong performance in privacy and security measures. While accountability and progress toward strategic goals had higher scores, programs consistently scored low in digital tool policies and procedures. Programs performed poorly in digital tool implementation and the utilization of large datasets, like SDOH. These findings demonstrate that while programs have strengths in security protocols and strategic accountability, they lack the capability to effectively evaluate and implement digital solutions or data sources for evidence-based decision-making.

Workforce Capacity and Competency

The assessment of Workforce Capacity and Competency indicates varied organizational support for staff development. It appears that there is strong leadership support of workforce training, providing resources, time and education for staff capacity, but low external staff development initiatives, such as educational institution partnerships. This suggests that there may be the leadership support for training but limited resources for staff upskilling and digital training. Staff accountability measures appear to vary across programs, suggesting different leadership approaches and missing standardization. These results suggest that while basic staff support structures exist, programs may need development in advanced workforce initiatives and standardized accountability measures.

Transparency

In Transparency, SPHL Services demonstrated moderate scoring in transparency and accountability, with some programs providing public insight on program outcomes and work while others remained internal. Many programs had limited documentation of program measurement and outcomes. This pattern reveals established internal transparency mechanisms, though significant gaps exist in performance tracking and information sharing practices.

INTEROPERABILITY

Foundational Interoperability

In the assessment of Foundational Interoperability, programs demonstrated clear strengths in security-related indicators, particularly in data access security and secure storage infrastructure. On interoperability across systems, programs were weaker in information exchange and data capture across different platforms. Many of the programs did not have the ability for data capture and data exchange (particularly in procurement). Many programs have limited communication or collaboration platforms. It appears that while many programs have prioritized security infrastructure, they have not yet developed the foundational systems necessary for seamless information exchange offering a strong area of future opportunity.

Structural

The assessment of Structural Interoperability shows a divide in digital infrastructure between SPHL function and administration infrastructure. While programs have successfully established specialized platforms for clinical functions (like laboratory testing and imaging results), they are limited in broader data integration and accessibility. There appears to be limited ability for many programs to connect and integrate beyond specific siloed platforms, such as the laboratory platform. Programs scored very low on the use of large population health data sets (such as SDOH). The limited cloud orchestration capabilities and limited Wi-Fi suggests that programs have limited digital infrastructure or foundations for digital maturity. The findings suggest that there are foundational aspects to digital maturity, such as digital infrastructure, that could be highly beneficial to all programs.

Organizational

Many of the programs illustrated strong privacy policies, infrastructure and staff training in IT security and phishing prevention. However, data sharing capabilities remain limited. Many of the SPHL programs show some ability to share data internally and with state agencies but have difficulty conducting information exchange with other health organizations that are external to the lab, including clinical and other healthcare settings. The absence of statewide interoperability policies and regulations appears to influence data sharing capabilities at lower administrative levels, suggesting a relationship between state policy frameworks and program-level interoperability implementation.

Semantic

The assessment of Semantic Interoperability reveals limitations in clinical data integration capabilities. A small portion of programs have implemented external data connections with bidirectional flow and access to external data sources. This suggests that there are opportunities for data and digital infrastructure improvements for SPHL services.

PREDICTIVE ANALYTICS

Predictive Analytics

SPHL services data shows varying governance and transparency practices across programs, while analytical capabilities remain an area for development. Current metrics indicate programs consistently register minimal implementation of advanced analytics infrastructure, including data collection systems and predictive tools. This pattern suggests opportunities to build fundamental analytical infrastructure to enable data-driven insights and predictive capabilities.

Personalized Analytics

SPHL services data reveals limited analytical capabilities across programs. Current metrics show consistently low implementation of data infrastructure for patient risk assessment and management. This pattern indicates opportunities to develop analytical foundations that would enable more data-driven laboratory services.

Operational Analytics

SPHL data shows strong performance in data governance and transparency across programs. Current metrics indicate limited capabilities in data collection and utilization - particularly for predictive analysis and operational improvements like costing, patient outcomes and labor management. Most programs do not have analytical capacity for operational insights. This creates a strong opportunity for the future as leveraging operational data will improve operational insights and decision-making.

PERSON-ENABLED HEALTH

Person-Enabled Care

Programs show limited digital infrastructure to collect data and flow it to patients. Overall, there are limited digital tools or processes to support patients. Most programs currently register limited metrics in data collection, analytics and population health tracking. Risk management tools remain an area for development, with basic digital tool usage showing early adoption. SDOH data collection and predictive analytics capabilities present key growth opportunities. These patterns indicate strategic pathways to strengthen data-driven care delivery and patient support across the system.

Personalized Care Delivery

The assessment of Personalized Care Delivery in SPHL services showed that while there are some foundational aspects of care delivery, such as higher scores in patient relationships and patient information sharing, there were gaps in digital infrastructure and data collection. Access and use of digital tools and technologies appeared to be limited for most programs, while the collection and use of big data (SDOH and population health data) was absent for most programs. This indicates a gap between traditional care delivery strengths and modern data-driven healthcare capabilities, which may speak to the current digital infrastructure.

Proactive Risk Management

Data reveals most programs have limited digital infrastructure but do have access to basic digital tools that are necessary for their work. Digital capabilities, data collection processes and analytics-driven decision-making are key areas of opportunity and future growth. Current infrastructure limitations affect programs' ability to digitally engage with the public and implement analytics effectively.

Predictive Population Health

SPHL services data shows mixed outcome measurement practices across programs, with stronger tracking of cost metrics compared to value assessments. Most programs show limited digital tool adoption and minimal implementation of SDOH data collection. The data indicates effective basic outcome monitoring, while highlighting opportunities to expand digital infrastructure for comprehensive data collection and predictive healthcare analytics.

Division of Administration and Division of Cannabis Regulation Findings

GOVERNANCE AND WORKFORCE

Policy and Decision-Making

Data shows programs have established a strong internal culture valuing data-driven decision-making. However, capabilities vary significantly across programs, with notably low implementation of accountability measures and digital tools across all programs. Community engagement metrics were consistently low throughout the programs. This pattern suggests a disconnect between programs' data appreciation and their ability to collect and utilize the data. The data highlights two key gaps: the need for enhanced digital infrastructure to support data utilization and opportunities to strengthen engagement with served populations to gather valuable community insights.

Stewardship

In Stewardship, Administration demonstrated strong scoring in indicators related to data privacy and security. Their scores on accountability measures were low, alongside the use of digital tools and infrastructure. These indicators suggest that there are strong data protection practices, while digital capabilities and infrastructure represent significant areas for development. The correlation between low digital infrastructure scores and minimal external data usage suggests both technological limitations and interoperability challenges.

Workforce Capacity

In Workforce Capacity and Competency, Administration demonstrated strong to moderate performance in indicators related to workforce training support and resource allocation. However, their scores on accountability measures were low. This pattern suggests established workforce development practices, while systematic accountability mechanisms present opportunities for enhancement.

Transparency

In Transparency, Administration demonstrated strong performance in indicators related to public decision and information sharing. Their scores were more variable for documentation and sharing of performance indicators. The tracking and measurement of quality and safety indicators against population metrics showed low performance across the programs. The data suggests a focus on sharing readily available information such as required financial and program data, while measurement against broader quality and safety datasets appears more limited. This suggests that measurement and transparency are present for some factors but limited for others. It further suggests that there are limitations when it comes to program benchmarking against other jurisdictions or programs.

INTEROPERABILITY

Foundational

In the assessment of Foundational Interoperability, programs demonstrated clear strengths in security-related indicators, particularly in data access security and secure storage infrastructure. External integration was missed among programs and there was limited clinical integration. These findings suggest that programs have strong privacy foundations but may not have the digital infrastructure for data sharing and connection to the healthcare systems.

Organizational

In the assessment of Foundational Interoperability, programs demonstrated clear strengths in security-related indicators, particularly in data access security and secure storage infrastructure. They score moderate in scores that require integration to external entities and with healthcare organizations with little to no integration with EMRs or clinical units. This suggests that programs have strong privacy foundations but may not have the digital infrastructure for data sharing and connection to the healthcare systems.

Structural

In the assessment of Structural Interoperability, programs scored higher in indicators such as cloud-based platforms, Wi-Fi access and network capabilities. However, implementation of patient-facing digital was limited between the programs. This contrast highlights a gap between technical infrastructure and actual deployment of patient-centered digital solutions.

PREDICTIVE ANALYTICS

Predictive Analytics

In the assessment of predictive analytics, programs showed varied adoption of analytic tools for decision-making. Data revealed significant opportunities for growth in analytics strategy development, decision-support tools and data collection processes, as most programs had not yet established these foundational elements. While several programs have begun building analytical capabilities, the current data highlights substantial gaps in analytical maturity and infrastructure development across the organization. This underutilization of predictive tools suggests untapped potential for enhancing data-driven operations and decision-making processes.

Personalized Analytics

Data shows limited adoption of personalized analytics across programs, with only a small number demonstrating moderate capability in risk assessment practices. Most programs have yet to implement systems for big data analytics and outcome tracking, revealing significant gaps in data collection, storage and analysis infrastructure. The current state indicates substantial room for developing capabilities in capturing patient outcomes, utilizing population-level data and generating meaningful analytical insights that could enhance service delivery and decision-making processes.

Operational Analytics

Programs demonstrated strong performance in data governance and transparency practices, establishing robust foundations for data management. However, the implementation of analytical tools for operational solutions and patient outcomes varied significantly across programs. This disconnect between established data governance frameworks and practical analytical capabilities suggests an opportunity to leverage data and enhance operational analytics across programs. The data indicates potential for developing more consistent analytical capabilities that could better inform operational decision-making and patient care outcomes.

Division of Regulation and Licensure Findings

GOVERNANCE AND WORKFORCE

Policy and Decision-Making

In the assessment of Policy and Decision-Making, programs in Regulation and Licensure appeared to have a demonstrated culture of using data and information for evidence-based decisions. Scores for community engagement and external input varied between programs. Similarly, indicators for defining value and implementing automation and interoperability showed significant variation. The findings suggest that while programs value data-driven decision-making, there are inconsistencies in their engagement with participants and implementation of technical capabilities.

Stewardship

In the assessment of Stewardship, indicators regarding privacy and data security remained high, Indicators covering the ability to adapt policies for new innovations and track performance showed wide variation, suggesting that while some areas have strong internal oversight, others may lack measurement processes. Many program aeras did not have, or utilize, digital tools limiting their capacity to work with large data sets. This shows that while programs have strong protective policies in place, they may lack the basic tools and systems needed to effectively collect and use data in their daily operations.

Workforce Capacity

In the assessment of workforce, Regulation and Licensure scored higher on indicators that suggest accountability frameworks and performance evaluations for the workforce. Throughout the programs, there was a wide variation on the upscaling of staff, such as providing the time, resources and opportunities for digital education. This gap between accountability measures and professional development opportunities reveals a workforce development challenge. Systems may exist for monitoring and evaluating staff performance, but there is significant opportunity for improved workforce digital health capacity building.

Transparency

In the assessment of License and Registrar, many of the programs appeared to have foundational transparency practices, but the collection and sharing of performance data and information was highly varied between programs. The collection and use of large data sets, such as population quality and safety data, was highly limited by the programs. This pattern suggests an operational gap between public-facing transparency and internal data capabilities. Programs may need a more standardized approach and update to the technical infrastructure for data collection and sharing.

INTEROPERABILITY

Foundational

In assessing Foundational Interoperability, programs scored high in privacy and security indicators. However, performance varied widely on external information exchange and patient health record integration. The variation suggests that while security foundations are strong, the ability to effectively share and integrate health information across systems remains inconsistent. It also suggests that some organizations may have more access to digital tools and processes than others.

Organizational

Programs demonstrated excellence in privacy and data indicators. Indicators on interoperability legislation and policy scored high though statewide interoperability policy implementation was notably absent. Similarly, capabilities for inter-program connectivity and health system integration were very low. This suggests that while programs have established internal data governance, the lack of state-level policy framework and digital infrastructure is preventing cross-system interoperability.

Semantic

Programs demonstrated significant variability in Semantic Interoperability. Indicators supporting clinical decision-making and clinical data use were low across all programs. This wide performance gap across programs suggests inconsistent implementation of semantic standards and clinical data management capabilities. It further suggests limitations to interoperability between programs and clinical organizations, limiting data for evidence-based decision-making.

Structural

In the assessment of Structural Interoperability, programs scored higher in indicators such as cloud-based platforms, Wi-Fi access and network capabilities. In the use of digital tools for patients, many programs were limited in both their use of digital tools for patients and their tie to outcomes. This reveals a significant disconnect between technical infrastructure and patient-centered data accessibility.

PREDICTIVE ANALYTICS

Predictive Analytics

In the assessment of Predictive Analytics, there were limitations across the programs in analytic tools to monitor and track progress. A small number used analytics to track patient outcomes and inform clinical care, while most are limited in their ability to do so. All programs were not connected to clinical tools for predictive analytics, tracking patient outcomes and personalizing care. This widespread lack of analytical capabilities suggests a significant gap in the healthcare system's ability to leverage data for proactive patient care and outcomes improvement, with only a few programs demonstrating basic analytical competencies.

Personalized Analytics

In the assessment of Personalized Analytics, a majority of programs scored very low across all indicators and many programs were limited in their ability for identifying patient risk and tracking outcomes. The performance across programs reveals a critical gap in analytical capabilities, suggesting low ability to collect and utilized data for advanced analytic capacities. The uniformly low scores indicate a systemic lack of infrastructure needed for personalized analytics implementation.

Operational Analytics

In assessing Operational Analytics, programs scored higher on indicators of data governance and support of data for evidence-informed decisions. Indicators that inform operational analytics, tracking costing and labor were all limited in the programs. This pattern demonstrates that while foundational data governance is stronger for these organizations, there is a significant gap in applying analytics to operational decision-making, particularly in critical areas of resource and cost management.

Division of Senior and Disability Services Findings

GOVERNANCE AND WORKFORCE

Policy and Decision-Making

The assessment of Policy and Decision-Making within DSDS revealed varying levels of capability in community engagement and technological integration. Some programs currently are engaging with the community, while others are still limited. The programs are highly varied in their outcome-focused strategies. But all programs are limited in their technological integration, such as digital tool utilization and patient information integration. These findings suggest that while programs maintain some community engagement, they may lack the technological infrastructure needed to effectively integrate information into evidence-based decision-making.

Stewardship

The assessment of Stewardship within DSDS demonstrated strong performance in privacy and security measures. Programs were varied between organizations for their policy evaluation and adaptability. Many programs were limited in their interoperability and the integration of external data for decision-making purposes. These findings indicate that while programs maintain robust privacy and security frameworks, they lack the technical capability to effectively share and utilize data across systems, limiting their ability to leverage external information for comprehensive decision-making.

Workforce Capacity

The assessment of Workforce Capacity and Competency within DSDS demonstrated varied support for staff development. Programs were stronger in their leadership support indicators, particularly in providing adequate training time but were limited in facilitating any external learning beyond internal resources. Both innovation and staff accountability appeared do be highly varied between programs. These findings indicate that while leadership support exists, programs have opportunities for growth in providing training for staff and supporting new innovations. Standardizing accountability across programs will create a more measurable and clear approach for staff learning and training.

Transparency

In terms of Transparency, DSDS demonstrated notable variation across programs. The programs appeared to have the foundation for transparency but were limited in data sharing between programs. There appeared to be opportunities for growth in the measuring of quality and safety across programs. This pattern suggests strong internal communication processes for decision-making, while external collaboration and safety information may not be measured and there may not be internal mechanisms for sharing.

INTEROPERABILITY

Foundational

The assessment of Foundational Interoperability indicates varying capabilities across programs. Programs are strong in their privacy and security, particularly in securing data and information privacy. The findings suggest limitations in data capture capabilities, (procurement processes, clinical integration, integration with statewide infrastructure). These findings suggest that programs may have stronger foundational elements of privacy and security but are missing the digital infrastructure needed for data collection and data sharing.

Organizational

In assessing Organizational Interoperability, programs have established basic infrastructure for secure communication, including reliable Wi-Fi, cloud orchestration platforms and data exchange systems. While internal communication foundations are in place, external data sharing capabilities remain limited. Programs demonstrate difficulties in sharing data for patient transitions between facilities, accessing external datasets (such as SDOH) and providing patients with access to their own health information. This gap between internal infrastructure and external data exchange suggests challenges in internal structures for interoperability.

Semantic

Semantic Interoperability in SDS reveals limited implementation across programs. Among the programs, there was strong limitations in integrating with clinical organizations. Some programs demonstrating limited implementation and many programs show no integration of data into clinical settings and supporting clinical decision-making. A small portion of programs have started to implement external data connections. This gap indicates challenges in accessing and utilizing large datasets and connections within clinical environments.

Structural

The assessment of Structural Interoperability shows varied scores in digital infrastructure across DSDS. Some programs have established foundational elements including cloud orchestration platforms and Wi-Fi networks and have implemented mobile navigation tools that enable patients to connect with personalized care delivery. However, a significant portion of unis lack digital tools for patient connectivity. Patients are unable to access their health records and have limited data ownership. Integration with external data systems remains limited, particularly in accessing SDOH information and supporting care transitions. This highlights significant challenges with external data sharing and exchange and may be a reflection on the current digital infrastructure.

PREDICTIVE ANALYTICS

Predictive Analytics

The assessment of Senior and Disability services showed that programs have opportunities for growth on predictive analytics. This shows that programs currently are limited in the tools or capacity to implement predictive analytics that could enhance patient care and improve clinical outcomes. It suggests a need and opportunity for investment in analytical infrastructure to support data-driven decision-making and personalized care delivery for these vulnerable populations.

Personalized Analytics

In the assessment of Personalized Analytics, programs have areas of opportunity for growth. Programs are currently limited in collecting large data sets for personalized analytics. This suggests that there will be significant improvement in this area when the programs are able to collect and leverage data for insight.

Operational Analytics

In the assessment of Operational Analytics, organizations were highly varied in data governance and oversight. This large distribution reveals a significant maturity gap in operational analytics capabilities, with most programs requiring deeper data collection and analysis capacity to inform operations.

PERSON-ENABLED HEALTH

Personalized Care Delivery

The assessment of Personalized Care Delivery in DSDS may indicate differences in abilities and systems. Traditional patient and staff relationships appear to have strong foundations, but the digital engagement of patients is limited (limited virtual care, limited digital tools) across programs. The programs appear to have challenges collecting data, especially for program tracking, costs and outcomes, which may reflect limited digital infrastructure. This illustrates a strong foundation for patient-centered care but also significant opportunities for integrating digital tools and technologies to support care.

Proactive Risk Management

The assessment of Proactive Risk Management within DSDS revealed that most programs were limited. Programs appeared to be limited in their digital infrastructure, data collection capabilities and data analysis functions, such as analytics. These scores demonstrate significant gaps across the key components of digital infrastructure, suggesting that while programs can provide basic user-friendly tools (such as access to websites) they lack the fundamental capacity to collect data from large datasets and utilize it for evidence-based decision-making.

Predictive Population Health

The assessment of Predictive Population Health within SDS was limited across programs. Programs were highly varied in their tracking and utilizing of outcomes data, suggesting they may measure select outcomes like cost while neglecting others such as value assessment. Programs were limited in data collection capabilities, both in gathering patient information and accessing external data sources including SDOH. Many programs did not have digital tools or resources for engaging with patients. These patterns suggest that while basic outcome measurement exists, there are substantial areas of opportunity for improved digital infrastructure, data collection and digital engagement capabilities.

REFERENCES

[i] Missouri Department of Health and Senior Services. (2023). Department overview and organizational structure. Retrieved from https://health.mo.gov/about/

[ii] Epidemiologists. https://www.cste.org/blogpost/1084057/338009/Congress-Funds-50-Million-to-Modernize-Public-Health-Data-Systems-and-Boosts-CDC-s-Budget. Published December 21, 2019. Accessed April 18, 2022.

[iii] Hagan C. Congress funds $50 million to modernize public health data systems and boosts CDC's budget. Council of State and Territorial

[iv] Kadakia KT, Desalvo KB. Transforming Public Health Data Systems to Advance the Population's Health. Milbank Q. 2023 Apr;101(S1):674-699. doi: 10.1111/1468-0009.12618. PMID: 37096606; PMCID: PMC10126962.

[v] HIMSS. (2024). https://www.himss.org/

[vi] Creswell, J. W., and Clark, V. L. P. (2017). Designing and Conducting Mixed Methods Research. Thousand Oaks, CA: Sage Publications.

[vii] Braun, V., and Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3(2), 77-101. https://doi.org/10.1191/1478088706qp063oa

APPENDIX C

PARTICIPANT OUTREACH

Email #1: Director's Email for Initial Participant Outreach

Audience: Entire Participant Register List
Sender: Director Paula Nickelson
To: All Participants w. Email Address to be BCCed
BCC: All Participant w. Email Address Identified (~115 emails)
Subject: Invitation to Participate in DHSS Data Landscape Survey, Maturity Evaluation, and Strategic Assessment

Dear Colleagues,

I am pleased to inform you that the Department of Health and Senior Services (DHSS) has launched a Data Landscape Survey, Maturity Evaluation, and Strategic Assessment, a first-of-its-kind initiative designed to guide future improvements in data collection, management, and utilization to enhance efficiencies and improve the health of Missourians.

You have been identified as someone who will have insights that will inform efforts and I kindly invite you to participate in the assessment of our agency's digital public health maturity and guide a plan of action for modernization.

DHSS has partnered with Guidehouse, Inc and Healthcare Information and Management Systems Society (HIMSS) to assist with our data maturity landscape assessment efforts. In the coming weeks, members of the Guidehouse and/or HIMSS teams will be contacting you and other leaders from across the State including representatives from DHSS, community-based organizations, local public health agencies, hospitals and health Systems, higher education, provider groups, and others with additional details regarding the engagement process and the anticipated level of time and effort required, should you elect to participate.

Our intentions with this initiative are ambitious and comprehensive and I sincerely hope that you will elect to participate, as we believe your feedback will be invaluable to helping support and strengthen the health of every Missourian.

Sincerely,
Paula Nickelson
Director
Missouri Department of Health and Senior Services

PARTICIPANT OUTREACH

Email #2: Director's Email for HIMSS Outreach

Audience: HIMSS DHI Tool Interview Participants
Sender: Director Paula Nickelson
To: HIMSS DHI Interview Participants to be BCCed (59 individuals)
BCC: Included in *Appendix A* below
Subject: Missouri Digital Health Assessment – Your Participation and Next Steps

Dear Colleagues,

On [date of email #1], you received an email with information regarding the Department of Health and Senior Services (DHSS)'s Data Landscape Survey, Maturity Evaluation, and Strategic Assessment. Today, DHSS is extending an invitation for you to participate in public health data landscape survey and strategic transformation maturity assessment.

DHSS has partnered with Healthcare Information and Management Systems Society (HIMSS) to deploy their Digital Health Indicator (DHI) to measure the current state of Missouri DHSS' public health information across the Department and its bureaus, divisions, and local public health authorities. Your feedback will be used to guide improvements in how data are collected, managed, and utilized to create efficiencies to improve the health of Missourians.

We are requesting the following from you:

1. Coordination with HIMSS team to establish a date and time for DHI assessment interview.
   - HIMSS will provide a detailed overview of the DHI assessment, and the anticipated amount of time it will take you to complete.
     Note: *The anticipated time to complete the DHI assessment will vary based on HIMSS' determination on the type of survey the participant will receive (i.e., full versus partial).*
2. Coordination with internal subject matter experts.
   - The DHI assessment contains questions on topics including, but not limited to:
   - Data strategy, governance, customer service, and product management processes.
   - System infrastructure, security, data storage practices, data collection, transformation, and other technical design and process details.
3. Await further steps from DHSS.
   - After completing the DHI assessment with HIMSS, project team members may contact you outlining next steps and how your input will be utilized.
   - Based on the feedback received DHSS may request your participation in additional meetings / information gathering sessions (no more than 1-2).

If you have questions about this request of the project please contact [insert Guidehouse email]. We look forward to your participation.

Sincerely,
Director Nickelson
Director
Missouri Department of Health and Senior Services

PARTICIPANT OUTREACH

Email #3: HIMSS Initial Outreach w. DHI Information and Considerations

[PLACEHOLDER – HIMSS TO PROVIDE]

Audience: HIMSS DHI Tool Interview Participants
Sender: HIMSS
To: HIMSS DHI Interview Participants to be sent individually
CC: TBD pending input from DHSS on who would like to be copied
BCC: N/A
Subject: Invitation to Participate in DHI Interview

Dear (_____) (insert contact name we are given).

My name is (_____) and I am a member of the HIMSS team who is working with Guidehouse to complete a Public Health data landscape survey to describe and map the current state of Missouri's public health information practices, data and digital tools.

We are reaching out to arrange a 2 hour Teams meeting with you and your team members to conduct a guided interview to assess your organization's use of data, digital tools and general questions about how your work is supported by your information system. We welcome all team members you feel can best answer the survey questions about use of data, digital tools and information infrastructure.

I would like to schedule this meeting with your team at one of the following dates and times, please let us know if any of these dates and times work. If not, we can send you additional dates and times to consider.

<Time request options here>

During our scheduled meeting, I will guide you through the survey questions from Digital Health Indicator (DHI) tool to assess digital health capacity for your organization. We would like your permission to record our discussion for internal note-taking purposes only. Transcripts and recordings will not be shared beyond the HIMSS data collector team.

We would be so grateful if you could let us know which of the times work best for your team to complete this guided interview. We are very much looking forward to meeting you and your team to complete the digital health survey and learn more about your organization.

Please let me know if you have any questions and thank you.

Kindly,
/HIMSS Team Member/

PARTICIPANT OUTREACH

Email #4: Director's Email of Thanks for Participation

Audience: Participants that Completed DHI Assessment
Sender: Director Paula Nickelson
To: Participants to be BCC'd (TBD)
BCC: Participants to be BCC'd (TBD)
Subject: Missouri Digital Health Assessment – Thank you for participating!

Dear [Individual Participant Group],

The Missouri Department of Health and Senior Services (DHSS) wants to thank you for your participation collaborating with Healthcare Information and Management Systems Society (HIMSS) to complete its Digital Health Indicator (DHI) and provide the Department with insights needed to assess the current state of public health information flow across its bureaus / divisions and local public health authorities.

Your assessment results will be aggregated and analyzed to guide improvements which will cover how data is collected, managed, and utilized in Missouri to create new efficiencies and improve the health of Missourians.

Next Steps

- DHSS will collaborate with Guidehouse Inc. and HIMSS to continue analyzing DHI assessment results.
- Based on the feedback received, DHSS may request your participation in additional meetings / information gathering sessions (no more than 1-2).
- Guidehouse and HIMSS will use all feedback to inform evidence-based decision-making and recommendations for improvements in a formal report to DHSS leadership in early 2025.

We thank you again for your participation and will be in touch.

STRATEGIC ASSESSMENT PARTICIPANT MEETINGS

Email #5: Strategic Assessment Overview and Invitation to Participate

Note: Five separate versions will be made for each regional meeting, depending on the specific time, region, location, and audience for the emails. Therefore, this email is a preliminary draft template intended to be edited.

Audience: Participant Groups
Sender: Guidehouse – Sarah Ekart (sekart@guidehouse.com)
To: **Regional* Group of Participants – TBD
BCC: Available in Participant Register (~115 emails)
Subject: DHSS Data Modernization Initiative (DMI) – Your Participation is Vital

Dear Colleagues,

We are pleased to invite you to participate in one of a series of meetings as part of the Missouri Department of Health and Senior Services (DHSS) Data Landscape Survey, Maturity Evaluation, and Strategic Assessment. Your input is necessary as we work to enhance statewide data systems to better serve the health and well-being of Missourians.

These meetings are designed to gather critical feedback and insights from participants around every region of the State. Each meeting will cover a specific topic and achieve specific goals.

The topic for the session we would like to include you is: [input topic(s)] and this meeting will [input based on decided topics]. If you do not believe you are the best point of contact from your organization to participate in this conversation, please let us know who else we should contact by emailing [input contact info]. Below, please find the meeting location and time:

- Meeting Location: [input once determined]
- Meeting Date and Time: [input once determined]

Please use the following link to register: [input link]

We encourage you to participate as your input is crucial to the success of this project. Your confidentiality and security will be protected throughout these engagements. The information collected will be used to enhance our understanding of existing data processes and to guide improvements in our data management systems. Again, should you have any questions or concerns, please do not hesitate to contact us at [input contact info].

We thank you for your time and cooperation. We look forward to your participation in this crucial initiative.

Best regards,
Guidehouse and the Department of Health and Senior Services

STRATEGIC ASSESSMENT PARTICIPANT MEETINGS

Email #6: Reminder Email for DHSS Data Modernization Initiative (DMI) Meeting

Audience: Participant Groups
Sender: Guidehouse – Sarah Ekart (sekart@guidehouse.com)
To: **Regional* List of Participant Groups – TBD
BCC: Available in Participant Register – Participants that Registered
Subject: Reminder: Upcoming DHSS Data Modernization Initiative (DMI) Meeting!

Dear [Participant Group],

Thank you for registering to participate in the upcoming participant meeting for the Missouri Department of Health and Senior Services (DHSS) Data Modernization Initiative (DMI). Meeting details are provided below for your reference:

- Discussion Topic: [input once determined]
- Meeting Location: [input once determined]
- Meeting Date and Time: [input once determined]

Your participation is critical in helping to enhance data systems to better serve the health and well-being of Missourians and we look forward to meeting you. As a reminder, all information shared during this meeting will be kept confidential and used solely for the purpose of this project.

If you have any questions or need further assistance, please feel free to contact us at: [input email]

Best regards,
Guidehouse, Inc. and the Department of Health and Senior Services

STRATEGIC ASSESSMENT PARTICIPANT MEETINGS

Email #7: Director's Second Email of Thanks for Participation

Audience: Participant Groups
Sender: Director Paula Nickelson
To: List of Participant Groups
BCC: Available in Participant Register – Participants that Attended Engagement(s)
Subject: DHSS Data Modernization Initiative (DMI) – Thank You for Participating!

Dear [Group],

We would like to extend our sincere gratitude for your participation in the recent meeting(s) for the Missouri Department of Health and Senior Services (DHSS) Data Modernization Initiative (DMI). Your valuable insights and feedback are essential to our efforts to enhance and streamline our data systems.

Our primary goal for this initiative is to streamline the data processes among different participants and ensure that all gaps in our data are addressed and your contributions will play a crucial role in DHSS achieving this goal. DHSS will use your input combined with participants across the State to develop a more efficient and comprehensive data system that will better serve the health and well-being of all Missourians.

As a reminder, your identity will remain confidential in all reports developed for through this initiative. Should you have any further thoughts or feedback, please do not hesitate to reach out to us at [input email]. Your continued collaboration is greatly appreciated as we move forward.

Sincerely,
Paula Nickelson
Director
Missouri Department of Health and Senior Services

STRATEGIC ASSESSMENT PARTICIPANT MEETINGS

Director Nickelson Introduction to Participants Before Engagement Meetings

Format: Video
Audience: Participant Groups

Hello,

I'm Paula Nickelson, Director of the Missouri Department of Health and Senior Services, and I have the privilege of welcoming you all to today's session. In June, DHSS partnered with Guidehouse, Inc. and the Healthcare Information and Management Systems Society (HIMSS) to evaluate data systems and flows across the state public health landscape and find a path forward to transform our data collection, management, and utilization processes.

Public health data and information systems nationwide require attention to improve data availability and systems interoperability. Through this effort, and with Guidehouse and HIMSS support, Missouri will be in position to improve planning for health interventions, monitor disease outbreaks, identify vulnerable populations, and communicate health data as efficiently as possible.

Your participation and insights today will drive DHSS' evaluation efforts, so we encourage you to share as many thoughts, ideas, and opinions as you can, because your support and the information gathered today will be used to improve the health of every Missourian through a re-envisioned data maturity model.

So again, on behalf of myself, DHSS, our partners, and the State of Missouri, thank you for your time and we look forward to working with you.

[VIDEO END]

APPENDIX D

MISSOURI DEPARTMENT OF
HEALTH &
SENIOR SERVICES

Data Landscape Survey, Maturity Evaluation, and Strategic Assessment

Executive Dashboard

October 11th, 2024

Agenda

1. Upcoming DHSS Meetings
2. Phase 1 Status: Data Landscape Survey
3. Phase 2 Status: Transformation Maturity Evaluation
4. Phase 3 Status: Strategic Assessment
5. Phase 4 Status: Final Report
6. Project Schedule
7. Next Steps

This work is supported by funds made available from the Centers for Disease Control and Prevention (CDC) of the U.S. Department of Health and Human Services (HHS), National Center for STLT Public Health Infrastructure and Workforce, through OE22-2203: Strengthening U.S. Public Health Infrastructure, Workforce, and Data Systems grant. The contents are those of the author(s) and do not necessarily represent the official views of, nor an endorsement, by CDC/HHS, or the U.S. Government.

Upcoming DHSS Meetings

#	Meeting Name	Location	Date & Time	Attendees	Status of Preparation
1	Missouri Board of Health (BOH) Meeting	Virtual	Date / Time TBD	Joshua Wymer Jamie Howgate	Pending confirmation of date from DHSS – targeting December 2024.
2	Stakeholder Engagement Series III	Missouri	October 15th – October 17th	Stakeholders	Registration form and reminder email sent.
3	Stakeholder Engagement Series IV	Missouri	October 28th – November 1st	Stakeholders	Finalizing location, dates, and times with Tiffany.
4	Stakeholder Engagement Series V	Missouri	November 11th – November 15th	Stakeholders	TBD

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MISSOURI DEPARTMENT OF HEALTH & SENIOR SERVICES

Phase 1
Public Health Data Landscape Survey

- On track
- Delayed
- Behind Schedule
- Not started

Overall Status
October 11, 2024
On Track

Deliverables & Activities Progress

#	Activities	Due Date	Status
1	Develop and finalize stakeholders included in Phases 2 and 3.	W3 June	**Complete**
2	Develop PH Data Landscape Survey Plan (Communication Plan).	W3 July	**Complete**
3	Develop map of data relationships across the statewide PH ecosystem.	W4 Jan*	
4	Develop Phase 1 Stakeholder Report presented in Jefferson City.	W2 Oct*	**Complete**

** Revised per latest workplan version (8/22).*

Risks & Issues

- None at this time

Decision Guidance

- None at this time

Next Actions

- Continue data mapping activities.

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MISSOURI DEPARTMENT OF HEALTH & SENIOR SERVICES

Phase 2
Transformation Maturity Evaluation

- On track
- Delayed
- Behind Schedule
- Not started

Overall Status October 11, 2024 — **On Track**

Current Deliverables & Activities

#	Activities	Due Date	Status
1	Submit HIMSS digital health indicator (DHI) tool for approval.	W1 Aug	Complete
2	Deploy HIMSS Tool.	W4 Oct	
3	Identify an agency score for digital health transformation and maturity.	W4 Oct	
4	Develop Transformation Report.	W4 Oct	
5	Develop Phase 1 and 2 Stakeholder Report presented in Jefferson City.	W4 Oct	

Risks & Issues

- None at this time.

Decision Guidance

- None at this time.

Next Actions

- **HIMSS has contacted all 58 recipients as of 9/11.**
  - Responses Received / Meeting Scheduled: **58**
  - Responses Outstanding: **0**
  - Response Rate: **100%**
- **HIMSS is currently at 60.3% completion of assessments. The team has completed 35 assessments, and 23 are in progress of the 58 scheduled as of 10/9.**

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MISSOURI DEPARTMENT OF HEALTH & SENIOR SERVICES

Phase 3
Strategic Assessment

- On track
- Delayed
- Behind Schedule
- Not started

Overall Status October 11, 2024 — **On Track**

Current Deliverables & Activities

#	Activities	Due Date	Status
1	Develop proposed plan for Stakeholder Event facilitators.	W1 Sept	Complete
2	Engage with agency-accepted facilitators of 25 Stakeholder Events	W2 Sept	Complete
3	Develop proposal in collaboration with DHSS a final list of stakeholder event participants	W1 Sept	Complete
4	Develop plan for 25 Stakeholder Events, to include online registration, meeting space, facilitation, note-taking and compilation of results.	W1 Sept	Complete
5	Conduct 25 regional stakeholder meetings.	W2 Nov	
6	Develop presentation on high-level results of phases one and two at twenty-five (25) statewide stakeholder events.	W2 Nov	
7	Develop Phase 1, 2 and 3 Stakeholder Report to be presented in Jefferson City	W4 Dec	

Risks & Issues

- Stakeholder Meetings will need to be completed by W1 December, taking holiday schedules into account.

Decision Guidance

- None at this time.

Next Steps

- Guidehouse development & DHSS approval of deck for Stakeholder Engagement Events (Series III) outlining agenda, meeting goals, questions, and expectations.
- Guidehouse to conduct Stakeholder Series 3 Meetings (and take photos) October 15-17, 2024.

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Phase 4
Final Report

- On track
- Delayed
- Behind Schedule
- Not started

Overall Status
October 11, 2024
On Track

Current Deliverables & Activities

#	Activities	Due Date	Status
1	Develop a visual timeline and table of contents	W4 Aug	Complete
2	Three draft report in-person meetings to receive and incorporate feedback	W2 Jan	
3	Develop compelling Executive Summary and Key Findings to present in person	W2 Jan	
4	Develop comprehensive acknowledgements list of participants from all phases for incorporation into the final report.	W1 Jan	
5	Develop and draft sample layouts and design elements for approval	W1 Nov	
6	Develop final, fully compliant final State Public Health Data Landscape Survey, Transformation Maturity, and Strategic Assessment Report by January 31, 2025 in both printed and electronic formats	W4 Jan	

Risks & Issues

- None at this time.

Decision Guidance

- None at this time.

Next Steps

- Guidehouse will confirm Final Report delivery timeline.

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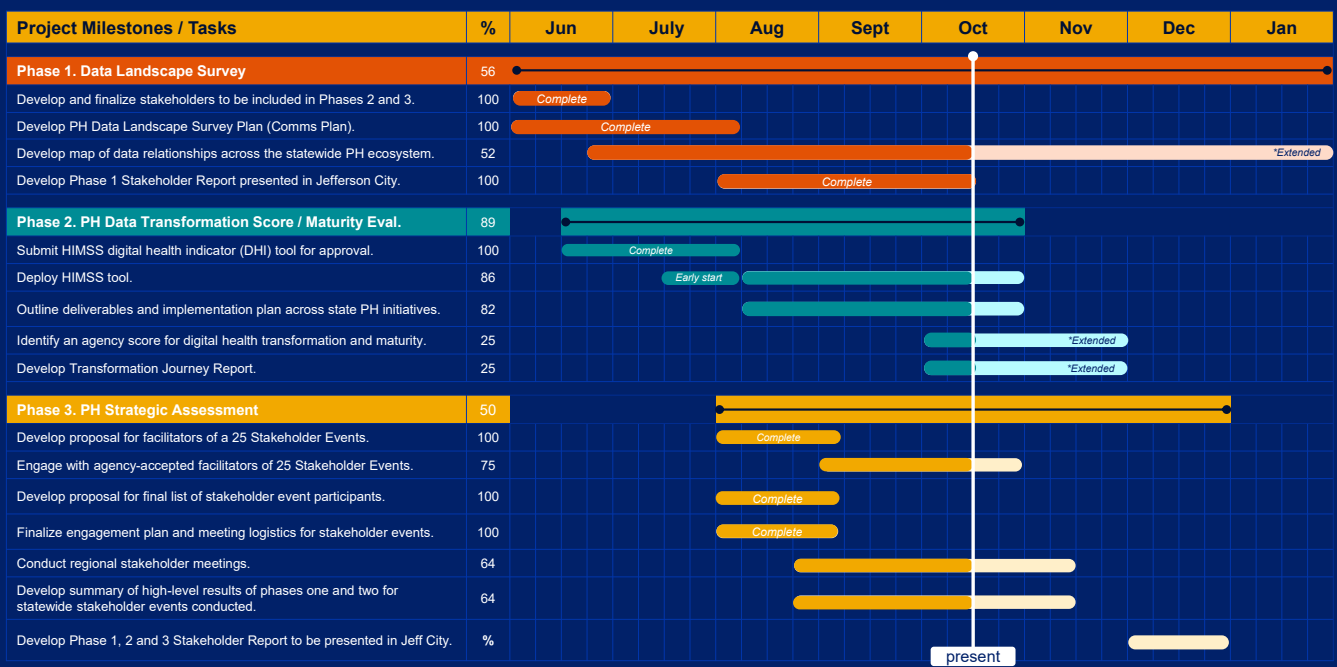
Project Schedule



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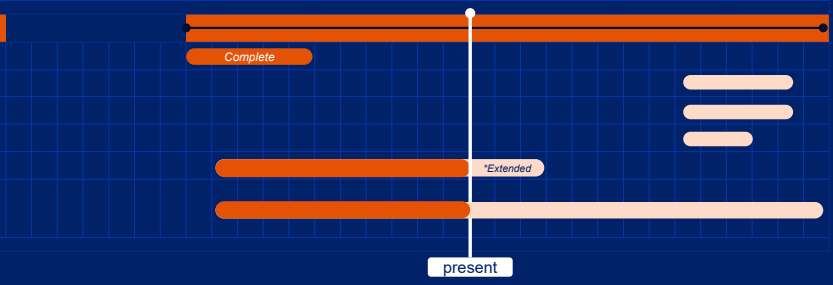
Project Schedule (cont.)

Project Milestones / Tasks	%
Phase 4. Final Report	44
Develop a visual timeline and table of contents.	100
Three draft report in-person meetings to receive and incorporate feedback.	%
Develop Executive Summary and Key Findings to present in person.	%
Develop acknowledgements from all phases for incorporation in report.	%
Develop and draft sample layouts and design elements for approval.	77
Develop final State Public Health Data Landscape Survey, Transformation Maturity, and Strategic Assessment Report by January 31, 2025, in both printed and electronic formats.	42



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Next Steps

Item #	Phase	Action Item(s)	Owner(s)	Due Date	Contingencies
1	3	Meet with DHSS Data Modernization Leadership Advisory Group	DHSS / GH	TBD	N/A
2	1	Close out Data Inventory Tool Questionnaire and analyze results	GH	October 15th	N/A
3	3	Conduct Stakeholder Series 3 Meetings	GH	October 15th – 17th	N/A

This work is supported by funds made available from the Centers for Disease Control and Prevention (CDC) of the U.S. Department of Health and Human Services (HHS), National Center for STLT Public Health Infrastructure and Workforce, through OE22-2203: Strengthening U.S. Public Health Infrastructure, Workforce, and Data Systems grant. The contents are those of the author(s) and do not necessarily represent the official views of, nor an endorsement, by CDC/HHS, or the U.S. Government.

APPENDIX E

PUBLIC HEALTH SYSTEMS INVENTORY TOOL FOR MO DHSS PROJECT

BACKGROUND INFORMATION

1. Your Name _____

2. Your Bureau/Agency/Unit _____

3. Which application or system are you answering about? If you are managing more than one system, please fill out the Questionnaire for each system.

- ☐ Access Database
- ☐ Excel Spreadsheet ACTS Survey and Compliance Complaint Software
- ☐ Ambulatory Unit Staff (RETIRED)
- ☐ ASPEN Survey and Compliance Software
- ☐ Behavioral Risk Factor Surveillance System (BRFSS)
- ☐ Capture Perfect
- ☐ Case Compass
- ☐ CNP – Community Nutrition Program
- ☐ Content Manager Enterprise Edition
- ☐ County-Level Study (CLS)
- ☐ Department of Health and Senior Services Intranet
- ☐ Department of Health and Senior Services Website(s)
- ☐ DNR (RETIRED)
- ☐ Donor Registry System
- ☐ DSDS Hotline application aka APS ORA
- ☐ eHARS – Enhanced HIV AIDS Reporting System
- ☐ Emergency System for Advance Registration of Volunteer Hlth Prof
- ☐ EMPower – Power outages (RETIRED)
- ☐ EMS Licensee
- ☐ Environmental Public Health Tracking (EPHT)
- ☐ EnvSurv – Environmental Surveillance
- ☐ Epitrax
- ☐ ESRI
- ☐ ESSENCE
- ☐ HAN – Health Alert Network
- ☐ HCBS Web Tool
- ☐ Hepatitis A Outbreak (RETIRED)
- ☐ Healthcare-Associated Infection Reporting (HAI)
- ☐ HESS – Hospital Electronic Syndromic Surveillance
- ☐ HL7 Messaging Portal
- ☐ Home and Community Services Provider System
- ☐ Instrument Manager
- ☐ Lab Web Portal
- ☐ LIMS – Laboratory Information Management System
- ☐ LIMSConnect
- ☐ MARS – Missouri Ambulance Reporting System
- ☐ MICA
- ☐ Missouri Public Health Information Management System (MOPHIMS)
- ☐ MoEVR
- ☐ MOHSAIC
- ☐ MOWINS
- ☐ Neometrics MSDS IV
- ☐ Newborn Screening
- ☐ OpenELIS 2
- ☐ Patient Abstract System Reporting Application (PASRA)
- ☐ Physician Prescribing Monitoring Program – PPMP
- ☐ Redcap
- ☐ School Health
- ☐ Service Coordination
- ☐ Sewershed Surveillance – COVID
- ☐ ShowMeVax – WebIZ
- ☐ ShowMeWorldCare
- ☐ Specimen Gate
- ☐ State Public Health Lab (SPHL) Ordering Form – COVID
- ☐ State Public Health Lab (SPHL) Ordering Manager – COVID
- ☐ Time Critical Diagnosis Registry – TCD Registry
- ☐ Vital Records – Mainframe
- ☐ WebSurv

4. Indicate which section of MOHSAIC you work with (i.e.. ShowMeHealthy Women, Newborn Hearing, Newborn Bloodspot, etc.)

_____

5. System acronym or common name _____

PUBLIC HEALTH SYSTEMS INVENTORY TOOL FOR MO DHSS PROJECT

6. Type of system

- ☐ Electronic Health Record
- ☐ Case Management
- ☐ Immunization Registries
- ☐ Other Registries [Cancer, Diabetes]
- ☐ Integrated Disease Surveillance
- ☐ Laboratory Information Management System
- ☐ Message Validation and Processing
- ☐ Surveillance System
- ☐ Vital Statistics System
- ☐ Other

7. Provide a description of the system and its use (2-4 sentences).

_____

_____

_____

8. **[OPTIONAL]** If the system has been purchased from a vendor, provide the name of the vendor. If not, please enter "developed in-house" _____

DATA SYSTEM INFORMATION

9. Choose the current status of the system from the provided options.

- ☐ Fully operational
- ☐ Under development
- ☐ Partially operational
- ☐ Under development
- ☐ Not yet operational
- ☐ Soon to be replaced
- ☐ Other

10. If you answered other than "Fully Operational", please elaborate on your response. (Describe status, if soon to be replaced, when is the system expected to be retired and/or replaced, etc.)

_____

_____

_____

11. List the sources of funding for this system.

_____

12. How is the system maintained? (Select all that apply.)

- ☐ Maintenance contract with separate vendor
- ☐ Office of Administration ITSD
- ☐ Internal Staff Support
- ☐ Other

13. Can data be extracted from your system? (Select all that apply.)

- ☐ Yes, internal program staff can extract data
- ☐ Yes, ITSD or a vendor can extract data
- ☐ Yes, external program staff or the public can extract data
- ☐ No

14. What is the earliest year that the system can pull data for analysis and reporting? _____

PUBLIC HEALTH SYSTEMS INVENTORY TOOL FOR MO DHSS PROJECT

15. Who are the main users or subscribers to your system? (Select all that apply.)

- ☐ Citizens / Public
- ☐ Community Based Organizations
- ☐ DHSS Staff
- ☐ Government Agency – State (internal to MO)
- ☐ Government Agency – State (external to MO)
- ☐ Healthcare Insurance Companies
- ☐ Hospitals/Clinics
- ☐ Laboratories
- ☐ Local Public Health Agencies
- ☐ Managed Care Organizations
- ☐ Medical Researchers
- ☐ Nurse midwife
- ☐ Other Healthcare Providers
- ☐ Physicians
- ☐ Patients
- ☐ Regulatory and Quality Assurance Agencies
- ☐ Schools
- ☐ Other

16. **[OPTIONAL]** Select the Operating System used by this system.

- ☐ Linux/Unix
- ☐ Mac OS X
- ☐ Microsoft Windows
- ☐ MS-DOS
- ☐ Solaris
- ☐ Do not know
- ☐ Other

17. **[OPTIONAL]** What database platform(s) does the system use? (Select all that apply.)

- ☐ DB2
- ☐ Microsoft SQL Server
- ☐ Microsoft Access
- ☐ Microsoft Excel
- ☐ MySQL
- ☐ Oracle
- ☐ REDCap
- ☐ Do not know
- ☐ Other

18. How do users access the system? (Select all that apply.)

- ☐ Desktop Application [Access Excel]
- ☐ Mobile Application
- ☐ Web Browser
- ☐ VPN Connection
- ☐ Other

PUBLIC HEALTH SYSTEMS INVENTORY TOOL FOR MO DHSS PROJECT

DATA FLOWS

19. Select the organizations that provide data electronically to this system. (Select all that apply.) *Electronically is defined as not requiring manual intervention for the processing of data received. (Includes web portals, direct integrations, etc.)*

- ☐ Birthing Centers
- ☐ Correctional Facilities
- ☐ DHSS Staff
- ☐ Emergency Medical Services
- ☐ Federal government agency
- ☐ Federally Qualified Medical Centers/Community Health Centers
- ☐ Free Standing Eds
- ☐ Hospital Eds
- ☐ Health Information Exchange
- ☐ Hospital Infection Preventionists
- ☐ Hospital Lab
- ☐ Hospital Other
- ☐ Insurance Claims
- ☐ Laboratories – private
- ☐ Laboratories – public
- ☐ Local health departments
- ☐ Long Term Care Facilities/Assisted Living Facilities
- ☐ Managed care organizations
- ☐ Members of the general public by self-report
- ☐ Private doctors/nurses
- ☐ Pharmacies
- ☐ Poison control centers
- ☐ Public health clinics
- ☐ Schools/Universities
- ☐ State/local agencies other than health departments (external to MO)
- ☐ State/local agencies other than health departments (internal to MO)
- ☐ State/Territorial health departments
- ☐ Tribal health departments
- ☐ Urgent Care Centers
- ☐ Veterinarians
- ☐ Data not received electronically from any organizations to this system
- ☐ Other

20. Select the organizations that provide data manually to this system. (Select all that apply.) *Manually is defined as hand-keyed data entry or paper-based (e.g., fax, e-fax, mail, e-mail)*

- ☐ Birthing Centers
- ☐ Correctional Facilities
- ☐ DHSS Staff
- ☐ Emergency Medical Services
- ☐ Federal government agency
- ☐ Federally Qualified Medical Centers/Community Health Centers
- ☐ Free Standing Eds
- ☐ Hospital Eds
- ☐ Health Information Exchange
- ☐ Hospital Infection Preventionists
- ☐ Hospital Lab
- ☐ Hospital Other
- ☐ Insurance Claims
- ☐ Laboratories – private
- ☐ Laboratories – public
- ☐ Local health departments
- ☐ Long Term Care Facilities/Assisted Living Facilities
- ☐ Managed care organizations
- ☐ Members of the general public by self-report
- ☐ Private doctors/nurses
- ☐ Pharmacies
- ☐ Poison control centers
- ☐ Public health clinics
- ☐ Schools/Universities
- ☐ State/local agencies other than health departments (external to MO)
- ☐ State/local agencies other than health departments (internal to MO)
- ☐ State/Territorial health departments
- ☐ Tribal health departments
- ☐ Urgent Care Centers
- ☐ Veterinarians
- ☐ Data not received electronically from any organizations to this system
- ☐ Other

PUBLIC HEALTH SYSTEMS INVENTORY TOOL FOR MO DHSS PROJECT

21. Select the organizations to which the system sends data electronically. (Select all that apply.) *Electronically is defined as not requiring manual intervention for the processing of data received. (Includes web portals, direct integrations, etc.)*

- ☐ Birthing Centers
- ☐ Correctional Facilities
- ☐ DHSS Staff
- ☐ Emergency Medical Services
- ☐ Federal government agency
- ☐ Federally Qualified Medical Centers/Community Health Centers
- ☐ Free Standing Eds
- ☐ Hospital Eds
- ☐ Health Information Exchange
- ☐ Hospital Infection Preventionists
- ☐ Hospital Lab
- ☐ Hospital Other
- ☐ Insurance Claims
- ☐ Laboratories – private
- ☐ Laboratories – public
- ☐ Local health departments
- ☐ Long Term Care Facilities/Assisted Living Facilities
- ☐ Managed care organizations
- ☐ Members of the general public by self-report
- ☐ Private doctors/nurses
- ☐ Pharmacies
- ☐ Poison control centers
- ☐ Public health clinics
- ☐ Schools/Universities
- ☐ State/local agencies other than health departments (external to MO)
- ☐ State/local agencies other than health departments (internal to MO)
- ☐ State/Territorial health departments
- ☐ Tribal health departments
- ☐ Urgent Care Centers
- ☐ Veterinarians
- ☐ Data not received electronically from any organizations to this system
- ☐ Other

22. Select the organizations to which the system sends data manually. (Select all that apply.) *Manually is defined as hand-keyed data entry or paper-based (e.g., fax, e-fax, mail, e-mail)*

- ☐ Birthing Centers
- ☐ Correctional Facilities
- ☐ DHSS Staff
- ☐ Emergency Medical Services
- ☐ Federal government agency
- ☐ Federally Qualified Medical Centers/Community Health Centers
- ☐ Free Standing Eds
- ☐ Hospital Eds
- ☐ Health Information Exchange
- ☐ Hospital Infection Preventionists
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- ☐ Hospital Other
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- ☐ Laboratories – private
- ☐ Laboratories – public
- ☐ Local health departments
- ☐ Long Term Care Facilities/Assisted Living Facilities
- ☐ Managed care organizations
- ☐ Members of the general public by self-report
- ☐ Private doctors/nurses
- ☐ Pharmacies
- ☐ Poison control centers
- ☐ Public health clinics
- ☐ Schools/Universities
- ☐ State/local agencies other than health departments (external to MO)
- ☐ State/local agencies other than health departments (internal to MO)
- ☐ State/Territorial health departments
- ☐ Tribal health departments
- ☐ Urgent Care Centers
- ☐ Veterinarians
- ☐ Data not received electronically from any organizations to this system
- ☐ Other

PUBLIC HEALTH SYSTEMS INVENTORY TOOL FOR MO DHSS PROJECT

23. Is this system routinely used to generate data sets?

- ☐ Yes, internal programmatic use only (programmatic analyses, internal reports)
- ☐ Yes, internal department leadership
- ☐ Yes, external data use only (public facing data access or reports)
- ☐ Yes, external partnerships (including federal reporting; not public)
- ☐ No

24. **[OPTIONAL]** Where is the analysis of the data set performed? (Select all that apply.)

- ☐ Centralized processing for daily analysis/codes
- ☐ Individual workstations
- ☐ Data Lake/Data Warehouse
- ☐ Other

25. **[OPTIONAL]** Select the functions and/or capabilities that are available in your system. (Select all that apply.)

- ☐ Analyze data
- ☐ Generate automated alerts
- ☐ Generate reports of analyzed data
- ☐ Generate exports or extracts reports of raw data
- ☐ Generate reports or maps of geo-coded data
- ☐ Receive data
- ☐ Receive alerts
- ☐ Send data
- ☐ Standardize data received from other systems
- ☐ Standardize data sent to other systems
- ☐ Support web-based data submission
- ☐ Workflow Decision Support
- ☐ There are no electronic components because this is a paper-based system
- ☐ Don't know
- ☐ Other

ACCESS DATABASE QUESTIONS

26. If your Access Database has a name, what do you call it? _____

27. What is the database used for? (Select all that apply.)

- ☐ Case Management
- ☐ Case Reporting
- ☐ Data Analysis
- ☐ Data Collection
- ☐ Financial Management
- ☐ Grants Management
- ☐ Outcome Reporting Requirements
- ☐ Program Management
- ☐ Project Management
- ☐ Other

28. **[OPTIONAL]** Who should we contact to ask more questions about these tools if not you? (Please indicate name, e-mail, and phone number.) _____

_____

APPENDIX F

[i] Missouri Department of Health & Senior Services. (2023). *About the Department of Health & Senior Services.* https://health.mo.gov/about/

[ii] Missouri Department of Health & Senior Services. (2023). *Department Overview And Organizational Structure.* https://health.mo.gov/about/

[iii] Nickelson P. F. (2023) Missouri's Public Health at a Glance. *Missouri medicine*, 120(1), 4-7 https://pmc.ncbi.nlm.nih.gov/articles/PMC9970341/

[iv] Missouri Department of Health & Senior Services. (n.d.). *Public Health Plans.* https://health.mo.gov/healthplans/index.php

[v] Centers for Medicare & Medicaid Services. (2024, August 21). *Social Drivers of Health and Health-Related Social Needs.* CMS. https://www.cms.gov/priorities/innovation/key-concepts/social-drivers-health-and-health-related-social-needs

[vi] Missouri Department of Health & Senior Services. (2023, September). *Focus: A Publication of The 2021 Vital Statistics.* Bureau of Vital Statistics. https://health.mo.gov/data/focus/pdf/2021-focus.pdf

[vii] Nickelson P. F. (2023) Missouri's Public Health at a Glance. *Missouri medicine*, 120(1), 4-7 https://pmc.ncbi.nlm.nih.gov/articles/PMC9970341/

[viii] Missouri Department of Health & Senior Services. (n.d.). *Behavioral Risk Factor Surveillance System (BRFSS).* https://health.mo.gov/data/brfss/index.php

[ix] Nickelson P. F. (2023) Missouri's Public Health at a Glance. *Missouri medicine*, 120(1), 4-7 https://pmc.ncbi.nlm.nih.gov/articles/PMC9970341/

[x] Nickelson P. F. (2023) Missouri's Public Health at a Glance. *Missouri medicine*, 120(1), 4-7 https://pmc.ncbi.nlm.nih.gov/articles/PMC9970341/

[xi] Chileshe, M., Bunkley, E. N., & Hunleth, J. (2022). The Rural Household Production of Health Approach: Applying Lessons from Zambia to Rural Cancer Disparities in the U.S. *International Journal Of Environmental Research and Public Health*, 19(2), 974. https://doi.org/10.3390/ijerph19020974

[xii] Kuhns. M., & Low, S. A. (2021, October). *Missouri Health Care Availability and Outcomes Differ Regionally.* Extension.missouri.edu. https://extension.missouri.edu/publications/mx56

[xiii] Nickelson P. F. (2023) Missouri's Public Health at a Glance. *Missouri medicine*, 120(1), 4-7 https://pmc.ncbi.nlm.nih.gov/articles/PMC9970341/

[xiv] *HealthierMO.* (2020). #HealthierMO. Ozarks Public Health Institute at Missouri State University. https://www.healthiermo.org/

[xv] Missouri Department of Health & Senior Services. (2023). *About the Department of Health & Senior Services.* https://health.mo.gov/about/

[xvi] Local Public Health Agencies | Health & Senior Services. (n.d.). Health.mo.gov. https://health.mo.gov/living/lpha/

[xvii] National Library of Medicine. (2010). The Governmental Public Health Infrastructure. Nih.gov; National Academies Press (US). https://www.ncbi.nlm.nih.gov/books/NBK221231/

[xviii] Missouri Association of Area Agencies on Aging | MA4. (2024, October 15). Missouri Association of Area Agencies on Aging. https://www.ma4web.org/

[xix] *Advance Health Information Exchange and Interoperability.* (2023, September 6). 4medica. https://www.4medica.com/blog_insights/advancing-healthcare-through-health-information-exchange-and-interoperability/

[xx] Missouri Department of Social Services. (n.d.). *Health Information Exchange*. https://dss.mo.gov/mhd/hie.htm

[xxi] Wilson, M. G., Lavis, J. N., & Guta, A. (2012). Community-based Organizations in the Health sector: a Scoping Review. Health Research Policy and Systems, 10(1). https://doi.org/10.1186/1478-4505-10-36

[xxii] Chan, R. (n.d.). Part 4 Higher Education & Teacher Education and Training Higher Education as a Field of Study: An Analysis of 495 Academic Programs, Research Centers, and Institutes across 48 Countries Worldwide. Retrieved December 11, 2024, from https://scholar.harvard.edu/files/roychan/files/higher_education_as_a_field_of_study_-_chan.pdf

[xxiii] Center for Medical Epidemiology and Population Health (CMEPH) - MU School of Medicine. (2024). Missouri.edu. https://medicine.missouri.edu/centers-institutes-labs/center-medical-epidemiology-population-health

[xxiv] Public Health Works A Web-Based Orientation Manual for Public Health Leaders. (n.d.). https://health.mo.gov/living/lpha/phworks/publichealthworks.pdf

[xxv] Brown, M. (2020). Unpacking the Theory of Change. *Stanford Social Innovation Review*, 18(4), 44-50. https://doi.org/10.48558/N0V8-KR42

[xxvi] United Nations Development Group. (2017). Theory of Change. https://unsdg.un.org/sites/default/files/UNDG-UNDAF-Companion-Pieces-7-Theory-of-Change.pdf

[xxvii] Healthcare Information and Management Systems Society. (2020). HIMSS. https://www.himss.org/

[xxviii] Missouri State Highway Patrol. (n.d.). *Patrol Locations.* https://statepatrol.dps.mo.gov/pages/patrollocations

[xxix] Assistant Secretary for Technology Policy/Office of the National Coordinator for Health IT. (2024, August 5). *Health Data, Technology, and Interoperability: Patient Engagement, Information Sharing, and Public Health Interoperability (HTI-2) Proposed Rule*. HealthIT.gov. https://www.healthit.gov/topic/laws-regulation-and-policy/health-data-technology-and-interoperability-patient-engagement

[xxx] *HealthierMO.* (2020). Our Work. Ozarks Public Health Institute at Missouri State University. https://www.healthiermo.org/our-work

[xxxi] CDC TRAIN. (n.d.). www.train.org; https://www.train.org/cdctrain/welcome

[xxxii] *Resource Library | PHII.org.* (n.d.). PHII. https://phii.org/resource-library/

[xxxiii] Public Health Accreditation Board. (2024, June 29). *Education & Training – Public Health Accreditation Board.* https://phaboard.org/education-training/

[xxxiv] Missouri Department of Health and Senior Services (2021, July 13). *Local Public Health Agencies by Governance.* https://health.mo.gov/living/lpha/pdf/ColorMapLPHA.pdf

[xxxv] Acosta, A., Benoit, M.-A., Conway, C., Hughes, D., Levi, J., Markus, A., Regenstein, M., Seyoum, S., Trott, J., & Van Bronkhorst, Hope. (2021). *Missouri's Public Health Response to COVID-19: Key Findings and Recommendations for State Action and Investment.* Health Sciences Research Commons. https://hsrc.himmelfarb.gwu.edu/sphhs_policy_briefs/61

[xxxvi] Fleurant, S., & Boufides, C. H. (2024, May 13). *Missouri Public Health Authority Toolkit – Network for Public Health Law.* Network for Public Health Law. https://www.networkforphl.org/resources/missouri-public-health-authority-project/missouri-public-health-authority-toolkit/